6/28/07

FINAL

AMENDMENT 27 TO THE REEF FISH FISHERY MANAGEMENT PLAN

AND

AMENDMENT 14 TO THE SHRIMP FISHERY MANAGEMENT PLAN

(INCLUDING SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT, REGULATORY IMPACT REVIEW, AND REGULATORY FLEXIBILITY ACT ANALYSIS)

JUNE 2007

Gulf of Mexico Fishery Management Council
2203 North Lois Avenue, Suite 1100
Tampa, Florida 33607
813-348-1630
813-348-1711 (fax)
888-833-1844 Toll Free
gulfcouncil@gulfcouncil.org
www.gulfcouncil.org

National Oceanic & Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701
727-824-5308
727-824-5305 (fax)
http://sero.nmfs.noaa.gov

This is a publication of the Gulf of Mexico Fishery Management Council Pursuant to National Oceanic and Atmospheric Administration Award No. NA05NMF4410003.

This page intentionally left blank

TABLE OF CONTENTS

ABBREVIATIONS USED IN THIS DOCUMENT

AP	Advisory Panel
AHRSAP	Ad Hoc Red Snapper Advisory Panel
Council	Gulf of Mexico Fishery Management Council
CPUE	Catch Per Unit Effort
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
FMP	Fishery Management Plan
GCEL	General Counsel for Enforcement and Litigation
GOM	Gulf of Mexico
HAPC	Habitat Area of Particular Concern
IFQ	Individual Fishing Quota
ITQ	Individual Transferable Fishing Quota
IRFA	Initial Regulatory Flexibility Analysis
LASAF	Limited Access System Administrative Fund
MP	Million Pounds
M-SFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NMFS	NOAA's National Marine Fisheries Service
OY	Optimum Yield
QS	Quota Shares
RA	Regional Administrator
RFA	Regulatory Flexibility Act of 1980
RFFMP	Reef Fish Fishery Management Plan
RIR	Regulatory Impact Review
SFA	Sustainable Fisheries Act
SEIS	Supplemental Environmental Impact Statement
SEP	Socioeconomic Panel
SSBR	Spawning Stock Biomass Per Recruit
SPR	Spawning Potential Ratio
SMZ	Special Management Zone
SFA	Sustainable Fisheries Act
USCG	United States Coast Guard
VMS	Vessel Monitoring System

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (FSEIS) COVER SHEET

Responsible Agencies and Contact Persons

Gulf of Mexico Fishery Management Council (Council)	813-348-1630
2203 North Lois Avenue	813-348-1711 (fax)
Tampa, Florida 33619-2272	gulfcouncil@gulfcouncil.org
Wayne Swingle (wayne.swingle@gulfcouncil.org)	http://www.gulfcouncil.org
National Marine Fisheries Service (NMFS)	727-824-5305
Southeast Regional Office	727-824-5308 (fax)
263 13th Avenue South	http://sero.nmfs.noaa.gov
St. Petersburg, Florida 33701	
Roy Crabtree (Roy.Crabtree@noaa.gov)	

Name Of Action

Joint Amendment 27 to the Reef Fish Fishery Management Plan and Amendment 14 to the Shrimp Fishery Management Plan

Type Of Action

(X) Administrative	( ) Legislative
( ) Draft	(X) Final

Filing Dates With The Environmental Protection Agency ()

Notice of intent to prepare DSEIS published on: on October 5, 2005 (70 FR 57859), and amended on January 10, 2006 (71 FR 1519).

DSEIS filed with EPA on: April 13, 2007

DSEIS comment period ended on: June 4, 2007

EPA comments on DSEIS – Appendix F

Responses to EPA Comments on DSEIS – Appendix G

ABSTRACT

The Gulf of Mexico red snapper stock is overfished and undergoing overfishing. The status of this stock is influenced not only by fishing mortality rates in the commercial and recreational red snapper fisheries, but also by red snapper bycatch mortality rates in the shrimp trawl fishery. The red snapper catch and bycatch rates of all fisheries must be substantially reduced to end overfishing between 2009 and 2010, which is the time frame in which the Gulf of Mexico Fishery Management Council (Council) committed to ending overfishing in the red snapper rebuilding plan. The National Marine Fisheries Service (NMFS) implemented interim measures to temporarily address overfishing of red snapper during 2007 while the Council develops additional measures to end overfishing and rebuild the red snapper stock in this Joint Amendment 27/14 to the Council's Shrimp and Reef Fish Fishery Management Plans

(Amendment 27/14). This rule set the directed red snapper TAC (6.5 MP), put in place recreational measures to constrain harvest to the recreational quota while allowing the season to remain unchanged, reduced the commercial minimum size limit to 13 inches TL, and established a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the western Gulf of Mexico. These interim measures are supported by a recent District Court opinion, which found the current red snapper rebuilding plan was based on flawed assumptions.

The primary purpose of Amendment 27/14 is to revise the rebuilding plan strategy to incorporate additional red snapper catch and bycatch reduction measures that have a reasonable probability of successfully ending overfishing and rebuilding the red snapper stock on schedule. Alternative measures considered in this DSEIS, which is integrated in Amendment 27/14 are grouped under the following actions: 1) reduce the total allowable catch of the directed commercial and recreational red snapper fisheries, and adjust regulations used to manage the recreational quota, accordingly; 2) consider any potential post-hurricane reductions in directed fishery effort and landings when evaluating TAC alternatives in Action 1; 3) establish separate bag limit restrictions for the captain and crew of for-hire vessels; 4) reduce the red snapper minimum size limit in the commercial fishery; 5) modify fishing gear restrictions; 6) establish a target red snapper bycatch mortality reduction goal for the shrimp fishery of the western gulf of Mexico; 7) define seasonal closure restrictions that can be used to manage shrimp fishing effort in relation to the target red snapper bycatch mortality reduction goal; and 8) establish a framework procedure to streamline the management of shrimp fishing effort in the western Gulf of Mexico. The measures identified as preferred in this DSEIS are expected to minimize to the extent practicable the unavoidable adverse impacts of ending overfishing on affected fisheries and fishing communities.

TABLE OF CONTENTS FOR FSEIS

The table of contents and sections comprising the FSEIS are as follows:

EXECUTIVE SUMMARY

Purpose and Need

The Gulf of Mexico red snapper stock is overfished and undergoing overfishing. Red snapper are taken as catch and bycatch in the commercial and recreational red snapper fisheries, and also taken as bycatch in the Gulf of Mexico shrimp trawl fishery. The considerable influence of all three fisheries on the status of red snapper challenges fishery managers to balance competing interests and goals in rebuilding the red snapper stock. The red snapper rebuilding plan established in 1990 has been revised and lengthened several times in response to new data and assessments that have provided a better understanding of stock biomass and influencing factors, including shrimp trawl bycatch mortality. The most recent red snapper stock assessment (SEDAR 7 2005) indicates red snapper catch and bycatch levels in both the directed red snapper and shrimp fisheries are likely to jeopardize the success of the latest rebuilding plan implemented in 2005, which is designed to end overfishing between 2009 and 2010, and rebuild the stock to the biomass that would maximize the yield of the fishery by the year 2032. The assessment indicates the red snapper fishing mortality rate of the western Gulf shrimp fishery is highest, followed by that of the eastern Gulf recreational red snapper fishery, then the western Gulf commercial red snapper fishery. The eastern and western fisheries are separated by the Mississippi River delta (SEDAR 7 2005).

In response to this information, the Gulf of Mexico Fishery Management Council (Council) initiated the development of this Joint Amendment 27/14 to the Reef Fish and Shrimp Fishery Management Plans (Joint Amendment 27/14). The NMFS implemented interim measures to temporarily address overfishing of red snapper during 2007 while the Council develops additional measures to end overfishing and rebuild the red snapper stock in Amendment 27/14. This rule set the directed red snapper total allowable catch (TAC) at 6.5 MP, put in place recreational measures to constrain harvest to the recreational quota while allowing the season to remain unchanged, reduced the commercial minimum size limit to 13 inches, and established a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the western Gulf of Mexico.

The interim measures are supported by a recent Court Opinion, which found the current red snapper rebuilding plan was based on flawed assumptions, should have considered the practicability of additional bycatch reduction in the shrimp trawl fishery, and does not demonstrate a 50% probability of rebuilding the red snapper stock by 2032. The interim measures are temporary and insufficient alone to achieve the overfishing and rebuilding objectives of the current red snapper rebuilding plan. Thus, the purpose of Amendment 27/14 is to revise the rebuilding plan strategy to incorporate additional red snapper catch and bycatch reduction measures that have a reasonable probability of successfully ending overfishing and rebuilding the red snapper stock on schedule.

Amendment 27/14 proposes to reduce the red snapper catch and bycatch of all fisheries to end overfishing between 2009 and 2010 and rebuild the red snapper stock by 2032 in compliance with the red snapper rebuilding plan. Actions evaluated include selecting a rebuilding plan and setting a TAC consistent with the plan, constraining the recreational harvest to a level consistent with this sector's quota, and reducing bycatch and discard mortality in the directed red snapper and shrimp fisheries. Because the commercial fishery currently operates under an individual fishing quota program, harvest is constrained by the number of shares allocated and requires no further action. The amendment is also intended to satisfy the Court requirement to put in place a revised red snapper rebuilding plan no later than December 12, 2007. Consequently, if the revised red snapper rebuilding plan proposed in this amendment cannot be implemented by December 12, 2007, then additional rulemaking may be required to implement one or more of the measures evaluated in this amendment on an interim basis until Joint Amendment 27/14 can be implemented.

Preferred Alternatives

Amendment 27/14 considers the environmental consequences of a range of temporary measures to address overfishing of red snapper during 2007. The measures identified as preferred would be:

1) Revise the red snapper rebuilding plan. Maintain a constant TAC at 5.0 million pounds (MP) between 2008 and 2010; the commercial quota would be 2.55 MP, and the recreational quota would be 2.45 MP. After 2010, TAC would correspond to the level of catch associated with fishing at a rate that produces MSY (proxy = 26 percent SPR). Management measures to achieve the 2.45 MP recreational quota would be a two-fish bag limit, 16-inch minimum size limit and, June 1-September 15 recreational fishing season (107 days). Review and adjust the rebuilding plan and directed fishery management measures, as necessary, based on periodic stock assessments and Magnuson-Act mandates (i.e., annual catch limits). ;

2) Consider a potential 10 percent post-hurricane reductions in directed fishery effort and landings when evaluating alternative TACs in Action 1;

3) Reduce the recreational red snapper bag limit from four fish per person per day to two fish per person per day, and prohibit the captain and crew of for-hire vessels from retaining the recreational bag limit;

4) Reduce the commercial minimum size limit from 15 inches to 13 inches total length;

5) Require the use of non-stainless steel circle hooks when using natural baits, and require the use of venting tools and dehooking devices when participating in all commercial and recreational reef fish fisheries;

6) Establish a target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the average of benchmark years of 2001-2003 with a reduction in this target to 60 percent on or before 2032;

7) Establish if necessary a seasonal closure beginning on the same start date as the closure of the EEZ off Texas in the 10 to 30-fathom zone of selected areas within statistical subzones 10-21 in the Gulf of Mexico. The need for the closure and its

extent and duration will be determined based on the annual evaluation of the level of shrimp effort and associated red snapper mortality. Any closure would be implemented in accordance with the framework outlined in Action 8 taking into consideration the mortality reductions associated with improved BRDs and other gear improvements; and

8) Establish a framework procedure to adjust the effort target and closed season for the shrimp fishery in the Gulf of Mexico within the scope of the preferred alternatives identified in Actions 6 and 7. The Southeast Fisheries Science Center (SEFSC) will conduct an annual assessment of the previous year's shrimp effort from the 10 to 30-fathom area in the Gulf (Statistical Subzones 10-21) and determine the area and duration of a closure and report this to the Regional Administrator for administrative action.

The full range of alternative measures considered in this amendment is described in Section 2.0. Additional alternatives considered but eliminated from more detailed study are described in Appendix A, along with the rationale for their elimination.

Affected Environment

The physical, biological, social, economic, and administrative resources affected by the proposed temporary measures are described in Section 3.0, and summarized below.

Physical Environment

The measures proposed in this Amendment would apply to the directed red snapper and shrimp trawl fisheries in federal waters of the Gulf of Mexico (Gulf). The Gulf 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. Federal waters extend to 200 nautical miles offshore from the nine-mile seaward boundary of the states of Florida and Texas, and the three-mile seaward boundary of the states of Alabama, Mississippi, and Louisiana.

Table 3.4.1 summarizes the physical environment utilized by red snapper during each stage of its life history. Red snapper eggs and larvae are pelagic, while juveniles are found associated with bottom features or over barren bottom. Adult red snapper are found in submarine gullies and depressions; over coral reefs, rock outcrops, and gravel bottoms; and are associated with oilrigs and other artificial structures. Adult penaeid shrimp are found in nearshore and offshore silt, mud, and sand bottoms while juveniles are found inhabiting estuaries.

Biological/Ecological Environment

Red snapper demonstrate the typical reef fish life history pattern. Adult females mature as early as 2 years and most are mature by 4 years (Schirripa and Legault 1999). Red snapper have been aged up to 57 years, but most caught by the directed fishery are 2- to 4-years old. Penaeid shrimp have short life spans (~ 1 year) and have either demersal (brown and white shrimp) or pelagic (pink shrimp) eggs. The proposed temporary measures also are likely to indirectly affect many other species of reef fish, as well as sea turtles and the smalltooth sawfish (NMFS 2005c). All of these species occur in the affected area and are described in Section 3.4.

Social/Economic Environment

The reef fish fishery and its red snapper component are composed of commercial and recreational sectors. Within the commercial sector are fishing vessels, dealers, support industries, and fishing communities. Recreational anglers participate in the reef fish fishery through several fishing modes, such as shore, private/rental, charter boats, and headboats. Charter boats and headboats comprise the for-hire fishery. In addition, there are also fishing communities that provide a place of residence, business, or employment associated with the recreational pursuit of reef fish.

As with the commercial reef fish sector, the commercial shrimp trawl fishery is comprised of fishing vessels, dealers, support industries, and fishing communities. Most federally permitted shrimp vessels are based in the western Gulf and mostly target brown shrimp. However, with changes in the market, increased operating costs, and damage from hurricanes, many facets of this fishery are changing and will have important consequences to the associated fishing communities.

There are approximately 1,075 commercially permitted reef fish vessels. On January 1, 2007, the commercial red snapper individual fishing quota (IFQ) program was implemented where fishermen were awarded red snapper shares based on their catch history. Prior to the IFQ program, this fishery was managed through a license system, of which 136 entities held red snapper Class 1 licenses, and 628 entities held red snapper Class 2 licenses. There are 227 dealers possessing permits to buy and sell reef fish species. In the for-hire industry, there are approximately 1,500 permitted reef fish vessels, of which, approximately 225 also have commercial reef fish permits. The number of commercial vessels participating in the Gulf shrimp fishery is not known. But 2,666 vessels are expected to qualify for moratorium permits, and of these vessels, 1,806 were active (i.e., had Gulf shrimp landings) in 2005.

Administrative Environment

The M-SFCMA divides responsibility for managing federal fisheries in the Gulf of Mexico between the Secretary of Commerce (Secretary) and the Council. The Secretary has delegated this management authority to NMFS. NOAA's Office of Law Enforcement, the U. S. Coast Guard, and various state agencies enforce fishery regulations.

Environmental Consequences

Detailed analyses of the environmental consequences of all alternatives considered in Amendment 27/14 and integrated DSEIS are presented in Section 5.0. The following tables (Tables a-h) summarize the overall effect of the alternatives relative to either the preferred or no action alternative for the physical, biological, economic, social, and administrative environments over the short term (3-5 years) versus the long term (5^+ years). Whether the overall effect is positive, negative, or neutral relative to the no action or preferred alternative (labeled with an “x”) is indicated with a “+”, “-”, or “0” sign, respectively. In addition, the table summarizes the cumulative effects and unavoidable adverse effects.

Table a: Summary comparison of environmental consequences associated with Action 1 alternatives respective to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, and "lt" is long-term.

Action 1. Revise the red snapper rebuilding plan and end overfishing of red snapper by 2009 or 2010.	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No Action - Do not revise the rebuilding plan, maintain constant 9.12 MP TAC until 2032; maintain 16-inch minimum size limit, 4-fish bag limit, and recreational fishing season from April 21 through October 31 (194 days).	st - lt -	st - lt -	st + lt -	st + lt -	st 0 lt -	st + lt -	st + lt -
Alt. 2: Revise the red snapper rebuilding plan; maintain constant TAC of 7.0 MP between 2008 and 2032; adjust bag limit, size limit, and season to obtain necessary reductions for recreational quota	st - lt -	st - lt -	st + lt -	st + lt -	st 0 lt -	st + lt -	st + lt -
Pref. Alt. 3: Revise the red snapper rebuilding plan; maintain a constant TAC of 5.0 MP between 2008 and 2010; after 2010, TAC correspond to catch associated with $F_{26\%\ SPR}$; adjust bag limit to 2 fish; adjust size limit and season to needed reductions for recreational quota	x	x	x	x	x	x	x
Alt. 4: Revise the red snapper rebuilding plan; maintain a constant TAC of 3.0 MP between 2008 and 2010; after 2010, TAC correspond to catch associated with $F_{26\%\ SPR}$; adjust bag limit, size limit, and season to obtain needed reductions for recreational quota	st + lt +	st + lt +	st - lt -	st - lt +	st 0 lt +	st - lt +	st - lt +

If bycatch could be successfully reduced to levels necessary under the 'linked' rebuilding plans (**Alternatives 1** and **2**), stock recovery ($B/B_{msy} > 1.0$) would be faster and occur well in advance of the 2032 rebuilding deadline. However, based on rebuilding projections conducted by the SEFSC in January through March 2007 and management alternatives under consideration in this amendment, it is impractical to assume bycatch can be reduced to the extent required in **Alternatives 1** and **2** in order to rebuild the stock. 'Delinked' rebuilding strategies (**Preferred Alternative 3** and **Alternative 4**) make realistic assumptions about reductions in bycatch. Under these assumptions, TACs no greater than 5 to 5.5 MP could be implemented from 2008 through 2010 to end overfishing. The rebuilding plan summarized in **Preferred Alternative 3** assumes fishing mortality on red snapper resulting from shrimp trawl bycatch will be reduced by 74 percent, while **Alternative 4** assumes fishing mortality on red snapper from shrimp trawl bycatch will be reduced by 50 percent. Currently, a 74 percent reduction in shrimp trawl bycatch appears achievable. Measures in Actions 7 and 8 would ensure this source of bycatch is constrained to this level. All the alternatives require the stock condition be assessed periodically to ensure the stock is recovering within the constraints of the rebuilding plan. **Preferred Alternative 3 and Alternatives 2** and **4** all contain suboptions to constrain the recreational harvest to the recreational quota (See Section 2.0 for details). In general, for a given TAC, the more restrictive bag and size limits are, the longer the fishing season can be. Additionally, the Council is not proposing measures to reduce or eliminate the recreational minimum size limit. In the short-term, lowering the minimum size limit is expected to speed stock recovery by a very small amount. However, over the long-term, TACs associated with lower minimum size limits are expected to be slightly less than TACs with a 16-inch recreational minimum size limit.

Table b: Summary comparison of environmental consequences associated with Action 2 alternatives relative to the no action alternative. Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates no action, "st" is short-term, and "lt" is long-term.

Action 2: Post-hurricane reduction in directed fishery effort assumed for Action 1 TAC alternatives.	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No action – Do not take into consideration any potential post-hurricane reductions in directed fishery effort and landings	x	x	x	x	x	x	x
Alt. 2 Assume a 25-percent reduction in post-hurricane fishing effort and landings	st - lt -	st - lt -	st + lt -	st + lt -	st 0 lt -	st + lt -	st + lt -
Pref. Alt. 3 Assume a 10-percent reduction in post-hurricane fishing effort and landings	st - lt -	st - lt -	st + lt -	st + lt -	st 0 lt -	st + lt -	st + lt -

The 2005 hurricane season was the busiest and costliest on record, resulting in significant physical and economic damage to coastal communities. The MRFSS fishing effort and landings data suggest some decrease in effort has occurred since Hurricane Katrina due to the direct effects of hurricanes, as well as increased fuel costs. **Alternative 1** would maintain the no action baseline for fishing effort (2001-03). No reductions in fishing effort would be assumed and the Council would need to select one of the management alternatives summarized in Action 1 for reducing red snapper harvest. This alternative would have the same impacts on the physical environment as those described in Action 1. **Alternative 2** and **Preferred Alternative 3** would assume a 25-percent and 10-percent reduction in fishing effort, respectively (which is assumed to correspond to a 25-percent and 10-percent reduction in landings, respectively), when analyzing alternatives for reducing red snapper fishing mortality. The NMFS, in developing interim regulations for 2007, assumed a 10 percent reduction in landings would occur from hurricane impacts. However, the magnitude of reductions varies by fishing sector, and it is unknown how long post-hurricane reductions in landings and fishing effort may continue into the future.

Table c: Summary comparison of environmental consequences associated with Action 3 alternatives relative to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, and "lt" is long-term.

Action 3: Captain and crew bag limit	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No action – Captain(s) and crew may retain a daily bag limit	st - lt -	st - lt -	st - lt -	st + lt -	st 0 lt -	st + lt -	st + lt -
Pref. Alt. 2: Bag limit for captain(s) and crew of for-hire vessels is zero	x	x	x	x	x	x	x

The 0-red snapper bag limit proposed in **Preferred Alternative 2** for the captain and crew of for-hire vessels would increase the probability the recreational red snapper regulations proposed in **Action 1, Preferred Alternative 3**, will sufficiently constrain the recreational fishery to its quota. As a result, this alternative would reduce the likelihood more severe restrictions would be imposed on the recreational fishery in the future to end overfishing and rebuild the red snapper stock on schedule. In addition, the preferred alternative, in conjunction with the **Action 1** preferred alternative, would allow the recreational season to remain open longer.

Table d: Summary comparison of environmental consequences associated with Action 4 alternatives relative to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, and "lt" is long-term.

Action 4: Commercial minimum size limit	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No action. Maintain 15-inch TL commercial minimum size limit	st - lt -	st - lt -	st - lt -	st - lt -	st 0 lt -	st - lt -	st - lt -
Pref. Alt. 2: Reduce commercial minimum size limit to 13-inches TL	x	x	x	x	x	x	x
Alt. 3: Eliminate commercial minimum size limit	st + lt +	st + lt +	st + lt +	st - lt +	st 0 lt +	st + lt +	st + lt +

Although **Alternative 3** would reduce overfishing to a slightly greater extent than would **Preferred Alternative 2**, the biological benefits of **Alternative 3** are not expected to outweigh the adverse social effects that alternative would create by exacerbating conflict between the commercial and recreational red snapper fisheries. Some members of the recreational sector believe it is inequitable to reduce or eliminate the commercial minimum size limit without similarly reducing or eliminating the recreational minimum size limit. The Council is not selecting as preferred measures to reduce or eliminate the recreational minimum size limit. As explained in **Action 1**, TACs associated with lower minimum size limits in the long term are expected to be slightly less than TACs with a 16-inch recreational minimum size limit.

Table e: Summary comparison of environmental consequences associated with Action 5 alternatives relative to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, and "lt" is long-term.

Action 5: Fishing gear restrictions	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No action - do not implement further fishing gear changes to reduce bycatch	st - lt -	st - lt -	st + lt -	st + lt -	st + lt -	st + lt -	st + lt -
Pref. Alt. 2: Require the use of circle hooks, venting tools and de-hooking devices in reef fish fisheries	x	x	x	x	x	x	x
Alt. 3: Require a minimum hook size	st 0 lt 0	st 0 lt 0	st 0 lt 0	st 0 lt 0	st 0 lt 0	st 0 lt 0	st 0 lt 0

Preferred Alternative 2 would require the use of circle hooks, venting tools, and dehooking devices when harvesting reef fish from the EEZ. This gear would reduce the level of discard mortality for reef fishes. For **Preferred Alternative 2** and **Alternative 3**, suboptions indicate the extent this gear could be required in the fishery (Options a-d). The preferred suboption for **Preferred Alternative 2** is all commercial and recreational reef fish fisheries. **Alternative 1** would not require any additional gear or gear modifications for the directed red snapper fishery or reef fish fishery to reduce regulatory discard mortality. However, many reef fish fishermen are thought to use circle hooks and dehooking devices, and they are required in the commercial and for-hire reef fish fisheries through Amendment 18A for aiding in releasing incidentally caught protected species. **Alternative 3** would require a minimum hook size while fishing for red snapper and/or reef fish. Larger hooks would reduce the number of undersized fish caught in the fishery; however, because of a lack of standardization in hook sizes between manufacturers, this requirement could be confusing for the fishing public.

Table f: Summary comparison of environmental consequences associated with Action 6 alternatives relative to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, "lt" is long-term, "DF" indicates the directed red snapper fishery, and "SF" indicates the shrimp trawl fishery.

Action 6: Target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No Action – do not establish a target reduction goal for the shrimp fishery	SF st - lt - DF st 0 lt 0	SF st - lt - DF st - lt -	SF st + lt - DF st 0 lt -	SF st + lt - DF st 0 lt -	SF st +- lt + DF st 0 lt 0	SF st - lt - DF st 0 lt -	SF st - lt - DF st - lt -
Alt. 2: Target reduction of shrimp trawl bycatch mortality on red snapper 50 percent less than the benchmark years of 2001-2003.	SF st - lt - DF st 0 lt 0	SF st - lt - DF st - lt -	SF st + lt - DF st 0 lt -	SF st + lt - DF st 0 lt -	SF st - lt - DF st 0 lt 0	SF st - lt - DF st - lt -	SF st - lt – DF st - lt -
Alt. 3: Target reduction of shrimp trawl bycatch mortality on red snapper 60 percent less than the benchmark years of 2001-2003.	SF st - lt - DF st 0 lt 0	SF st - lt - DF st - lt -	SF st + lt - DF st 0 lt -	SF st + lt - DF st 0 lt -	SF st - lt - DF st 0 lt 0	SF st - lt – DF st - lt -	SF st - lt – DF st - lt -
Alt. 4: Target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003.	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0
Alt. 5: Target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003 – adjust percentage as appropriate after subsequent assessments.	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0
Pref. Alt. 6: Target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003 – adjust percentage to 60 percent by 2032.	x	x	x	x	x	x	x

The 2005 assessment for red snapper indicated a need for a 74 percent reduction in shrimp trawl bycatch mortality compared to average levels experienced during the 2001-2003 period in order to maintain the current rebuilding plan for red snapper and end overfishing between 2009 and 2010. However, as a result of changing economic conditions in the shrimp fleet leading to declines in effort and reductions in bycatch through currently used BRDs, it is anticipated that F in 2007 will be approximately 72 percent below the 2001-2003 average. Thus targets identified in **Alternatives 2** or **3** would establish a target mortality reduction that has probably already been achieved. The Council also expects effort and participation in the fishery to continue to decline due to potential reductions in permits from the implementation of the shrimp vessel permit moratorium and the current external factors impacting the shrimp fishery, which are anticipated to continue at least through 2012. Thus the reduction target in **Alternative 4 and 5**, as well as, **Preferred Alternative 6** may also be achieved by 2008. If future conditions in the shrimp fishery were to change such that effort were to increase, the target bycatch reduction set in **Alternative 4 and 5**, as well as, **Preferred Alternative 6** would keep this fishery in line with reductions in F needed to rebuild the red snapper stock.

Table g: Summary comparison of environmental consequences associated with Action 7 alternatives relative to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, "lt" is long-term, "DF" indicates the directed red snapper fishery, and "SF" indicates the shrimp trawl fishery.

Action 7: Seasonal closure restrictions for shrimp fishery	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No action – do not consider establishing fishing restrictions.	SF st - lt - DF st - lt -	SF st - lt - DF st - lt -	SF st + lt - DF st 0 lt -	SF st + lt - DF st 0 lt -	SF st + lt - DF st 0 lt 0	SF st - lt - DF st 0 lt -	SF st - lt – DF st 0 lt -
Pref. Alt. 2: Establish a seasonal closure beginning on the same start date as the closure of the EEZ off Texas in the 10 to 30-fathom zone of selected areas within statistical zones 10-21 in the Gulf of Mexico. The extent and duration determined by the annual evaluation of shrimp effort and red snapper mortality.	x	x	x	x	x	x	x
Alt. 3: Establish a seasonal closure within January 1-April 30 in the 10 to 30-fathom zone within statistical zones 10-21. The extent and duration determined by the annual evaluation of shrimp effort and red snapper mortality.	SF st - lt - DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st + lt + DF st 0 lt 0	SF st + lt + DF st 0 lt 0	SF st - lt - DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt - DF st 0 lt 0
Alt. 4: Establish a seasonal closure within October 1-November 30 in the 10 to 30-fathom zone within statistical zones 10-21. The extent and duration determined by the annual evaluation of shrimp effort and red snapper mortality.	SF st - lt - DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st + lt + DF st 0 lt 0	SF st + lt + DF st 0 lt 0	SF st - lt - DF st 0 lt 0	SF st 0 lt 0 DF st 0 lt 0	SF st 0 lt - DF st 0 lt 0

Because of the relatively high bycatch of juvenile red snapper in the shrimp trawl fishery, managers have, on several occasions, considered alternatives to minimize such bycatch through area and seasonal closures. **Preferred Alternative 2** would provide for a potential closure in the northern and western Gulf (Statistical Subzones 10-21) within the 10 to 30-fathom zone in conjunction with the beginning of the Texas Closure, which closes the entire EEZ off Texas from typically May 15 to July 15. Closures established under this alternative could alleviate fishing mortality problems stemming from shifts in fishing effort to Louisiana mid-shelf regions during the Texas Closure each year, which could occur under **Alternatives 3** and **4**. **Preferred Alternative 2** and **Alternatives 3** and **4** would be implemented in accordance with the framework outlined in Action 8.

Table h: Summary comparison of environmental consequences associated with Action 8 alternatives relative to the preferred alternative (bold). Positive, negative, and neutral effects relative to the preferred alternative are described with +, -, or 0 signs, respectively. "na" represents none identified or not applicable, "x" indicates preferred, "st" is short-term, and "lt" is long-term.

Action 8: Framework procedure for shrimp fishery	Environment					Cum effect	Unavoid adverse
	Phys	Bio	Econ	Soc	Admin		
Alt. 1: No action – no framework	st 0 lt -	st 0 lt -	st 0 lt -	st 0 lt -	st - lt -	st 0 lt -	st 0 lt -
Pref. Alt. 2: Establish a framework to adjust the effort target and closed season within the scope of alternatives identified in Actions 6 and 7.	x	x	x	x	x	x	x

The framework mechanism of **Preferred Alternative 2** would allow the Council (at its discretion) to more quickly manage shrimp effort through a seasonal closure, if the timing and geographic extent of such a closure fell within the scope of those evaluated in Actions 6 and 7.

Major Conclusions and Areas of Controversy

Red snapper management decisions are always controversial, primarily because multiple sources of fishing mortality influence the status of the red snapper stock. The directed fishery, comprised of the commercial and recreational sectors, and the shrimp trawl fishery have different management goals and objectives. Some red snapper fishery participants view the shrimp fishery as the major impediment to red snapper stock recovery, and oppose any additional restrictions on directed red snapper harvest. Some shrimp fishery participants perceive additional restrictions on shrimp trawl bycatch as unfair given the substantial decline in effort and profitably this fishery has experienced in recent years due to competition from imported shrimp, increased fuel prices, and damage to vessels from hurricanes. In actuality, the relative contributions of the red snapper and shrimp fisheries to red snapper bycatch mortality are area dependent. During 2001-03, the red snapper fishery was responsible for the majority of red snapper mortality in the eastern Gulf, and the shrimp fishery was responsible for the majority of red snapper mortality in the western Gulf (See Section 3.4.1.2).

There is also controversy within the red snapper fishery related to the implementation of differential minimum size limits. Some recreational anglers had perceived NMFS' proposal in the interim rule to reduce the commercial red snapper minimum size limit as unfair, unless the agency also reduced the recreational red snapper minimum size limit. Scientific analyses suggest both red snapper and commercial fishery participants would benefit from reducing the minimum size limit in the commercial fishery because the high discard mortality rate of that fishery nullifies any benefit that would be derived from protecting smaller size fish. However, reducing the minimum size limit in the recreational fishery would not benefit the red snapper stock or stock recovery because the discard mortality rate of the recreational fishery is substantially lower than that of the commercial fishery. SEDAR 7 (2005) estimates the red snapper discard mortality rate ranges from 71 percent (eastern Gulf) to 82 percent (western Gulf) in the commercial red snapper fishery, and from 15 percent (eastern Gulf) to 40 percent (western Gulf) in the recreational red snapper fishery. While the discard mortality rate of the commercial fishery is much higher than that of the recreational fishery, the total number of red snapper released by the recreational fishery during 2001-2003 was substantially higher than that of the commercial fishery. While the Council has considered smaller size limits in Action 1, it has selected to maintain the recreational size limit of 16-inches total length as part of its Action 1 preferred alternative.

Controversy over these management issues is exacerbated at this time because the affected fisheries are still recovering from the damaging effects of the 2004 and 2005 hurricane seasons. Although data from MRFSS 2006 showed little reduction in catch and effort, license sales, charter trip bookings, and other indicators of effort appear to be down, especially since the implementation of the Interim Rule that included a 2-fish bag limit. Because of this information and the year-to-year uncertainty in the MRFSS data, the Council believed that a continued assumption of a 10% reduction in effort due to hurricanes and other economic conditions was warranted, at least until the updated stock assessment is received in 2009. While measures to address overfishing will adversely affect the social and economic environments in the short term, the adverse social and economic effects of not taking action to address overfishing and rebuild the stock are expected to be more severe in the long term. The preferred alternatives identified in this joint amendment are expected to benefit red snapper fishermen, fishing communities, and the Gulf states in the long term, and help the fishery produce the greatest overall net benefit to the Nation.

FISHERY IMPACT STATEMENT

Regulations impose restrictions on fishery participants, which can result in adverse effects on fishermen and fishing communities. Amendment 27 to the Reef Fish Fishery Management Plan and Amendment 14 to the Shrimp Fishery Management Plan (FMP) proposes to: (1) Implement measures to revise the red snapper rebuilding plan and end overfishing by 2009 or 2010 through a reduction in the total allowable catch (TAC) with concomitant reductions in the recreational bag limit and fishing season (Action 1); (2) Assumes a reduction in directed fishing effort for red snapper as a result of hurricanes in 2004 and 2005 and the elimination of the bag limit for captain and crew of for-hire vessels (Actions 2 and 3); (3) Reduces bycatch in the directed red snapper fishery by reducing the commercial minimum size limit and requiring the use of circle hooks, venting tools, and dehooking devices (Actions 4 and 5); (4) Establishes target bycatch reduction goals for juvenile red snapper caught in the shrimp fishery and a framework procedure to implement time and area closures to meet the target reduction goals.

Management measures to reduce the TAC for red snapper are expected to have substantial short-term impacts on the commercial and recreational fisheries. Reducing TAC from 9.12 MP to 5.0 MP is expected to reduce the recreational fishing season from 194 days to approximately 107 days and reduce the bag limit from 4 fish to 2 fish. Likewise the commercial share of TAC will drop from 4.65 MP to 2.55 MP. Since the commercial red snapper fishery is regulated by an IFQ program the impacts would come only from the reduced harvest. On the other hand, these reductions coupled with a constant fishing mortality rate (F) strategy will allow TAC to recover to approximately 10.0 MP by 2012 to 2013 and ultimately to approximately 17.2 MP at maximum sustainable yield (MSY). Consequently, it is likely that the long-term benefits to the stock and the users, both commercial and recreational, outweigh the short-term impacts of the reduced TAC.

Although the actions to assume a reduced amount of effort or to actually reduce effort as with Action 2 (post-hurricane reduction); Action 3 (eliminating the bag limit for captains and crew of for-hire vessels); and Actions 6, 7, and 8 (setting a framework procedure to cap fishing mortality through time/area closures to reduce effort in the shrimp fishery) would have unique, albeit minimal impacts, these impacts would be indirect in that they primarily influence the TAC and the associated bag limit and fishing season in Action 1. In fact, there would likely be no immediate impacts from Actions 6, 7, and 8 because it appears that the effort target has essentially been met, and there is no information that would indicate that effort is likely to increase in the near future due to high fuel costs and low shrimp prices. Additionally, the need for and extent of time/area closures will be evaluated in the future through a separate process. The same is true for actions to reduce bycatch through reducing the commercial minimum size limit (Action 4) and requiring circle hooks, venting tools, and dehooking devices (Action 5). These actions would reduce fishing mortality, but they would have a minimal impact on TAC, extending the recreational fishing season, and increasing bag limits.

This page intentionally left blank

1.0 INTRODUCTION

1.1 Purpose and Need for Action

The Magnuson-Stevens Fishery Conservation and Management Act (M-SFCMA) requires the National Marine Fisheries Service (NMFS) and regional fishery management councils to end overfishing, rebuild overfished stocks, and achieve, on a continuing basis, the optimum yield from federally managed fish stocks. These mandates are intended to ensure fishery resources are managed for the greatest overall benefit to the nation, particularly with respect to providing food production and recreational opportunities, and protecting marine ecosystems. To further this goal, the M-SFCMA requires fishery managers to specify through rebuilding plans their strategy for rebuilding overfished stocks to a sustainable level within a certain time frame, and to minimize bycatch and bycatch mortality to the extent practicable.

The Gulf of Mexico red snapper stock is overfished and undergoing overfishing. Red snapper are taken as catch and bycatch in the commercial and recreational red snapper fisheries, and also taken as bycatch in the Gulf of Mexico shrimp trawl fishery. The considerable influence of all three fisheries on the status of red snapper challenges fishery managers to balance competing interests and goals in rebuilding the red snapper stock. The red snapper rebuilding plan established in 1990 has been revised and lengthened several times in response to new biological data and assessments, which have improved scientists understanding of the factors influencing red snapper mortality and rebuilding. The current red snapper rebuilding plan, implemented in 2005, is designed to end overfishing of red snapper between 2009 and 2010 and rebuild the red snapper stock by 2032. This plan provides commercial and recreational red snapper fisheries a constant, total allowable annual catch quota of 9.12 million pounds (MP), based on the assumption that the bycatch reduction devices (BRDs) used in shrimp trawl gear, combined with attrition in the shrimp fishery, would reduce shrimp trawl bycatch mortality of red snapper by 60-70 percent from 1984-1989 levels between 2006 and 2009.

The most recent red snapper stock assessment (SEDAR 7 2005) concluded that red snapper continue to be overfished and undergoing overfishing, and that estimated catch and bycatch rates must be reduced to end overfishing between 2009 and 2010 and rebuild the red snapper stock by 2032 in compliance with the current red snapper rebuilding plan. In response to this information, the Council initiated the development of this Joint Amendment 27/14 to the Reef Fish and Shrimp Fishery Management Plans (Joint Amendment 27/14). Additionally, NMFS implemented interim measures to temporarily address overfishing of red snapper during 2007 until Joint Amendment 27/14 can be approved and implemented.

In summary, the interim measures implemented by NMFS in 2007:

- Reduce the total allowable catch of the commercial and recreational red snapper fisheries from 9.12 MP to 6.5 MP, which results in commercial and recreational red snapper quotas of 3.315 MP and 3.185, respectively;
- Reduce the recreational red snapper bag limit from four fish to two fish per person per day;
- Prohibit the captain and crew of for-hire vessels from retaining the recreational bag limit;
- Reduce the commercial red snapper minimum size limit from 15 inches to 13 inches total length; and

- Establish a target red snapper bycatch mortality reduction goal for the shrimp fishery that equals 50 percent of the average bycatch mortality that occurred during 2001-2003 and a level of shrimp effort equal to that observed in the fishery in 2005.

The interim measures will be implemented in two phases: the new commercial minimum size limit was implemented on April 2, 2007; and the remaining management changes will be implemented on May 2, 2007. All interim measures will expire on September 30, 2007, unless they are extended on an interim basis for one additional 186-day period, or replaced by measures implemented through another rule (including, but not limited to a rule implementing measures evaluated in this Joint Amendment 27/14).

The interim measures are supported by a recent Court Opinion on lawsuits the Coastal Conservation Association (CCA), Gulf Restoration Network, and The Ocean Conservancy filed against the Secretary of Commerce and NMFS shortly after the current red snapper rebuilding plan was approved and implemented (CCA v. Gutierrez, et al., Case no. H-05-1214, consolidated with Gulf Restoration Network, et al., Case No. H-05-2998 (S. D. Tex, 2007)). These lawsuits were consolidated and included claims NMFS violated the M-SFCMA, Administrative Procedures Act (APA), and National Environmental Policy Act (NEPA) when it approved and implemented the red snapper rebuilding plan. The lawsuit also claimed that NMFS erred in denying a petition filed by CCA, which requested interim or emergency rulemaking to further reduce red snapper bycatch in the shrimp trawl fishery.

The Court Opinion, which was filed March 13, 2007, agreed with the claims that the red snapper rebuilding plan violated the requirements of the MSA and the APA. Specifically, the Court found the rebuilding plan was based on flawed assumptions, should have considered the practicability of additional bycatch reduction in the shrimp trawl fishery, and does not demonstrate a 50 percent probability of rebuilding the red snapper stock by 2032. The Opinion disagreed with the claims that NMFS did not consider an adequate range of rebuilding alternatives as required by NEPA, and that NMFS violated the APA in denying CCA's petition for interim or emergency rulemaking to address shrimp trawl bycatch. The Court ordered the Secretary of Commerce/NMFS to establish a revised red snapper rebuilding plan by December 12, 2007.

While the interim measures implemented by NMFS will reduce overfishing during 2007, they are short-term measures which are not sufficient to achieve the overfishing and rebuilding objectives of the current red snapper rebuilding plan. The purpose of this Joint Amendment 27/14 is to revise the rebuilding plan strategy to incorporate additional red snapper catch and bycatch reduction measures that have a reasonable probability of successfully ending overfishing and rebuilding the red snapper stock on schedule.

The most recent red snapper assessment indicated yield is maximized if the red snapper mortality rate is constrained to that associated with 26 percent SPR. The Council has generally controlled red snapper mortality in the commercial and recreational red snapper fisheries with a TAC, 51 percent of which is allocated in the commercial quota and 49 percent of which is allocated in the recreational quota. The Council is considering in this Joint Amendment 27/14 revising the constant, annual 9.12 MP TAC quota provided to the commercial and recreational fisheries in the current red snapper rebuilding plan. The Council is also evaluating in this amendment alternative measures to constrain recreational catches to the levels prescribed by alternative, reduced total allowable catch quotas. The Council is not considering adjusting seasonal closures or other regulations designed to manage the commercial sector's portion of reduced TAC quotas other than reducing the minimum size limit to reduce discards because the transferable, IFQ program implemented January 1, 2007, is expected to constrain commercial catches to the commercial quota.

Total allowable catch quotas, minimum size limits, bag limits, and seasonal closures, are generally effective in limiting fishing mortality, the size of fish targeted, the number of targeted fishing trips, and/or the time fishermen spend pursuing a species. However, these management tools have the unavoidable adverse effect of creating regulatory discards, which makes reducing bycatch in the recreational fishery and during closed seasons particularly challenging. The current red snapper stock assessment estimates that the red snapper discard mortality rate ranges from 71 percent (eastern Gulf) to 82 percent (western Gulf) in the commercial red snapper fishery, and from 15 percent (eastern Gulf) to 40 percent (western Gulf) in the recreational red snapper fishery. While the discard mortality rate of the commercial fishery is much higher than that of the recreational fishery, the total number of red snapper released by the recreational fishery during the baseline years, 2001-2003, was substantially higher than that of the commercial fishery.

Discard mortality can limit the amount by which TAC quotas reduce fishing mortality if not adequately documented and accounted for by fishery scientists and managers. Discard mortality also can limit the maximum amount of yield harvested by a fishery. The effectiveness of each TAC quota and rebuilding plan evaluated by the Council in ending overfishing and rebuilding the red snapper stock depends on the extent to which red snapper bycatch can be practically reduced in each fishery. Consequently, each TAC quota and rebuilding plan alternative requires a specified level of bycatch reduction for each fishery in order to effectively end overfishing and rebuild the red snapper stock. The Council is evaluating in Joint Amendment 27/14 the effects of alternative TAC quotas and rebuilding plans on bycatch and analyzing the practicability of taking additional action to further minimize red snapper bycatch and bycatch mortality in the commercial and recreational red snapper fisheries and in the shrimp fishery.

Reducing red snapper bycatch in the shrimp trawl fishery is also a challenging goal. Recent information suggests the BRDs used by the shrimp trawl fleet are not as effective as previously thought, and red snapper bycatch is more closely correlated with the amount of effort the fleet applies in harvesting shrimp. Available data indicate shrimp effort is declining even more rapidly than predicted when the current red snapper rebuilding plan was implemented in 2005. This decline has benefited those fishermen who have remained in the shrimp fishery and are experiencing an increase in the amount of shrimp they catch per unit of effort. However, the broader societal benefits of this effort decline depend upon the fishery applying a level of effort that is sufficient to produce the OY of shrimp. Fishery scientists and managers continue working to better understand the level of shrimp effort that optimizes benefits to fishermen and society, and how that compares to the level of effort that would reduce red snapper bycatch to the extent practicable.

The NMFS is currently reviewing the Council's proposal to change the bycatch reduction requirements of BRDs certified for use in the shrimp trawl fishery. If approved and implemented, this proposal would increase flexibility, promote innovation, and allow for the certification of BRDs that achieve a level of bycatch reduction that is equivalent to the level achieved when the devices were first introduced in the shrimp fishery. Additionally, the Council is considering in this joint amendment the practicability of taking additional action to further minimize shrimp trawl bycatch, including the potential need for and feasibility of managing the effort of shrimp fishermen who operate in areas of high red snapper abundance to assist fishery managers in achieving the objectives of the red snapper rebuilding plan. The Council may evaluate additional alternatives for managing effort in the shrimp fishery in a future amendment, following the completion of analyses and recommendations requested from the Ad Hoc Shrimp Effort Working Group and Ad Hoc Shrimp Effort Management Advisory Panel.

This Joint Amendment 27/14 proposes to reduce the red snapper catch and bycatch of all fisheries to end overfishing between 2009 and 2010 and rebuild the red snapper stock by 2032 in compliance with the red snapper rebuilding plan. If the revised red snapper rebuilding plan proposed in this amendment cannot be implemented by December 12, 2007 in compliance with the aforementioned Court Order, then additional rulemaking may be required by NMFS to implement one or more of the measures evaluated in this amendment on an interim basis until Joint Amendment 27/14 can be implemented.

1.2 History of Management

The management history of the reef fish and shrimp fisheries in the Gulf of Mexico demonstrates considerable efforts by the Council to balance the impacts on red snapper by the shrimping industry, and the commercial and recreational sectors, and the difficulties in regulating these fisheries to achieve OY and minimize bycatch. A decline in red snapper stock as reported in recent stock assessments has occurred at least in some areas of the Gulf under the jurisdiction of the Council. Known factors contributing to this decline include overfishing by directed recreational and commercial users; reduction of habitat; and bycatch in both the directed fishery and the shrimp fishery.

FMPs and regulatory amendments impacting the red snapper fishery are summarized below. A more complete history of reef fish and shrimp management in the Gulf can be obtained by contacting the Council.

1.2.1 History of Red Snapper Management (and other relevant reef fish management)

The Reef Fish FMP (with its associated environmental impact statement [EIS]) was implemented on November 8, 1984, and defined the reef fish Fishery Management Unit (FMU) to include red snapper and other important reef fish. Section 5.2.1 describes the FMU defined by the Reef Fish FMP. The FMPs implementing regulations were designed to rebuild declining reef fish stocks and included: 1) Prohibitions on the use of fish traps, roller trawls, and power head-equipped spear guns within an inshore stressed area; 2) a minimum size limit of 13 inches total length (TL) for red snapper, with exceptions that for-hire boats were exempted until May 8, 1987, and each angler could keep five undersize fish; and 3) the specification of OY for snapper and grouper [49 FR 39548].

Amendment 1 to the Reef Fish FMP (with its associated EA, RIR, and IRFA) was implemented on February 21, 1990. The primary objective of the amendment was to stabilize long-term population levels of all reef fish species by January 1, 2000, at a level that equaled at least 20 percent of the spawning stock biomass per recruit (SSBR) that would occur with no fishing. The amendment established a seven-red snapper recreational bag limit and a 3.1-MP commercial quota for red snapper, which were to reduce fishing mortality by 20 percent. Additionally, the amendment specified a framework procedure for specifying TAC to allow for annual management changes, and established a longline and buoy gear boundary inshore of which the directed harvest of reef fish with longlines and buoy gear was prohibited, and the retention of reef fish captured incidentally in other longline operations (e.g., shark) was limited to the recreational bag limit.

A **regulatory amendment** implemented on March 11, 1991, set the red snapper TAC at 4.0 MP, to be allocated with a commercial quota of 2.04 MP and a seven-red snapper recreational daily bag limit (1.96 MP allocation) beginning in 1991. This amendment also contained a proposal by the Council to effect a 50 percent reduction of red snapper bycatch in 1994 by the shrimp trawl fleet operating in the exclusive economic zone (EEZ), to occur through the mandatory use of finfish excluder devices on shrimp trawls, reduction in fishing effort, area or seasonal closures of the shrimp fishery, or a combination of these actions. This combination of measures was projected to achieve a 20 percent spawning potential ratio (SPR) by the year 2007. The 2.04 MP quota was reached on August 24, 1991, and the red snapper fishery was closed to further commercial harvest in the EEZ for the remainder of the year.

The Reef Fish Stock Assessment Panel (RFSAP) was convened in March 1990 at the Council's request to review the 1990 red snapper stock assessment produced by NMFS. The RFSAP recommended the Council close the directed fishery because the shrimp trawl fishery was harvesting the acceptable biological catch (ABC). Without further reducing shrimp trawl bycatch, only a fishery closure would allow the Council to achieve the 20 percent SSBR goal by the year 2000. As a result, **Amendment 3** (with its associated EA, RIR, and IRFA), implemented on July 29, 1991, added flexibility to the annual framework procedure for specifying TAC by allowing rebuilding timeframes to be adjusted in response to changing scientific advice, with the exception that the maximum time to rebuild could not exceed 1.5 times the generation time of the species under consideration [56 FR 30513]. Additionally, the amendment revised OY and overfishing definitions, replaced the 20 percent SSBR target with a target of 20 percent SPR, and specified 2007 as the target year to rebuild the stock to 20 percent SPR.

The commercial red snapper fishery harvested its 2.04 MP annual quota in just 53 days in 1992, causing the fishery to close on February 22, 1992 [56 FR 33883]. NMFS implemented an **emergency rule** [56 FR 30513] at the Council's request, which reopened the fishery from April 3, 1992, through May 14, 1992, with a 1,000-pound trip limit. This rule was intended to alleviate the adverse economic and social effects of the extended fishery closure. NMFS determined the one-time quota overage approximating 600,000 pounds would not compromise red snapper rebuilding.

Amendment 4 (with its associated EA and RIR), implemented on May 8, 1992, established a moratorium on the issuance of new reef fish permits for a maximum period of three years. The moratorium was intended to moderate short-term future increases in fishing effort and to help stabilize fishing mortality while the Council considered a more comprehensive effort limitation program. It allowed permits to be transferred between vessels owned by the permittee or between individuals when the permitted vessel was transferred. Amendment 4 also changed the month in which red snapper TAC is specified from April to August, and added species to the reef fish FMU [57 FR 11914].

An **emergency rule**, effective December 30, 1992, created a red snapper endorsement to the reef fish permit. The endorsement was issued to owners or operators of federally permitted reef fish vessels who had annual landings of at least 5,000 pounds of red snapper in two of the three years from 1990 through 1992. The emergency rule provided permitted vessels with red snapper endorsements a 2,000-pound possession limit of red snapper during the open season, and permitted vessels without the endorsement a 200-pound possession limit during the open season. The rule was initially effective for 90 days and later extended for an additional 90 days. A related **emergency rule** delayed the opening of the 1993 commercial red snapper season until February 16 to allow NMFS time to process and issue the endorsements [59 FR 966].

A **regulatory amendment** implemented on March 23, 1993, increased the red snapper TAC to 6.0 MP, and allocated 3.06 MP and 2.94 MP to the commercial and recreational sectors, respectively. The amendment established a seven-red snapper recreational daily bag limit, and adjusted the rebuilding target year to 2009, which was the maximum allowable rebuilding timeframe based on an estimated red snapper generation time of 13 years (Goodyear 1992) [58 FR 16371].

A **regulatory amendment**, implemented on January 1, 1994, delayed the start of the 1994 commercial red snapper fishery until February 10, 1994, to minimize fishing during hazardous winter weather and to ensure the commercial red snapper fishery was open during Lent, when there is increased demand for seafood. Additionally, the amendment restricted commercial vessels to landing no more than one trip limit per day [58 FR 68325].

Amendment 5 (with its associated EIS, RIR, and IRFA), implemented on February 7, 1994, restricted the use of fish traps within the Gulf EEZ, and implemented a three-year moratorium on participation in the fish trap fishery by creating a fish trap endorsement and limiting qualifiers to those trap fishermen who had recorded reef fish landings between January 1, 1991, and November 19, 1992. Additionally, Amendment 5 created a special management zone (SMZ) with gear restrictions off the Alabama coast, created a framework procedure for establishing future SMZs, required all finfish (except oceanic migratory species) be landed with head and fins attached, established a schedule to gradually raise the minimum size limit for red snapper to 16 inches TL over a period of five years, and closed the Riley's Hump area (near Dry Tortugas, Florida) to all fishing during May and June to protect mutton snapper spawning aggregations.

Amendment 6 (with its associated EA, RIR, and IRFA), implemented on June 29, 1993, extended the provisions of the red snapper endorsement emergency rule for the remainder of 1993 and 1994, unless replaced sooner by a comprehensive effort limitation program. In addition, the amendment added trip limit adjustments to the list of management actions covered under the framework procedure for specifying TAC [58 FR 33025].

Amendment 7 (with its associated EA, RIR, and IRFA), implemented on February 7, 1994, established reef fish dealer permitting and record keeping requirements, allowed fish trap permits and endorsements to be transferred between immediate family members during the fish trap permit moratorium, and allowed other reef fish permits or endorsements to be transferred if the permit holder died or became disabled. The Secretary disapproved one provision of the amendment, which would have limited the sale of reef fish to permitted dealers [59 FR 6588].

A **regulatory amendment** implemented on January 1, 1995, established February 24, 1995, as the opening date of the 1995 commercial red snapper fishery. Additionally, the amendment reduced the recreational daily bag limit to five fish, and increased the recreational minimum size limit to 15 inches TL (one year ahead of the scheduled increase), in response to continued overages by the recreational sector [59 FR 67646].

A red snapper Individual Transferable Quota (ITQ) program, proposed in **Amendment 8** (with its associated EA, RIR, and IRFA) and approved by NMFS in 1995 [60 FR 61200], was never implemented because of Congressional action taken through the 1996 SFA to place a moratorium on the development or implementation of new ITQ programs until October 1, 2000. The ITQ program proposed in Amendment 8 would have: allocated the commercial red snapper quota based on historical participation in the fishery during the years 1990-1992; specified a four-year period for harvest under the ITQ program, during which time the Council and NMFS would evaluate the program and determine whether it should be eliminated, extended as is, or adjusted; and established a Council-created board to consider appeals. An interim rule published in February 1996 (61 FR 7751) suspended implementation of the red snapper ITQ previously scheduled to begin April 1, 1996, to make sure the entire 1996 commercial quota for red snapper available to the fishery which opened February 1, 1996, and to extend for the emergency period the red snapper trip limit and permit endorsement system.

Amendment 9 (with its associated EA and RIR), implemented on July 27, 1994, provided for collection of commercial red snapper landings and eligibility data for the years 1990 through 1992 to assist in identifying potential qualifiers for and analyzing the effects of limiting access to the fishery. This amendment also extended the reef fish permit moratorium and red snapper endorsement system through December 31, 1995, to prevent participation in the fishery from increasing while the Council considered longer-term measures. The Council received the results of the data collection effort in November 1994, at which time consideration of Amendment 8 resumed [59 FR 39301].

A **regulatory amendment**, implemented October 16, 1996, increased the red snapper TAC to 9.12 MP, and allocated 4.65 MP and 4.47 MP to the commercial and recreational sectors, respectively. The amendment extended the target recovery date to 2019, based on new information the life span and generation time of red snapper was longer than previously believed.

A March 1996 addendum to the regulatory amendment split the 1996 and 1997 commercial red snapper quotas into two seasons each: a spring opening on February 1 with a 3.06 MP quota, and a fall opening on September 15, after which the remainder of the quota could be taken (61 FR 48641).

Amendment 11 (with its associated EA and RIR) was partially approved by NMFS and implemented January 1, 1996. Provisions approved in the amendment included: limited sale of GOM reef fish by permitted vessels to permitted reef fish dealers; required permitted reef fish dealers to purchase reef fish caught in GOM federal waters only from permitted vessels; allowed reef fish permits and fish trap endorsements to be transferred in the event of death or disability; implemented a new reef fish permit moratorium for no more than five years or until December 31, 2000, while the Council considered limited access for the reef fish fishery; allowed permit transfers to other persons with vessels by vessel owners (not operators) who qualified for their reef fish permit; allowed a one time transfer of existing fish trap endorsements to permitted reef fish vessels whose owners have landed reef fish from fish traps in federal waters, as reported on logbooks received by the Science and Research Director of NMFS from November 20, 1992, through February 6, 1994; and established a charter vessel/headboat permit program [60 FR 64356].

The agency disapproved a proposal to redefine OY from 20 percent SPR (the same level as overfishing) to an SPR corresponding to a fishing mortality rate of $F_{0.1}$ until an alternative operational definition that optimizes ecological, economic, and social benefits to the Nation could be developed. In April 1997, NMFS also disapproved a revised proposal to define OY as 30 percent SPR. Following the Congressional repeal of the red snapper ITQ program proposed in Amendment 8, an **emergency rule** was published in the *Federal Register* on January 2, 1996, to extend the red snapper endorsement system for 90 days. That emergency rule was superseded by another **emergency rule**, published in the *Federal Register* on February 29, 1996, which extended the red snapper endorsement system through May 29, 1996, and subsequently, for an additional 90 days until August 27, 1996.

Amendment 12 (with its associated EA and RIR) was implemented on January 15, 1997. NMFS disapproved proposed provisions that would have exempted the commercial sector from the automatic red snapper size limit increase to 15 inches TL in 1996 and to 16 inches TL in 1998 [61 FR 65983].

Amendment 13 (with its associated EA and RIR), implemented on September 15, 1996, further extended the red snapper endorsement system through the remainder of 1996 and, if necessary, through 1997, in order to give the Council time to develop a permanent limited access system that was in compliance with the new provisions of the M-SFCMA (61 FR 48413).

A **regulatory amendment**, implemented on March 17, 1997, changed the opening date of the fall 1997 commercial red snapper season from September 15 to September 2 at noon, and closed the season on September 15 at noon. Thereafter, the commercial season was opened from noon of the first day to noon of the fifteenth day of each month until the 1997 commercial quota was reached. The amendment also addressed the new M-SFCMA requirement that recreational red snapper be managed under a quota system by authorizing the Regional Administrator (RA) to close the recreational fishery in the EEZ at such time as projected to be necessary to prevent the recreational sector from exceeding its allocation. The recreational red snapper fishery was closed on November 27, 1997, after filling its 1997 quota of 4.47 MP (61 FR 46677 and 61 FR 48641).

A **regulatory amendment**, implemented on January 1, 1998, exempted the recreational sector from the pre-approved plan (see Amendment 5) to increase the red snapper minimum size limit to 16 inches TL (63 FR 443).

Amendment 14 (with its associated EA, RIR, and IRFA), implemented on March 25 and April 24, 1997, implemented a ten-year phase out of the reef fish trap fishery, and allowed fish trap endorsements to be transferred for two years, after which time such transfers would be limited to death or disability situations, to other vessels owned by the same entity, or to any of the 56 individuals who were fishing traps after November 19, 1992, and were excluded by the moratorium. Additionally, Amendment 14 prohibited the use of fish traps west of Cape San Blas, Florida, provided the RA authority to reopen a fishery prematurely closed before the allocation was reached, and modified the provisions for transferring commercial reef fish vessel permits (62 FR 13983).

Amendment 15 (with its associated EA, RIR, and IRFA), implemented on January 29, 1998, replaced the temporary red snapper endorsement system with a permanent two-tier red snapper license limitation system. The new system provided Class 1 license holders with a 2,000-pound trip limit, and Class 2 license holders with a 200-pound trip limit. Vessels without a Class 1 or Class 2 red snapper license were prohibited from commercial harvest of red snapper. Licenses were fully transferable. The amendment divided the commercial red snapper season into two parts: two-thirds of the quota was allocated to a February 1 opening; and the remaining quota was allocated to a September 1 opening. The commercial fishery was allowed to operate from noon of the first day to noon of the fifteenth day of each month during each opening until the respective quotas were reached (62 FR 67714).

A subsequent **regulatory amendment** proposed maintaining the 9.12 MP TAC, but reducing to zero the bag limit for the captain and crew of for-hire recreational vessels in order to extend the recreational red snapper season. The NMFS provisionally approved the Council's proposal to maintain the TAC. However, the agency released only 6.0 MP of the TAC, indicating the remaining 3.12 MP would be released only if BRDs achieved better than a 50 percent reduction in juvenile red snapper shrimp trawl mortality. The agency did not approve the proposed reduction in bag limit for captain and crew of for-hire recreational vessels. The 3.12 MP TAC held in reserve was released on September 1, 1998, following the completion of a shrimp trawl observer program conducted during the summer of 1998, which indicated BRDs would be able to achieve the bycatch reduction needed for the red snapper recovery program to succeed. In lieu of implementing the regulatory amendment, the NMFS implemented an **interim rule** effective April 14, 1998 (63 FR 18144), which initially allocated only two-thirds of the 9.12 MP TAC, and reduced the recreational red snapper daily bag limit to four fish from January 1 to August 30, 1998. A subsequent **interim rule** allocated the remainder of the TAC effective September 1, 1998.

An **interim rule**, implemented in January 1999, extended the four-fish recreational daily bag limit rule, and provided for the recreational fishery to reopen in January 1999 (64 FR 47711). A **regulatory amendmen**t implemented on October 1, 1999, reduced the recreational red snapper daily bag limit to four fish for recreational fishermen and to zero fish for captain and crew of for-hire vessels. The amendment specified March 1 as the opening date of the recreational red snapper fishing season, reduced the commercial and recreational red snapper minimum size limit to 14 inches TL, and reduced the duration of the commercial red snapper fishery from 15 days to 10 days each month beginning September 1, until the seasonal sub-allocation was met or the fishing year ended. The zero-fish bag limit provision for captain and crew was rescinded by a December 1999 interim rule before it became effective.

Amendment 17 (with its associated EA and RIR), implemented on August 2, 2000, extended the reef fish permit moratorium to December 31, 2005, unless replaced sooner by a comprehensive controlled access system (65 FR 41016).

A **regulatory amendment**, implemented on September 18, 2000, increased the red snapper recreational minimum size limit from 15 inches to 16 inches TL, established a four fish recreational daily bag limit, and reinstated the red snapper bag limit for captain and crew of for-hire vessels. The amendment specified a recreational red snapper season of April 15 through October 31, subject to revision by the RA to accommodate reinstating the bag limit for captain and crew. Additionally, it provided for a commercial red snapper spring and fall season to open at noon on February 1 and on October 1, respectively. The amendment provided for a ten-day fishery each month of each season until the seasonal sub-allocations were reached (65 FR 50158). These measures were implemented through an **interim rule** on January 19, 2000 (64 FR 71056), and extended through a second **interim rule** on June 19, 2000 (65 FR 36643).

Amendment 19 (with its associated EIS, RIR, and IRFA), implemented on August 19, 2002, amended all Gulf FMPs. This amendment established two marine reserves off the Dry Tortugas, within which fishing and anchoring by fishing vessels were prohibited (67 FR 47467).

Amendment 20 (with its associated EA and RIR), implemented on June 16, 2003, amended the Reef Fish and Coastal Pelagic FMPs. This amendment established a three-year moratorium on the issuance of new charter and headboat vessel permits in GOM reef fish and coastal migratory pelagic fisheries to limit further expansion in the for-hire fisheries while the Council considered the need for more comprehensive effort management systems. The control date notice announcing the consideration of a limited access system was dated November 18, 1998. However, the Council established a qualifying cut-off date of March 29, 2001, to include all those for-hire vessels who were permitted or who had applied for a permit at that time. Persons with a recreational for-hire vessel under construction prior to March 29, 2001, and who could demonstrate expenditures of at least $5,000.00 also qualified for a moratorium permit, as did persons who qualified as historical captains (68 FR 26230).

Amendment 21 (with its EA, RIR, and IRFA), approved in March 2004, extended the Madison-Swanson and Steamboat Lumps marine reserve closures for six years and modified fishing restrictions within the reserves.

Amendment 22 (with its FSEIS, RIR, and IRFA), implemented on July 5, 2005, set post-SFA biological reference points and status determination criteria for red snapper, established a rebuilding plan for the red snapper stock, and specified a reporting program to improve bycatch monitoring in the reef fish fishery.

Amendment 23 (with FEIS, RIR, and IRFA) implemented on July 8, 2005, contained measures for vermilion snapper designed to end overfishing and initiate implementation of the rebuilding plan in a manner that allocates the necessary restrictions fairly and equitably between the recreational and commercial sectors of the fishery, as required by the Magnuson-Stevens Act.

Amendment 24 (with its EA, RIR, and IRFA), approved in June 2005, established an indefinite limited access system for the commercial reef fish fishery in the Gulf EEZ.

Amendment 26 (with SEIS, RIR, and IRFA), approved by the Council in March 2006 and implemented by NMFS in December 2006, established an IFQ program for the commercial red snapper fishery. Quota shares are freely transferable to other reef fish permit holders during the first 5 years following implementation and to anyone thereafter.

An interim rule, published on April 2, 2007, reduced the red snapper total allowable catch quota to 6.5 MP, resulting in a commercial quota of 3.315 MP and a recreational quota of 3.185 MP; reduced the red snapper recreational bag limit from four fish to two fish per person per day; prohibited the captain and crew of for-hire vessels from retaining the recreational bag limit; reduced the commercial minimum size limit from 15-inches to 13-inches total length; and established a target red snapper bycatch mortality reduction goal for the shrimp fishery that equates to 50 percent of the bycatch mortality that occurred during 2001-2003 and a level of shrimp effort equal to that observed in the fishery in 2005.

1.2.2 History of Shrimp Management

The Shrimp FMP, supported by an Environmental Impact Statement (EIS), was implemented on May 15, 1981. The FMP defined the Shrimp Fishery Management Unit to include brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), pink shrimp (*Farfantepenaeus duorarum*), royal red shrimp (*Hymenopenaeus robustus*), seabobs (*Xiphopeneus kroyeri*), and rock shrimp (*Sicyonia brevirostris*). The actions implemented through the FMP and its subsequent amendments, have addressed the following objectives:

1. Optimize the yield from shrimp recruited to the fishery.
2. Encourage habitat protection measures to prevent undue loss of shrimp habitat.
3. Coordinate the development of shrimp management measures by the Gulf of Mexico Fishery Management Council (Council or GMFMC) with the shrimp management programs of the several states, where feasible.
4. Promote consistency with the Endangered Species Act and the Marine Mammal Protection Act.
5. Minimize the incidental capture of finfish by shrimpers, when appropriate.
6. Minimize conflict between shrimp and stone crab fishermen.
7. Minimize adverse effects of obstructions to shrimp trawling.

8. Provide for a statistical reporting system.

The principal thrust of the plan was to enhance yield in volume and value by deferring harvest of small shrimp to provide for growth. Principle actions included: (1) establishing a cooperative Tortugas Shrimp Sanctuary with the state of Florida to close a shrimp trawling area where small pink shrimp comprise the majority of the population most of the time; (2) a cooperative 45-day seasonal closure with the state of Texas to protect small brown shrimp emigrating from bay nursery areas; and (3) seasonal zoning of an area of Florida Bay for either shrimp or stone crab fishing to avoid gear conflict.

Amendment 1, supported by an EA, was approved later that year. This amendment provided the Regional Administrator (RA) of the NMFS Southeast Regional Office with the authority (after conferring with the GMFMC) to adjust by regulatory amendment the size of the Tortugas Sanctuary or the extent of the Texas closure, or to eliminate either closure for one year.

Amendment 2/EA (1983), updated catch and economic data in the FMP. **Amendment 3/EA** (1984) resolved another shrimp-stone crab gear conflict on the west-central coast of Florida.

Amendment 4/EA, partially approved in 1988 and finalized in 1989, identified problems that developed in the fishery and revised the objectives of the FMP accordingly. The annual review process for the Tortugas Sanctuary was simplified, and the GMFMC's and RA's review for the Texas closure was extended to February 1st. A provision that white shrimp taken in the EEZ be landed in accordance with a state's size/possession regulations to provide consistency and facilitate enforcement with the state of Louisiana was to have been implemented at such time when Louisiana provided for an incidental catch of undersized white shrimp in the fishery for seabobs. This provision was disapproved by the NMFS with the recommendation that it be resubmitted under the expedited 60-day Secretarial review schedule after Louisiana provided for a bycatch of undersized white shrimp in the directed fishery for seabobs. This resubmission was made in February of 1990 and applied to white shrimp taken in the EEZ and landed in Louisiana. It was approved and implemented in May of 1990.

In July 1989, the NMFS published revised guidelines for FMPs that interpretatively addressed the M-SFCMA's (then called the Magnuson Fishery Conservation and Management Act) National Standards (50 CFR Part 602). These guidelines required each FMP to include a scientifically measurable definition of overfishing and an action plan to arrest overfishing should it occur.

In 1990, Texas revised the period of its seasonal closure in Gulf waters from June 1 to July 15 to May 15 to July 15. The FMP did not have enough flexibility to adjust the cooperative closure of federal waters to accommodate this change, thus an amendment was required.

Amendment 5/EA, approved in 1991, defined overfishing for Gulf brown, pink, and royal red shrimp and provided for measures to restore overfished stocks if overfishing should occur. Action on the definition of overfishing for white shrimp was deferred, and seabobs and rock shrimp were deleted from the management unit. The duration of the seasonal closure to shrimping off Texas was adjusted to conform with the changes in state regulations.

Amendment 6/EA (1993), eliminated the annual reports and reviews of the Tortugas Shrimp Sanctuary in favor of monitoring and an annual stock assessment. Three seasonally opened areas within the sanctuary continued to open seasonally, without need for annual action. A proposed definition of overfishing of white shrimp was rejected by the NMFS as not being based on the best available data.

Amendment 7/EA, finalized in 1994, defined overfishing for white shrimp and provided for future updating of overfishing indices for brown, white, and pink shrimp as new data become available. A total allowable level of foreign fishing (TALFF) for royal red shrimp was eliminated; however, a redefinition of overfishing for this species was disapproved.

Amendment 8/EA, submitted in 1995 and implemented in early 1996, addressed management of royal red shrimp. It established a procedure that would allow TAC for royal red shrimp to be set up to 30 percent above MSY for no more than two consecutive years so that a better estimate of MSY could be determined. This action was subsequently negated by the 1996 Sustainable Fisheries Act (SFA) amendment to the M-SFCMA that defined overfishing as a fishing level that jeopardizes the capacity of a stock to maintain MSY, and does not allow OY to exceed MSY.

Amendment 9, supported by a Supplemental Environmental Impact Statement (SEIS) and implemented in 1998, required the use of a NMFS certified BRDs in shrimp trawls used in the EEZ from Cape San Blas, Florida (85°30' W. Longitude) to the Texas/Mexico border, and provided for the certification of the Fisheye BRD in the 30 mesh position. The purpose of this action was to reduce the bycatch mortality of juvenile red snapper by 44 percent from the average mortality for the years 1984-89 (F=2.06). This amendment exempted shrimp trawls fishing for royal red shrimp outside of 100 fathoms, as well as groundfish and butterfish trawls. It also excluded small try nets and no more than two ridged frame roller trawls that do not exceed 16 feet. Amendment 9 also provided mechanisms to change the bycatch reduction criterion and to certify additional BRDs.

Amendment 10/EA, approved in 2004, required BRDs in shrimp trawls used in the Gulf east of Cape San Blas, Florida (85°30' W. Longitude). Certified BRDs for this area are required to demonstrate a 30 percent reduction by weight of finfish.

Amendment 11/EA, which was fully implemented in December 2002, required owners and operators of all vessels harvesting shrimp from the EEZ of the Gulf to obtain a federal commercial vessel permit. This amendment also prohibited the use of traps to harvest royal red shrimp from the Gulf of Mexico and to transfer royal red shrimp at sea.

Amendment 12/EA, was included as part of the Generic Essential Fish Habitat (EFH) Amendment that established EFH for shrimp in the Gulf.

Amendment 13/EA, established an endorsement to the existing federal shrimp vessel permit for vessels harvesting royal red shrimp; defined the overfishing threshold and the overfished condition for royal red; defined maximum sustainable yield and optimum yield for the penaeid shrimp stocks in the Gulf; established bycatch reporting methodologies and improve collection of shrimping effort data in the EEZ; required completion of a Gulf Shrimp Vessel and Gear Characterization Form; established a moratorium on the issuance of commercial shrimp vessel permits; and required reporting and certification of landings during the moratorium.

2.0 MANAGEMENT ALTERNATIVES

Action 1. Measures to revise the red snapper rebuilding plan and end overfishing of red snapper by 2009 or 2010.

On March 12, 2007, the United States District Court for the Southern District of Texas, Houston Division, issued a ruling on legal challenges to the current red snapper rebuilding plan contained in Amendment 22 to the Reef Fish FMP. The Court ruled the rebuilding plan in Amendment 22 had less than a 50 percent chance of rebuilding red snapper by 2032 and, therefore, required a new rebuilding plan be established within 9 months of the ruling (i.e., December 12, 2007). However, the Council had already initiated Joint Amendment 27/14 to further reduce harvest and bycatch of red snapper and to revise the rebuilding trajectory approved in Amendment 22 based on the findings of SEDAR 7 (2005) that indicated red snapper were undergoing overfishing and the stock was still overfished.

The following alternatives describe management measures associated with five different rebuilding plans to constrain recreational harvest within the allocated quota. With the exception of quota reductions, no measures are proposed to further constrain the commercial harvest because the commercial fishery operates under an IFQ program; quota shares are reduced proportionally based on the number of shares a fisherman possesses at the time of the quota reduction. Recreational management measures necessary to achieve various TACs are summarized for each alternative. The length of the recreational fishing season specified for each alternative is based on allowing captain and crew to retain bag limits of red snapper while under charter. If captain and crew are prohibited from retaining bag limits of red snapper (see Action 3) then the length of the recreational fishing season will be longer (see Table 2.1).

Reductions in TAC for each of the alternatives in this action are based on baseline levels of directed red snapper fishery landings and fishing effort during 2001-03 and assume no post-hurricane reductions in fishing effort/landings. Table 2.4 summarizes the length of the fishing season for each of the alternatives in Action 1 if a 10 or 25 percent reduction in post-hurricane fishing effort/landings is assumed and the captain and crew red snapper bag limit is set to zero (Preferred Alternative 2 in Action 3). Similar reductions in commercial red snapper landings are not assumed because the fishery is operating under an IFQ program as of January 1, 2007.

Alternative 1. No Action – Do not revise the red snapper rebuilding plan approved in Amendment 22 to the Reef Fish Fishery Management Plan. Maintain a constant 9.12 MP TAC until 2032; the commercial quota would remain at 4.65 MP and the recreational quota would remain at 4.47 MP. Maintain the 16-inch minimum size limit, 4-fish bag limit, and recreational fishing season from April 21 through October 31 (194 days). Review and adjust the rebuilding plan and directed fishery management measures, as necessary, based on periodic stock assessments and Magnuson-Act mandates (e.g., annual catch limits).

Alternative 2. Revise the red snapper rebuilding plan in Reef Fish Amendment 22 by reducing TAC to 7.0 MP between 2008 and 2032; the commercial quota would be 3.57 MP and the recreational quota would be 3.43 MP. Review and adjust the

rebuilding plan and directed fishery management measures, as necessary, based on periodic stock assessments. Management measures to achieve the 3.43 MP recreational quota would be:

Option a. 4-fish bag limit, 16-inch minimum size limit, and:

- **Suboption i.** **May 15 – September 30 recreational fishing season (139 days).**
- **Suboption ii.** **Gulfwide weekend openings. Recreational fishing season May 15 – August 31 plus 8 consecutive weekends after August 31 (125 days).**
- **Suboption iii.** **Texas weekend openings. In the EEZ off Texas, May 15 – August 31 recreational fishing season plus 8 consecutive weekends after August 31 (125 days). In the rest of the EEZ, May 15 – September 30 recreational fishing season with no weekend openings (139 days).**
- **Suboption iv.** **Western Gulf weekend openings. In the EEZ west of the Mississippi River, May 15 – August 31 recreational fishing season plus 8 consecutive weekend openings after August 31 (125 days). In the EEZ east of the Mississippi River, May 15 – September 30 recreational fishing season with no weekend openings (139 days).**

Option b. 3-fish bag limit and:

- **Suboption i.** **16-inch minimum size limit and May 15 – October 15 recreational fishing season (154 days).**
- **Suboption ii.** **15-inch minimum size limit and June 1 – October 15 recreational fishing season (137 days).**

Option c. 2-fish bag limit and:

- **Suboption i.** **15-inch minimum size limit and May 15 – October 15 recreational fishing season (154 days).**
- **Suboption ii.** **13-inch minimum size limit and May 15 – September 15 recreational fishing season (124 days).**
- **Suboption iii.** **15-inch minimum size limit and Gulfwide weekend openings. Recreational fishing season May 15 – August 31 plus 12 weekend openings after August 31 (133 days).**
- **Suboption iv.** **15-inch minimum size limit and Texas weekend openings. In the EEZ off Texas, May 15 – August 31 recreational fishing season plus 12 consecutive weekends after August 31 (133 days). In the rest of the EEZ, May 15 – October 15 fishing season with no weekend openings (154 days).**
- **Suboption v. 15-inch minimum size limit and western Gulf weekend openings. In the EEZ west of the Mississippi River, May 15 – August 31 recreational fishing season plus 12 consecutive weekend openings after August 31 (133 days). In the EEZ east of the Mississippi River, May 15 – October 15 recreational fishing season with no weekend openings (154 days).**

Preferred Alternative 3. Revise the red snapper rebuilding plan in Reef Fish Amendment 22 by reducing TAC to 5.0 MP between 2008 and 2010; the commercial quota would be 2.55 MP, and the recreational quota would be 2.45 MP. After 2010, TAC would correspond to the level of catch associated with fishing at rate that produces MSY

(proxy = 26 percent SPR). Review and adjust the rebuilding plan and directed fishery management measures, as necessary, based on periodic stock assessments. Management measures to achieve the 2.45 MP recreational quota would be:

Preferred Option a. 2-fish bag limit, 16-inch minimum size limit, and:
- **Preferred Suboption i. June 1 – September 15 recreational fishing season (107 days).**
- **Suboption ii. May 1 - July 31 recreational fishing season (92 days)**

Option b. 2-fish bag limit, 16-inch minimum size limit and:
- **Suboption i. May 15 – August 15 recreational fishing season (92 days)**
- **Suboption ii. Gulfwide weekend openings. July 1 – July 31 recreational fishing season plus 6 weekends immediately prior to July 1 and 7 weekends immediately after July 31 (57 days).**
- **Suboption iii. Texas weekend openings. In the EEZ off Texas, July 1 – July 31 recreational fishing season plus 6 weekends immediately prior to July 1 and 7 weekends immediately after July 31 (57 days). In the rest of the EEZ, May 15 – August 15 recreational fishing season with no weekend openings (92 days).**
- **Suboption iv. Western Gulf weekend openings. In the EEZ west of the Mississippi River, July 1 – July 31 recreational fishing season plus 6 weekends immediately prior to July 1 and 7 weekends immediately after July 31 (57 days). In the rest of the EEZ, May 15 - August 15 recreational fishing season with no weekend openings (92 days).**

Option c. 2-fish bag limit, 15-inch minimum size limit and May 15 – August 10 recreational fishing season (88 days).

Option d. 2-fish bag limit, 14-inch minimum size limit and:
- **Suboption i. May 15 – July 31 recreational fishing season (77 days).**
- **Suboption ii. June 1 – August 15 recreational fishing season (76 days).**
- **Suboption iii. May 1 – July 9 recreational fishing season (71 days).**

Option e. 2-fish bag limit, 13-inch minimum size limit and June 1 – July 31 recreational fishing season (61 days).

Option f. 1 fish bag limit, 14-inch minimum size limit and:
- **Suboption i. June 1 – September 30 recreational fishing season (122 days).**
- **Suboption ii. May 1 – August 10 recreational fishing season (102 days).**

Option g. 1 fish bag limit, 16-inch minimum size limit, and:
- **Suboption i. May 15 – October 15 recreational fishing season (154 days).**
- **Suboption ii. May 1 – September 15 recreational fishing season (138 days).**

Alternative 4. Revise the red snapper rebuilding plan in Reef Fish Amendment 22 by reducing TAC to 3.0 MP between 2008 and 2010; the commercial quota would be

1.53 MP, and the recreational quota would be 1.47 MP. After 2010, TAC would correspond to the level of catch associated with fishing at rate that produces MSY (proxy = 26 percent SPR). Review and adjust the rebuilding plan and directed fishery management measures, as necessary, based on periodic stock assessments. Management measures to achieve the 1.47 MP recreational quota would be:

Option a. 2-fish bag limit, 16-inch minimum size limit, and

- **Suboption i. August 1 – September 15 recreational fishing season (46 days).**
- **Suboption ii. Gulfwide weekend openings. August 1 – August 31 recreational fishing season plus 2 weekends immediately prior to August 1 and 2 weekends immediately after August 31 (39 days).**
- **Suboption iii. Texas weekend openings. In the EEZ off Texas, August 1 – August 31 recreational fishing season plus 2 weekends immediately prior to August 1 and 2 weekends immediately after August 31 (39 days). In the rest of the EEZ, August 1 – September 15 recreational fishing season with no weekend openings (46 days).**
- **Suboption iv. Western Gulf weekend openings. In the EEZ west of the Mississippi River, August 1 – August 31 recreational fishing season plus 2 weekends immediately prior to August 1 and 2 weekends immediately after August 31 (39 days). In the rest of the EEZ, August 1 – September 15 recreational fishing season with no weekend openings (46 days).**

Option b. 2-fish bag limit, 15-inch minimum size limit, and August 1 – September 8 recreational fishing season (39 days).

Option c. 2-fish bag limit, 14-inch minimum size limit, and August 1 – September 4 recreational fishing season (35 days).

Option d. 2-fish bag limit, 13-inch minimum size limit, and August 1 – August 31 recreational fishing season (31 days).

Table 2.1. Length of the recreational red snapper fishing season for alternatives in Action 1 if captain and crew are allowed or are prohibited from retaining bag limits of red snapper while under charter (see Action 2; Note: the change in fishing season length for various alternatives in some cases exceed 3-7 days. This is because closed seasons summarized in Action 1 were analyzed in 15-day increments and reductions in harvest for some alternatives are slightly greater than necessary to meet specified TACs. As a result, when alternatives in Action 1 are combined with a zero captain and crew bag limit, the season can be extended in some instances longer than 3-7 days).

		Fishing Season	
Rec quota	**Alternative**	**allow capt/crew bag**	**prohibit capt/crew bag**
3.43 mp (7.0 mp TAC)	Alt 2(a)(i)	May 15 - Sept 30	May 15 - Oct 7
	Alt 2(a)(ii)	May 15 - Aug 31, 8 wkends Gulfwide	May 15 - Aug 31, 10 wkends Gulfwide
	Alt 2(a)(iii)	May 15 - Aug 31, 8 wkends Texas May 15 - Sept 30 rest of Gulf	May 15 - Aug 31, 10 wkends Texas May 15 - Oct 7 rest of Gulf
	Alt 2(a)(iv)	May 15 - Aug 31, 8 wkends west Gulf May 15 - Sept 30 east Gulf	May 15 - Aug 31, 10 wkends west Gulf May 15 - Oct 7 east Gulf
	Alt 2(b)(i)	May 15 - Oct 15	May 15 - Oct 31
	Alt 2(b)(ii)	June 1 - Oct 15	June 1 - Oct 24
	Alt 2(c)(i)	May 15 - Oct 15	May 15 - Oct 31
	Alt 2(c)(ii)	May 15 - Sept 15	May 15 - Sept 24
	Alt 2(c)(iii)	May 15 - Aug 31, 12 wkends Gulfwide	May 15 - Aug 31, 15 wkends Gulfwide
	Alt 2(c)(iv)	May 15 - Aug 31, 12 wkends Texas May 15 - Oct 15 rest of Gulf	May 15 - Aug 31, 15 wkends Texas May 15 - Oct 27 rest of Gulf
	Alt 2(c)(v)	May 15 - Aug 31, 12 wkends west Gulf May 15 - Oct 15 east Gulf	May 15 - Aug 31, 15 wkends west Gulf May 15 - Oct 27 east Gulf
2.45 mp (5.0 mp TAC)	Alt 3(a)(i)	June 1 - Sept 15	June 1 - Sept 30
	Alt 3(a)(ii)	May 1 - July 31	May 1 - Aug 7
	Alt 3(b)(i)	May 15 - Aug 15	May 15 - Aug 31
	Alt 3(b)(ii)	July 1 - July 31 + 13 wkends Gulfwide	July 1 - July 31 + 15 wkends Gulfwide
	Alt 3(b)(iii)	July 1 - July 31 + 13 wkends Texas May 15 - Aug 15 rest of Gulf	July 1 - July 31 + 15 wkends Texas May 15 - Aug 31 rest of Gulf
	Alt 3(b)(iv)	July 1 - July 31 + 13 wkends west Gulf May 15 - Aug 15 rest of Gulf	July 1 - July 31 + 15 wkends west Gulf May 15 - Aug 31 rest of Gulf
	Alt 3(c)	May 15 - Aug 10	May 15 - Aug 15
	Alt 3(d)(i)	May 15 - July 31	May 15 - Aug 5
	Alt 3(d)(ii)	June 1 - Aug 15	June 1 - Aug 20
	Alt 3(d)(iii)	May 1 - July 9	May 1 - July 15
	Alt 3(e)	June 1 - July 31	June 1 - Aug 7
	Alt 3(f)(i)	June 1 - Sept 30	June 1 - Oct 4
	Alt 3(f)(ii)	May 1 - Aug 10	May 1 - Aug 15
	Alt 3(g)(i)	May 15 - Oct 15	May 15 - Oct 22
	Alt 3(g)(ii)	May 1 - Sept 15	May 1 - Sept 25
1.47 mp (3.0 mp TAC)	Alt 4(a)(i)	Aug 1 - Sept 15	Aug 1 - Sept 22
	Alt 4(a)(ii)	Aug 1 - Aug 31 + 4 wkends Gulfwide	Aug 1 - Aug 31 + 6 wkends Gulfwide
	Alt 4(a)(iii)	Aug 1 - Aug 31 + 4 wkends Texas Aug 1 - Sept 15 rest of Gulf	Aug 1 - Aug 31 + 6 wkends Texas Aug 1 - Sept 22 rest of Gulf
	Alt 4(a)(iv)	Aug 1 - Aug 31 + 4 wkends west Gulf Aug 1 - Sept 15 rest of Gulf	Aug 1 - Aug 31 + 6 wkends west Gulf Aug 1 - Sept 22 rest of Gulf
	Alt 4(b)	Aug 1 - Sept 8	Aug 1 - Sept 15
	Alt 4(c)	Aug 1 - Sept 4	Aug 1 - Sept 11
	Alt 4(d)	Aug 1 - Aug 31	Aug 1 - Sept 7

Red Snapper Allocation

Since 1990, the red snapper fishery has been managed under an overall TAC, which is allocated between the commercial (51 percent) and recreational (49 percent) sectors. This allocation was established in Amendment 1 to the Reef Fish FMP and is based on average commercial and recreational landings during 1979-1987 (GMFMC 1989). All of the rebuilding plans and alternatives in Action 1 continue to allocate the TAC and quotas based on this allocation ratio, resulting in equal proportion reductions to the commercial and recreational quotas.

2008 Commercial Quota

Interim regulations published on April 2, 2007, reduced the red snapper TAC from 9.12 MP to 6.5 MP through September 29, 2007. This temporary reduction in TAC will expire after that time unless extended on an interim basis for another 186 days. The Council intends to further reduce the red snapper TAC in 2008 to end overfishing and rebuild the red snapper stock in compliance with the red snapper rebuilding plan. The Council's preferred red snapper TAC for 2008 is 5.0 MP (**Action 1**; **Preferred Alternative 3**). The Council is requesting NMFS implement this TAC adjustment for the 2008 fishing year on or before January 1, 2008, to ensure the amount of red snapper allocation issued to the commercial red snapper IFQ fishery does not exceed the commercial quota defined by the Council's preferred TAC for 2008 (51 percent of 5.0 MP, or 2.55 MP). If NMFS is unable to publish a final rule on or prior to December 1, 2007, to implement this TAC adjustment for the 2008 fishing year, then the Council requests NMFS issue only 2.55 MP of red snapper allocation to the commercial red snapper IFQ fishery at the start of the 2008 fishing season, as opposed to 51 percent of the current 6.5-MP TAC (3.32 MP). This will reduce the likelihood that NMFS would be required to retract red snapper allocation from the commercial red snapper IFQ fishery during the 2008 fishing year.

ABC and TAC

Acceptable biological catch (ABC) refers to a range of catches for a species or species group that will produce the desired biological results given a set of biological stock parameters and management targets. Historically, the Council’s Reef Fish Stock Assessment Panel recommended ABC levels for red snapper. However, with the implementation of the Southeast Data, Assessment, and Review (SEDAR) process, the SEDAR panel now is tasked with reviewing the adequacy and appropriateness of management benchmarks. During review of the red snapper stock assessment, the SEDAR panel indicated it was not possible to specify an ABC for red snapper without guidance from the Council on the level of assumed shrimp bycatch reduction (SEDAR 7 2005).

Total allowable catch (TAC) is a level of catch that is set by managers at or below the maximum ABC. The level of TAC is selected after considering the biological, ecological and socioeconomic implications of catch levels within the ABC range. The level of risk (i.e., failure to attain management targets without a future reduction in TAC being needed) should also be considered. In general, TACs set near the upper end of the ABC range carry a greater risk of not ending overfishing and rebuilding the red snapper stock than TACs set at a lower catch level.

The current 9.12 MP TAC has been in effect since 1996. Amendment 22 to the Reef Fish FMP (GMFMC 2004a) revised the rebuilding plan for red snapper based on the results of the 1999 stock assessment (Schirripa and Legault 1999). The revised rebuilding plan maintained the initial TAC at 9.12 MP and set management targets to end overfishing by 2009 or 2010 and rebuild the stock to B_{msy} by 2032. The Council specified in Amendment 22 (GMFMC 2004a) that the rebuilding plan would be reviewed and revised, as necessary, after periodic stock assessments.

The 2005 stock assessment indicates all TACs under consideration, even the no action 9.12 MP, will allow spawning biomass to increase over the short term. However, TACs greater than 7 MP will not end overfishing in the timeframe specified by the rebuilding plan (Thompson 2005). The following discussion focuses on the effects of various rebuilding plans and TACs that would end overfishing by 2009 or 2010 and rebuild red snapper to B_{msy} (proxy = 26 percent SPR) by 2032, in accordance with the Council's currently approved rebuilding plan (GMFMC 2004a). The level TAC can be set at over the next three years is dependent on numerous factors, including the amount shrimp trawl bycatch mortality, directed fishery bycatch and closed season bycatch can be reduced. In general, the greater the reduction in closed season, directed fishery, and shrimp trawl dead discards, the higher directed TAC can be set.

The maximum ABC for red snapper that would end overfishing within the timeframe set by the Council's rebuilding plan is 7 MP. However, a 7 MP TAC would require all sources of fishing mortality (i.e., directed fishery, closed season bycatch, and shrimp trawl bycatch) be reduced by 74 percent in order to end overfishing (Thompson 2005). Based on management measures considered in this amendment and revised rebuilding plans developed by the SEFSC (Chester 2007; SERO 2007), bycatch is unlikely to be reduced across all sources by 74 percent; especially closed season discards (Chester 2007, SERO 2007, Crabtree 2006). Therefore, if TAC is set at 7 MP and all sources of fishing mortality are not reduced by 74 percent, overfishing would continue beyond 2009 or 2010. This would result in slower than expected rebuilding progress and require implementation of additional measures to end overfishing. Beginning in 2010, the reauthorized Magnuson-Stevens Act will require the Council to immediately end overfishing if it has not already done so.

Rebuilding Plans

The Council considered four alternative rebuilding plans in addition to no action (**Alternative 1**). The red snapper rebuilding plan is being revised in accordance with a March 12, 2007, District Court order, which requires the Secretary of Commerce to establish a new red snapper rebuilding plan within 9 months of the Court ruling. The revised rebuilding plan must ensure that there is at least a 50 percent probability of ending overfishing and rebuilding red snapper to the biomass at MSY. In revising the red snapper rebuilding plan, the Council is not considering changes to the timeframe for ending overfishing or rebuilding the stock. As specified in Amendment 22 to the Reef Fish FMP, overfishing must end between 2009 and 2010 and the stock must be rebuilt to B_{msy} (proxy = 26 percent SPR) by 2032 (GMFMC 2004a).

Table 2.2 summarizes red snapper rebuilding plans for each of the alternatives in **Action 1**. Two types of rebuilding strategies were considered during SEDAR 7 (2005): 1) a 'linked' rebuilding strategy, which requires proportional reductions in fishing mortality across all sources (i.e., directed fishery, closed season bycatch, and shrimp trawl bycatch) and 2) a 'delinked' rebuilding strategy, which allows disproportional reductions in fishing mortality across all sources. Under a 'delinked' rebuilding strategy, decisions are made by fishery managers regarding the extent to which bycatch can be practically reduced by available management tools (e.g., circle hooks, dehooking devices, lower size limits, etc.). Under a 'linked' rebuilding strategy, reductions in fishing mortality, including bycatch, are assumed to be achievable, even if they cannot practically be achieved with available management tools. **Alternatives 1** (9.12 MP TAC) and **2** (7 MP TAC) are based on 'linked' rebuilding strategies, whereas **Preferred Alternatives 3** and **Alternative 4** are based on 'delinked' rebuilding strategies. In addition to the rebuilding plans considered herein, the Council reviewed and considered a myriad of other rebuilding plans, which are summarized in Thompson (2005), Crabtree (2006), and Chester (2007). The success of each of these TACs and rebuilding strategies in ending overfishing and rebuilding red snapper is contingent, in large part, on how much bycatch can be practically reduced.

Figure 2.1 and Table 2.2 compare TACs and estimated discards (numbers) resulting from two 'linked' rebuilding plans (**Alternatives 1** and **2**) and three 'delinked' rebuilding plans (**Alternatives 3** and **4**). It should be noted that two rebuilding plans are summarized for **Alternative 3**. The **Alternative 3** rebuilding plans differ because each specifies different levels of shrimp bycatch reduction throughout the duration of the rebuilding plan (see **Action 6, Alternatives 4** and **6** for further details). One plan holds the target shrimp F reduction constant at 74 percent less than the 2001-03 baseline years (see **Action 6, Alternative 4**), while the other plan allows the shrimp bycatch target to decrease from 74 percent to 67 percent to 60 percent as the stock rebuilds (see **Action 6, Preferred Alternative 6**). In general, the 'linked' strategy results in faster stock recovery than the 'delinked' strategy, but requires much greater reductions in closed season bycatch and shrimp trawl discards over the long-term. Because higher TACs are allowed under a 'linked' rebuilding strategy, more open season directed fishery discards are estimated to occur when compared with the preferred 'delinked' rebuilding plan (**Preferred Alternative 3**). Over the long-term, closed season and shrimp trawl discards must be maintained at levels lower than those assumed under 'delinked' rebuilding strategies in order to rebuild the stock to 26 percent SPR (proxy for B_{msy}). If bycatch can be successfully reduced to levels necessary under the 'linked' rebuilding plans (**Alternatives 1** and **2**), stock recovery ($B/B_{msy} > 1.0$) would be much faster and occur well in advance of the 2032 rebuilding deadline. However, based on rebuilding projections conducted by the SEFSC in January through March 2007 (Chester 2007; SERO 2006) and bycatch management alternatives considered in this amendment (i.e., lower size limits, gear restrictions, etc.), it is impractical to assume bycatch can be reduced to the extent required in **Alternatives 1** and **2** in order to end overfishing and rebuild the stock. Because sufficient bycatch reduction cannot be achieved to satisfy the assumptions of the 'linked' rebuilding strategies, maintaining TAC at 9.12 MP or setting TAC at 7 MP would not end overfishing by 2009 or 2010 (SERO 2007 in reference to Crabtree 2006) as required by the Magnuson-Stevens Act and as specified by approved red snapper rebuilding plan. Even if realistic assumptions are made about reductions in bycatch (i.e., 'delinked' rebuilding strategies), TACs no greater than 5 to 5.5 MP could be implemented from 2008 through 2010 to end overfishing (Table 2.3).

‘Delinked’ rebuilding strategies require lower TACs over the short-term, because the rebuilding plan does not assume closed season bycatch and/or shrimp trawl bycatch are reduced to the extent estimated under a ‘linked’ rebuilding strategy. Rebuilding plans summarized in **Alternatives 3** and **4** make reasonable assumptions about how much bycatch can be practically reduced. In general, the more shrimp trawl bycatch and/or closed season bycatch allowed, the lower TAC must be set. Additionally, the higher TAC is set, the greater the number of open season discards estimated to occur. The rebuilding plans summarized for **Alternative 3** each assume fishing mortality on red snapper resulting from shrimp trawl bycatch will be reduced by 74 percent between 2007 and 2010. **Alternative 4** assumes fishing mortality on red snapper from shrimp trawl bycatch will be reduced by 50 percent during this same time period. **Actions 6 and 7** in this amendment summarize measures proposed to cap shrimp effort and restrict effort if this cap is exceeded. **Alternatives 3** and **4** also assume fishing mortality will be reduced during the closed season by 10 percent owing to implementation of the commercial red snapper IFQ system and the requirement to use circle hooks for the harvest of all reef fish (see Action 5). Directed fishery bycatch is associated with the preferred minimum size limits selected in Actions 1 and 4; i.e., directed fishery bycatch was assumed to correspond to the bycatch resulting from a 13-inch commercial minimum size limit and 16-inch recreational minimum size limit.

In addition to the alternatives described above, several other red snapper rebuilding projections were conducted by the SEFSC in January through March 2007 (Chester 2007; SERO 2007); these projections did not assume fishing mortality could be reduced proportionally across all sources - they are ‘delinked’ rebuilding strategies. Rather, the projections include reasonable assumptions about how much bycatch can be reduced in various fisheries and during the closed season. Because closed season bycatch cannot be sufficiently reduced as required by a ‘linked’ rebuilding strategy, all projections indicate TAC would have to be set much lower than 7 MP in order to end overfishing by 2009 or 2010 (SERO 2007 in reference to Crabtree 2006). Table 2.3 summarizes the results of these projections. Projection runs 1 and 7 in Table 2.3 correspond to rebuilding plans summarized for **Alternative 3** and **Alternative 4**, respectively. All other projection runs summarized in Table 2.3 represent additional information the Council was presented with when selecting the range of alternatives to revise the red snapper rebuilding plan.

All rebuilding projections summarized in Table 2.3 include updated directed fishery landings and shrimp effort through 2005, end overfishing by 2009 or 2010, depending on the level TAC is set at over the next two to three years (2008-2009 or 2008-2010), and rebuild the red snapper stock to the Council’s rebuilding goal (26 percent SPR, which is a proxy for B_{msy}) by 2032.

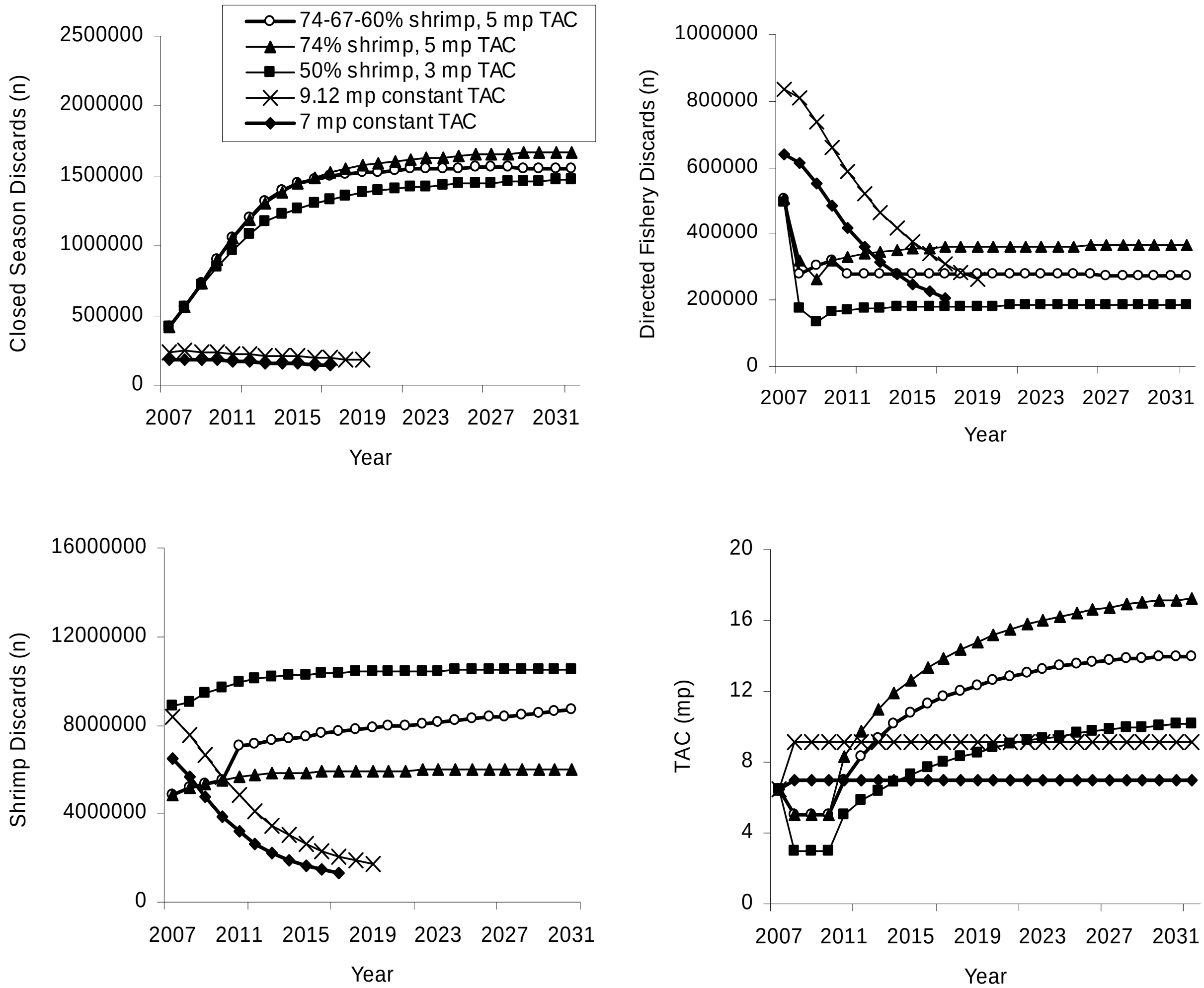


Figure 2.1. Estimated red snapper TAC (mp), directed fishery discards (numbers), closed season discards (numbers), and shrimp trawl discards (numbers) for five rebuilding strategies: 1) 'delinked' 74-67-60 percent shrimp, 5 MP TAC (Council preferred), 2) 'delinked' 74 percent shrimp, 5 MP TAC (same as projection run #1 in Table 2.3, 3) 'delinked' 50 percent shrimp, 3 MP TAC (same as projection run #7 in Table 2.3), 4) 'linked' 7 MP constant TAC, and 5) 'linked' 9.12 MP constant TAC.

The following inputs and assumptions were used for the projections summarized in Table 2.3:

1. Directed fishery landings in 2006 were set equal to directed fishery landings in 2005;
2. Shrimp fishing mortality in 2006 was set at 60 percent less than the 2001-2003 baseline shrimp fishing mortality rate;
3. After 2006, the shrimp fishing mortality rate was set at 50, 62, or 74 percent of the 2001-03 baseline shrimp fishing mortality;
4. TAC for the directed fishery was set at 6.5 million pounds (mp) in 2007;
5. Commercial directed fishery discards correspond to those estimated under a 13-inch minimum size limit;

6. Recreational directed fishery discards correspond to those estimated under either a 14-inch or 16-inch minimum size limit;
7. The fishing mortality rate associated with closed season discards was set 10 percent less than the 2001-2003 baseline fishing mortality rate owing to implementation of the IFQ program;
8. The release mortality rate for recreational discards during both the open and closed season was reduced by 0, 5, or 10 percent owing to circle hooks, venting tools, and dehooking devices; and,
9. TAC in 2008-2009 or 2008-2010 corresponds to the level of catch necessary to end overfishing and was contingent on the level at which shrimp effort was capped (see #3 above). After 2009 or 2010, TAC was increased at a constant rate associated with Fmsy (proxy = $F_{26\%SPR}$) to rebuild the stock to 26 percent SPR by 2032.

In Action 5, the Council approved requirements for circle hooks, venting tools, and dehooking devices in the reef fish fishery. These gears may result in small reductions in recreational release mortality rates, which would allow higher TACs (100,000 to 150,000 greater) regardless of the minimum size limit selected. The Council's preferred rebuilding plan (**Action 1, Preferred Alternative 3** – 74-67-60 percent shrimp F reduction) does not take into account reductions in release mortality resulting from circle hooks and other release gears, therefore increasing the probability that overfishing will end by 2009 or 2010.

Reducing the recreational minimum size limit from 16 to 14 inches total length would allow TAC to increase by 100,000 to 160,000 pounds over the short-term (next 2-3 years). Over the long-term (through 2032), lower size limits would result in slightly lower TACs than higher size limits.

Maximum sustainable yields range from 10.2 to 17.8 MP for the projection runs summarized in Table 2.3, and are largely contingent on the amount shrimp fishing mortality is reduced (i.e., greater reductions in shrimp fishing mortality result in greater MSY). Similarly, the more closed season bycatch can be reduced, the greater MSY.

Table 2.2 Yield and spawning potential streams for proposed red snapper rebuilding plans.

	Alternative 1		Alternative 2		Alternative 3 (74% shrimp F reduction)		Preferred Alternative 3 (74-67-60% shrimp F reduction)		Alternative 4 (50 percent shrimp F reduction)	
Year	Yield (MP)	S/So	Yield (MP)	S/So	Yield (MP)	S/So	Yield (MP)	S/So	Yield (MP)	S/So
2008	9.12	3.2%	7.0	3.4%	5.0	3.0%	5.0	3.0%	3.0	3.1%
2009	9.12	3.9%	7.0	4.4%	5.0	4.1%	5.0	4.1%	3.0	4.1%
2010	9.12	4.8%	7.0	5.7%	5.0	5.4%	5.0	5.4%	3.0	5.5%
2011	9.12	6.1%	7.0	7.5%	8.3	6.9%	7.0	6.9%	5.1	7.0%
2012	9.12	7.6%	7.0	9.7%	9.7	8.5%	8.3	8.6%	5.8	8.6%
2013	9.12	9.5%	7.0	12.3%	10.9	10.1%	9.4	10.4%	6.4	10.2%
2014	9.12	11.8%	7.0	15.4%	11.9	11.7%	10.2	12.1%	6.9	11.7%
2015	9.12	14.4%	7.0	18.8%	12.7	13.2%	10.8	13.7%	7.3	13.2%
2016	9.12	17.3%	7.0	22.5%	13.3	14.7%	11.3	15.2%	7.6	14.7%
2017	9.12	20.5%	7.0	26.5%	13.9	16.1%	11.7	16.6%	8.0	16.0%
2018	9.12	23.9%			14.4	17.4%	12.0	17.9%	8.3	17.2%
2019	9.12	27.5%			14.8	18.5%	12.3	19.1%	8.6	18.4%
2020					15.2	19.6%	12.6	20.1%	8.8	19.4%
2021					15.5	20.5%	12.9	21.0%	9.0	20.3%
2022					15.8	21.4%	13.1	21.9%	9.2	21.2%
2023					16.0	22.1%	13.3	22.6%	9.3	21.9%
2024					16.3	22.8%	13.4	23.2%	9.5	22.6%
2025					16.4	23.4%	13.5	23.8%	9.6	23.2%
2026					16.6	23.9%	13.6	24.2%	9.7	23.7%
2027					16.8	24.4%	13.7	24.6%	9.8	24.2%
2028					16.9	24.8%	13.8	25.0%	9.9	24.6%
2029					17.0	25.1%	13.9	25.3%	10.0	25.0%
2030					17.1	25.4%	13.9	25.5%	10.0	25.3%
2031					17.2	25.7%	13.9	25.7%	10.1	25.6%
2032					17.2	25.9%	14.0	25.9%	10.2	25.8%

Table 2.3. Summary of total allowable red snapper catches ending overfishing by 2009 or 2010 and the estimated maximum sustainable yield for various red snapper rebuilding scenarios. Projection runs 8-18 (highlighted in gray) were interpolated from projection runs 1-7.

	Assumptions				TACs (mp) ending overfishing		
Projection Run	Minimum Size Limits	Reduction in Closed Season F	Circle Hook Release Mortality Reduction	Shrimp F reduction	2008-09	2008-10	Yield at 26% SPR
1	13, 16	-10%	0%	74%	4.57	5.30	17.2
2	13, 16	-10%	-5%	74%	4.66	5.40	17.6
3	13, 16	-10%	-10%	74%	4.72	5.47	17.8
4	13, 14	-10%	0%	74%	4.73	5.45	17.2
5	13, 14	-10%	-5%	74%	4.83	5.56	17.5
6	13, 14	-10%	-10%	74%	4.88	5.63	17.7
7	13, 16	-10%	0%	50%	2.80	3.27	10.2
8*	13, 16	-10%	-5%	50%	2.86	3.31	10.3
9*	13, 16	-10%	-10%	50%	2.89	3.35	10.5
10*	13, 14	-10%	0%	50%	2.90	3.36	10.1
11*	13, 14	-10%	-5%	50%	2.96	3.43	10.3
12*	13, 14	-10%	-10%	50%	2.99	3.47	10.4
13*	13, 16	-10%	0%	62%	3.69	4.29	13.7
14*	13, 16	-10%	-5%	62%	3.76	4.35	13.9
15*	13, 16	-10%	-10%	62%	3.81	4.41	14.1
16*	13, 14	-10%	0%	62%	3.81	4.41	13.6
17*	13, 14	-10%	-5%	62%	3.89	4.50	13.9
18*	13, 14	-10%	-10%	62%	3.93	4.55	14.1

Discussion: As described in the purpose and need for this amendment, reductions in red snapper directed fishing mortality and bycatch mortality are needed for the stock to rebuild. **Action 1** examines changes to the TAC, commercial quota, recreational quota, and various recreational management measures. Section 5.1 examines the effects of the various **Action 1** alternatives relative to each other within the physical, biological/ecological, socioeconomic, and administrative environments. Important factors to this discussion include:

- The Council's red snapper rebuilding plan specifies overfishing will end by 2009 or 2010 and red snapper will be rebuilt to B_{MSY} (26 percent SPR) by 2032 (GMFMC 2004a). No revisions to these timeframes are proposed in this amendment.
- Recovery of red snapper in the western Gulf is more contingent on reductions in shrimp trawl bycatch (and to a lesser extent commercial fishing mortality), whereas recovery of red snapper in the eastern Gulf is more contingent on reductions in recreational fishing mortality and bycatch.
- A 74 percent reduction in total red snapper fishing mortality (both the directed and shrimp trawl fisheries) from baseline levels (2001-03) is required to end overfishing of red snapper.
- The maximum ABC that would end overfishing of red snapper by 2009 or 2010 is 7 MP. In order to end overfishing under a 7 MP TAC, fishing mortality across all sources, including closed season bycatch, must be reduced by 74 percent.
- Preferred bycatch reduction management alternatives discussed in this amendment are not expected to reduce closed season bycatch to the extent necessary to end overfishing under a 7 MP TAC.
- Red snapper rebuilding plans summarized in Tables 2.2 (Alternative 3 and 4) and 2.3, which incorporate reasonable assumptions about bycatch reduction based on available management tools, indicate TACs ranging from 5 to 5.5 MP are necessary to end overfishing by 2009 or 2010.
- The more bycatch is reduced, the higher TAC can be set.
- Smaller recreational minimum size limits reduce the number of red snapper discarded dead, but increase landings and catch rates. To compensate for increases in recreational landings resulting from lower minimum size limits, more restrictive bag limits and closed seasons must be imposed to constrain landings within specified recreational quota levels.
- Reducing the recreational minimum size limit from 16 to 15, 14, or 13 inches slows stock recovery over the long-term, although changes in spawning potential and the rate of stock recovery are very small for recreational size limits ranging from 13 to 15 inches TL (Figure 4.2.1). The more the recreational size limit is reduced the slower the stock recovers in the long-term. Eliminating the minimum size limit would greatly slow stock recovery (see Figure 4.2.1).
- In the short-term (next 5-10 years), lower recreational minimum size limits would allow slightly higher TACs, although differences in recovery relative to no action are negligible. These results are consistent with Porch (2005), who indicated stock recovery would be slightly faster for 13-15 inch minimum size limits over the short-term, but slightly slower over the long-term (through 2032). Lowering the minimum size limit is expected to result in a slightly lower TAC over the long-term than if a higher minimum size limit is maintained.
- Adverse economic impacts increase as TACs are reduced. Higher bag limits and longer open seasons, result in less adverse economic impacts than shorter open seasons and lower bag

limits. Anglers generally prefer reducing the red snapper bag limit to reducing the length of the fishing season, unless the bag limit becomes too restrictive.

- Impacts to the administrative environment increase with higher TACs and/or greater assumptions about the success of bycatch reduction measures. TACs greater than those summarized in Table 2.3 are unlikely to end overfishing and therefore additional management actions may be needed in the future to end overfishing. Fishing seasons that include weekend openings and weekday closings are complicated and likely to reduce regulatory compliance. Implementing different regulations in the eastern versus western Gulf would require a line of demarcation, which causes some enforcement problems and angler confusion near the line.
- Impacts to the physical environment are expected to be small since most fishing occurs on artificial structures and the primary gear used is hook-and-line.

Comparison of Physical, Biological, and Ecological Consequences

The 2005 red snapper stock assessment (SEDAR 7 2005) continues to indicate red snapper are undergoing overfishing and overfished. Red snapper fishing mortality rates are too high in both the directed and shrimp fisheries (SEDAR 7 2005). In comparison to previous assessments, the directed fishery now contributes to a greater portion of fishing mortality than previously thought because of higher juvenile natural mortality rates (age 0 and age 1) and higher directed fishery release mortality rates of regulatory discards. Shrimp trawl bycatch of red snapper still remains a significant source of mortality in the western Gulf and actions are being considered in this amendment to further reduce shrimp trawl bycatch of red snapper (see **Actions 6** and **7**).

Action 1 considers four rebuilding plans for red snapper. Constant TACs are being considered for at least the next three years (2008-2010) and are intended to end overfishing in the directed fishery. NMFS implemented a temporary rule for the 2007-fishing season that establishes a 6.5 MP TAC. All TACs under consideration, even the no action 9.12 MP, will allow spawning biomass to increase. However TACs greater than 7.0 MP will not end overfishing by 2009 or 2010, and TACs greater than 5 to 5.5 MP are not expected to end overfishing between 2009 and 2010 because adequate reductions in bycatch would not be achieved.

Alternative 1 (no action) would maintain the current rebuilding plan and hold TAC constant at 9.12 MP until 2032 (Table 2.2). This TAC would result in no changes to the commercial quota or recreational management regulations over the short- or long-term. The rebuilding plan associated with a constant 9.12 MP TAC assumes shrimp trawl, directed fishery, and closed season discards would decline throughout the timeframe of the rebuilding plan. However, based on rebuilding projections conducted by the SEFSC in January through March 2007 (Chester 2007; SERO 2007) and management alternatives under consideration in this amendment, bycatch is projected to actually increase as the stock rebuilds. Although a 9.12 MP TAC would result in some stock recovery, it would not reduce recreational dead discards and would continue to allow overfishing after 2009 or 2010. Over the long-term, maintaining TAC at 9.12 MP would result in faster than expected stock recovery when compared to the Council's rebuilding benchmark ($F_{MSY} = F_{26\%SPR}$); however, stock recovery would only be faster if reductions in bycatch summarized in Figure 2.1 are achieved. Based on management measures considered in this amendment and revised rebuilding plans developed by the SEFSC (Table 2.3), bycatch is unlikely to be reduced across all sources to the levels summarized in Figure 2.1. Of the four alternatives considered in **Action 1**, **Alternative 1** would reduce fishing mortality the least, has the lowest probability of ending overfishing over the next three years, and would result in no additional recreational management measures to reduce the number of red snapper discarded dead. Preliminary information from the SEFSC indicates the rebuilding plan under **Alternative 1** has less than a 50 percent chance of ending overfishing by 2010 unless shrimp and closed season discard rates are reduced by substantially more than 74 percent. **Alternative 1** has a greater than 50 percent chance of allowing rebuilding by 2032 if shrimp and closed season discard rates are both reduced by 74 percent or more relative to 2001-2003 levels. Because fishing mortality across all sources, including closed season bycatch, will not likely be reduced by this amount the probability of ending overfishing will be less than 50 percent.

Alternative 2 would revise the red snapper rebuilding plan and reduce the TAC to 7 MP and hold it constant until 2032 (Table 2.2). Relative to **Preferred Alternative 3**, TAC would not increase over time as the stock rebuilds. By 2012, TAC for the preferred rebuilding plan (**Preferred Alternative 3**, Table 2.2) would exceed the constant 7 MP TAC for **Alternative 2** and would remain well above the 7 MP TAC throughout the remainder of the rebuilding plan. This TAC is the maximum ABC that could be taken from the red snapper stock to end overfishing within the timeframe specified by the Council's rebuilding plan. The commercial quota would be 3.57 MP and the recreational quota would be 3.43 MP. **Alternative 2** would only end overfishing of red snapper in 2009 or 2010 if all sources of mortality can be reduced proportionally by 74 percent. Based on projections conducted by the SEFSC in January through March 2007 (Chester 2007; SERO 2007), bycatch is unlikely to be reduced to levels necessary to end overfishing under a 7 MP TAC (Chester 2007; SERO 2007 in reference to Crabtree 2006); therefore, lower TACs are needed. Over the long-term, **Alternative 2** would result in faster than expected stock recovery when compared to the Council's rebuilding benchmark (F_{MSY} = $F_{26\%SPR}$); however, stock recovery would only be faster if reductions in bycatch summarized in Figure 2.1 are achieved. Rebuilding over the next three years would be expected to occur at a slower rate when compared to the Council's rebuilding benchmark (F_{MSY} = $F_{26\%SPR}$). **Alternative 2** would reduce fishing mortality more in 2008 than **Alternative 1**, but less than **Preferred Alternative 3 or Alternative 4.** Over the long-term, **Alternative 2** has a greater probability of ending overfishing than **Alternative 1**, but a lower probability than **Preferred Alternative 3** and **Alternative 4**. Preliminary information from the SEFSC indicates the rebuilding plan under **Alternative 2** has a slightly greater than 50 percent chance of ending overfishing by 2010 if shrimp and closed season discard rates are reduced by 74 percent or more. **Alternative 2** has a greater than 50 percent chance of rebuilding the red snapper stock by 2032 if shrimp and closed season discard rates are both reduced by 74 percent or more relative to 2001-2003 levels. Because fishing mortality across all sources, including closed season bycatch, will not likely be reduced by this amount the probability of ending overfishing will be less than 50 percent.

Alternative 2 includes 11 options and/or suboptions. Options and sub-options for **Alternative 2** include various bag limit, size limit, and open season combinations. Sub-options under **Option 2(a)** would maintain the four fish bag limit and 16-inch size limit, but would reduce the length of the open season to 125-139 days. **Suboptions 2(a)(ii) – 2(a)(iv)** would establish 8 weekend openings either Gulf-wide, in the western Gulf, or off Texas, following a core fishing season.

Sub-options under **Option 2(b)** would reduce the bag limit to three fish, maintain the 16-inch minimum size limit or reduce it to 15-inches, and reduce the length of the open season to 137-154 days. Suboptions under **Option 2(c)** would reduce the bag limit to two fish, reduce the minimum size limit to either 13 or 15-inches TL, and reduce the length of the open season to 124-154 days. **Suboptions 2(c)(iii) – 2(c)(v)** would establish 12 consecutive weekend openings either Gulf-wide, in the western Gulf, or off Texas, following a core fishing season. All management measures included in **Options 2(a), 2(b), and 2(c)** are estimated to achieve at least a 23 percent reduction in harvest.

Preferred Alternative 3 would revise the red snapper rebuilding plan and reduce the TAC to 5 MP from 2008 through 2010 (Table 2.2). After 2010, TAC would be increased consistent with a fishing mortality rate that produces MSY. The rate TAC increases is contingent on the amount of shrimp bycatch mortality allowed. If the shrimp bycatch mortality target is held constant at 74 percent less than the baseline fishing mortality rate during 2001-03, then TAC would increase at a faster rate and MSY would be 17.2 MP when the stock is fully rebuilt. Under the Council's preferred rebuilding plan, shrimp bycatch fishing mortality would be set at 74 percent less than the 2001-03 baseline fishing mortality rate in 2008 through 2010, 67 percent in 2011, and decline constantly from 67 to 60 percent between 2011 and 2032 (see **Action 6, Preferred Alternative 6**). The Council's preferred rebuilding plan would allow TAC to increase throughout the rebuilding plan and MSY would be 14.0 MP when the stock is fully rebuilt. Under either rebuilding plan, the commercial quota would be 2.55 MP and the recreational quota would be 2.45 MP during 2008 through 2010. **Preferred Alternative 3** would end overfishing between 2009 and 2010, consistent with the Council's rebuilding plan (Chester 2007). **Preferred Alternative 3** would permit the Gulf-wide red snapper stock to attain the expected $F_{26\%SPR}$ biomass trajectory by 2009 or 2010. **Preferred Alternative 3** would require shrimp trawl fishing mortality be reduced by 74 percent during 2008 through 2010 and closed season red snapper fishing mortality be reduced by a minimum of 10 percent. Directed fishery bycatch is associated with the preferred minimum size limits selected in Actions 1 and 4 (i.e., directed fishery bycatch was assumed to correspond to the bycatch resulting from a 13-inch commercial minimum size limit and 16-inch recreational minimum size limit). Over both the short- and long-term, **Preferred Alternative 3** has a higher probability of ending overfishing than **Alternatives 1** and **2**. The probability of **Preferred Alternative 3** ending overfishing would be similar to the probability of **Alternative 4** ending overfishing if the Council had selected a 50 percent shrimp bycatch mortality target (see Action 6) in conjunction with **Alternative 4**; however, **Alternative 4** (3 MP TAC) has a greater probability of ending overfishing than **Preferred Alternative 3** if the Council selects a shrimp trawl fishing mortality reduction greater than 50 percent. Preliminary information from the SEFSC indicates the preferred rebuilding plan has at least a 50 percent probability of end overfishing and rebuilding the stock to B_{msy}. Because TAC is 0.3 MP lower than the maximum TAC allowed over the next three years (Table 2.3, projection run #1) and the rebuilding plan does not take into account reductions in release mortality resulting from circle hooks and other release gears (see Action 5), the probability of ending overfishing is estimated to be higher than 50 percent. Additionally, adjusting the rebuilding plan after subsequent stock assessments will increase the probability of successfully rebuilding red snapper.

Preferred Alternative 3 includes 15 options and/or suboptions. Options and sub-options for **Preferred Alternative 3** include various bag limit, size limit, and open season combinations. All options for **Preferred Alternative 3** would reduce the bag limit to either one or two fish. **Preferred Option 3(a)(i)** would maintain the 16-inch size limit and reduce the length of the open season to 107 days. **Option 3(a)(ii)** would maintain the 16-inch size limit and start the fishing season on May 1, which would allow for a 92-day fishing season. **Option 3(b)** would maintain the 16-inch size limit and reduce the length of the open season to 57-92 days. **Suboption 3(b)(i)** would establish a May 15 - August 15 fishing season Gulfwide. **Suboptions 3(b)(ii-iv)** would allow harvest only on weekends before and after a core July fishing season. This would result in the shortest fishing season because a majority of red snapper are landed by recreational anglers on weekends (SERO 2006d). Six consecutive weekend openings prior to July 1 and 7 consecutive weekend openings after July 31 would extend the fishing season from mid-May to late September. **Option 3(c)** would reduce the minimum size limit to 15-inches TL and establish an 88-day fishing season. **Option 3(d)** would reduce the minimum size limit to 14-inches TL and **Suboptions 3(d)(i-iii)** would reduce the length of the open season to 71-77 days. **Option 3(e)** would reduce the minimum size limit to 13 inches TL and establish a 61-day fishing season. **Option 3(f)** would reduce the bag limit to one and the minimum size limit to 14-inches TL, and **Suboptions 3(f)(i-ii)** would reduce the length of the fishing season to 102-122 days. **Option 3(f)** would reduce the bag limit to one and maintain the 16-inch TL minimum size limit. **Suboptions 3(f)(i-ii)** would reduce the length of the fishing season to 138-154 days. All management measures included in **Options 3(a-g)** are estimated to achieve at least a 45 percent reduction in harvest and therefore would benefit red snapper stock recovery.

Alternative 4 would revise the red snapper rebuilding plan and reduce the TAC to 3 MP during 2008 through 2010 (Table 2.2). After 2010, TAC would be increased consistent with a fishing mortality rate that produces MSY, assuming a 50 percent reduction in shrimp trawl bycatch mortality. The commercial quota would be 1.53 MP and the recreational quota would be 1.47 MP during 2008 through 2010. **Alternative 4** would end overfishing between 2009 and 2010, consistent with the Council's rebuilding plan (Chester 2007). **Alternative 4** would permit the Gulf-wide red snapper stock to attain the expected $F_{26\%SPR}$ biomass trajectory by 2009 or 2010. **Alternative 4** would require shrimp trawl fishing mortality be reduced by a minimum of 50 percent and closed season red snapper fishing mortality be reduced by a minimum of 10 percent. Directed fishery bycatch is associated with the preferred minimum size limits selected in Actions 1 and 4 (i.e., directed fishery bycatch was assumed to correspond to the bycatch resulting from a 13-inch commercial minimum size limit and 16-inch recreational minimum size limit). Over both the short- and long-term, **Alternative 4** has the highest probability of ending overfishing of any of the alternatives if the Council selects a 74 percent shrimp trawl fishing mortality goal. Relative to **Preferred Alternative 3**, **Alternative 4** would have a similar probability of ending overfishing if the Council selects a 50 percent shrimp trawl fishing mortality reduction goal. Preliminary information from the SEFSC indicates the proposed rebuilding plan has at least a 50 percent probability of end overfishing and rebuilding the stock to B_{msy}. Because TAC is 0.27 MP lower than the maximum TAC allowed over the next three years (Table 2.3, projection run #7) and the rebuilding plan does not take into account reductions in release mortality resulting from circle hooks and other release gears (see Action 5), the probability of ending overfishing is estimated to be higher than 50 percent. Additionally, adjusting the rebuilding plan after subsequent stock assessments will increase the probability of successfully rebuilding red snapper.

Alternative 4 includes 7 options and/or suboptions. Options and sub-options for **Alternative 4** include various bag limit, size limit, and open season combinations. All options for **Alternative 4** would reduce the bag limit to two fish. **Option 4(a)** would maintain the 16-inch size limit and reduce the length of the open season to 39-46 days. **Suboption 3(b)(i)** would establish an August 1 – September 15 fishing season Gulfwide. **Suboptions 4(a)(ii-iv)** would allow harvest only on weekends before and after a core August fishing season. This would result in the shortest fishing season because recreational anglers land a majority of red snapper on weekends (SERO 2006d). Two consecutive weekend openings prior to August 1 and 2 consecutive weekend openings after August 31 would extend the fishing season from mid-July to mid-September. **Option 4(b)** would reduce the minimum size limit to 15-inches TL and establish a 39-day fishing season. **Option 4(c)** would reduce the minimum size limit to 14-inches TL and establish a 35-day fishing season. **Option 4(d)** would reduce the minimum size limit to 13 inches TL and establish a 31-day fishing season. All management measures included in **Options 4(a-d)** are estimated to achieve at least a 67 percent reduction in harvest and therefore would benefit red snapper stock recovery.

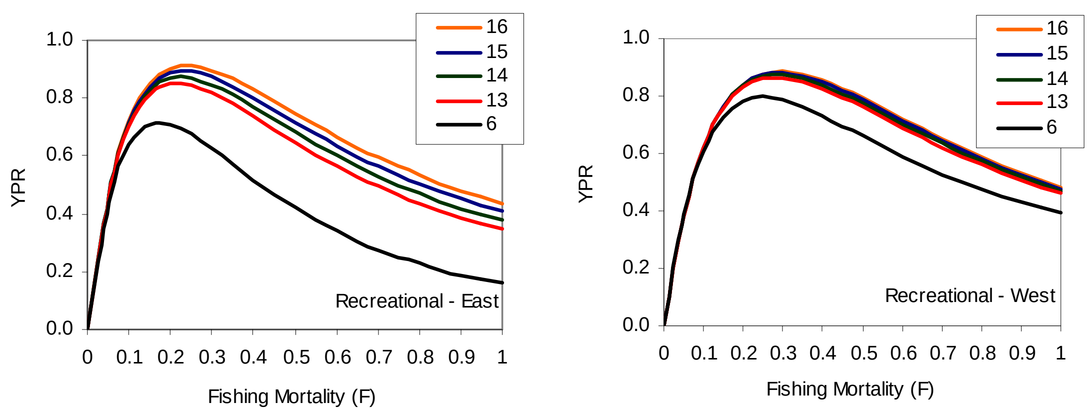
In general, sub-options with lower size limits will reduce dead discards the most, but will lower yield-per-recruit and result in slightly slower stock recovery over the long-term. The current 16-inch minimum size limit represents the greatest source of regulatory discards by the recreational fishery. To compensate for the increase in landings and fishing mortality associated with lower size limits, additional management measures are necessary to maintain landings within the specified recreational quota. These additional management measures will partly diminish the benefits of lowering the size limit, because they increase dead discards and shorten the open season when size limits would be effective. Lower bag limits and higher size limits allow for longer fishing seasons. Establishing weekend openings after a core season reduces the number of allowable days for fishing because effort is higher and more red snapper are landed on weekends.

Porch (2005) evaluated various minimum size limits for red snapper and found the 16-inch recreational minimum size limit resulted in the fastest recovery for the stock over the long-term, although size limits as low as 13-inches TL were found to only slightly slow stock recovery over the long-term (see Figure 4.2.1). Over the short-term, lowering the minimum size limit may slightly speed up stock recovery, allowing for higher TACs at lower minimum sizes. Based on recreational minimum size limits ranging from 6 to 16 inches TL, YPR analyses indicate 16 inches maximizes YPR assuming current fishing selectivities and discard mortality rates (Figure 2.2). In the western Gulf, where recreational release mortality rates are higher (40 vs. 15 percent), there was little difference in YPR for various minimum size limits (SERO 2006b).

As discussed above, the probability of **Alternatives 1** through **4** ending overfishing and rebuilding the red snapper stock is contingent on whether or not fishing mortality (including bycatch mortality) can be adequately reduced. Numerous alternatives to reduce bycatch are considered in this amendment, or were considered, but eliminated from further consideration (see Appendix A). None of the proposed bycatch reduction measures summarized in Actions 1, 4, and 5 are expected to reduce bycatch to levels necessary under a 'linked' rebuilding strategy. Because closed season and directed dead discards cannot be sufficiently reduced to target bycatch reduction levels, **Alternatives 1** (9.12 MP TAC) and **Alternative 2** (7 MP TAC) would not end overfishing. TACs proposed in **Preferred Alternative 3** and **Alternative 4** assume bycatch in the directed fishery and during the closed season would only be partially reduced due

to the implementation of the commercial IFQ program, gear requirements, and a lower commercial minimum size limit. Both **Preferred Alternative 3** (5 MP TAC) and **Alternative 4** (3 MP TAC) would end overfishing, as long as the assumptions above are met and shrimp trawl fishing mortality is reduced by 74 percent. A lesser reduction in shrimp fishing mortality (50 percent) in combination with **Alternative 4** would also end overfishing.

Figure 2.2. Yield-per-recruit for various recreational minimum size limits by region. YPR is based on selectivities from the 2005 stock assessment and assumed released mortality rates of 15 and 40 percent for the eastern and western Gulf, respectively.



Alternatives 2-4 are all expected to have some negative impacts on other reef fish species due to effort shifting. Impacts on other species would be greatest for alternatives with lower TACs and shorter red snapper fishing seasons. Species likely to be impacted the most include: vermilion snapper, gray triggerfish, and gag, which all co-occur with red snapper. Currently, vermilion snapper is not overfished and is not undergoing overfishing and both gag and gray triggerfish are experiencing overfishing.

Alternatives 1-4 are not expected to significantly effect the physical environment since most fishing for red snapper occurs over artificial structures and the primary gear used is hook-and-line. Impacts to the physical environment are largely associated with reductions in fishing effort. The lower TAC is set and the more restrictive management measures are set, the more effort will likely be reduced, thereby benefiting the physical environment through less gear-habitat interactions. **Alternative 1** is expected to have the greatest impacts on the physical environment, albeit very small, followed by **Alternatives 2, 3,** and **4**, respectively.

Action 2. Post-hurricane reduction in directed recreational fishery effort/landings assumed for Action 1 TAC alternatives.

Alternative 1. Do not take into consideration any potential post-hurricane reductions in directed recreational fishery effort and landings when evaluating alternative TACs and management measures in Action 1.

Alternative 2. Assume a 25-percent reduction in post-hurricane recreational fishing effort and landings when evaluating alternative TACs and management measures in Action 1.

Preferred Alternative 3. Assume a 10-percent reduction in post-hurricane recreational fishing effort and landings when evaluating alternative TACs and management measures in Action 1.

Discussion: The 2005 hurricane season was the busiest and costliest on record. There were 28 named storms, including 15 hurricanes, four of which reached category 5 strength. Along the Gulf coast from the Florida Panhandle to Texas, where red snapper primarily are caught, five named storms (Tropical Storm Arlene and Hurricanes Cindy, Dennis, Katrina, and Rita) made landfall. Hurricanes Katrina (landfall August 29, 2005) and Rita (landfall September 24, 2005) were the most devastating of these storms, impacting an area stretching from eastern Texas to western Alabama and resulting in significant physical and economic damage to coastal communities. These storms came on the heal of hurricanes in 2004, especially Hurricane Ivan which caused extensive damage in the Orange Beach, Alabama – Pensacola, Florida area. Direct losses to the fishing industry and businesses supporting fishing activities included: loss of vessels, loss of revenue due to cancelled fishing trips, and destruction of marinas and other fishery infrastructure (Walker et al. 2006).

Because of the social, economic, and physical impacts resulting from these hurricanes, the Council approved a motion at their June 2006 meeting to consider a 25-percent reduction in fishing effort and landings (**Alternative 2**) when analyzing recreational management measures in Action 1. At the March 2007 Council meeting, the Council also approved a motion to consider a 10-percent reduction in fishing effort and landings (**Preferred Alternative 3**) when analyzing recreational management measures in Action 1. Similar reductions in effort are not assumed for the commercial fishery since an IFQ program was implemented in 2007 and the only change to management measures being considered in Action 1 is a lower quota. The Council is considering a smaller minimum commercial size limit in Action 4. Although this alternative will likely increase the rate of harvest, allowing the quota to be met faster, IFQ shareholders would be restricted to harvesting only their share of the commercial quota specified in Action 1. The IFQ will also allow commercial fishermen impacted by last year's storms the opportunity to sell or lease their shares to other fishermen who may have a greater likelihood of using the shares.

Final MRFSS effort estimates for 2006 indicate charter trips in federal waters of the exclusive economic zone (EEZ) were up 7 percent relative to the 2001-03 average effort level and up 2 percent relative to 2002-2005 average effort level. In contrast, private trips in the EEZ during 2006 were down 13 percent relative to the 2001-03 average effort level and 15 percent relative to the 2002-05 average effort level. For all areas fished (state and federal waters), charter trips in 2006 were up by 11 percent relative to the 2001-03 average effort level and 9 percent relative to the 2002-05 average effort level, whereas private trips were up 8 percent relative to 2001-03 average effort level and 5 percent relative to 2002-05 average effort level.

The 2006 MRFSS red snapper landings in numbers of fish were 1 percent less than average MRFSS red snapper landings during 2001-03 and 3 percent less than average MRFSS red snapper landings during 2002-2005. In terms of pounds landed, the weight of MRFSS red snapper landings was 19 to 18 percent less than 2001-03 and 2002-05 average landings levels. On average, the weight of each red snapper landed in 2006 was less than the average weight of each red snapper landed during the prior four to five years (3.3 versus 4.0 pounds).

Although effort in 2006 was not significantly different from average effort in 2001-2003 or 2002-2005, it is uncertain whether or not this level of participation will continue in the future. In addition to impacts from hurricanes, the directed red snapper fisheries (along with the shrimp fishery) are being affected by increase fuel costs and loss of infrastructure. These factors along with the proposed reductions in the recreational fishing season and bag limits could result in a reduction in fishing effort in the future.

Alternative 1 would maintain the status quo baseline for fishing effort (2001-03). No reductions in fishing effort would be assumed and the Council would need to select one of the management alternatives summarized in Action 1 for reducing red snapper harvest. This alternative would have the same impacts on the physical environment as those described in Action 1. Reductions in fishing effort will result in less gear (hook-and-line, anchors, spears) interactions with habitat, resulting in minor benefits to the physical environment. **Alternative 1** would be the most precautionary management approach for selecting management measures in Action 1. Assuming no change in fishing effort occurs, impacts to the biological environment would be the same as those described for various management alternatives in Action 1. However, if reductions in fishing effort occur, but are not accounted for when analyzing management measures in Action 1, there would be an increased likelihood necessary reductions in fishing mortality would be achieved. Not accounting for reductions in fishing effort that may occur would also potentially allow for faster than expected rebuilding progress, thereby ending overfishing sooner than expected. **Alternative 1** would have no effect on the administrative environment. Management alternatives summarized in Action 1 are expected to reduce recreational landings to levels that approximate the annual quota, potentially requiring no in-season management changes and allowing the recreational fishery to operate under a fixed season length.

Alternative 1, which would use baseline effort levels in the evaluation of management measures considered under Action 1, does not affect previously estimated changes in net fishing effort and in economic values. Conclusions derived from the previous comparative evaluation of economic impacts associated with the different management scenarios considered in Action 1 still apply.

Alternative 2 and **Preferred Alternative 3** would assume a 25-percent and 10-percent reduction in fishing effort and landings, respectively, when analyzing management measures in Action 1 for reducing red snapper fishing mortality. The NMFS, in developing interim regulations for 2007, assumed a 10 percent reduction in landings would occur from hurricane impacts. As described above, landings and fishing effort information indicate some declines occurred after Hurricane Katrina. However, the magnitude of reductions varies by fishing sector and it is unknown how long post-hurricane reductions in landings and fishing effort may continue into the future. Table 2.4 summarizes the length of the recreational fishing season if the Council assumes either a 10 or 25-percent reduction in landings/fishing effort and prohibits captain and crew from retaining bag limits of red snapper (see Action 3).

If a 10 percent or 25-percent reduction in effort/landings does occur, then benefits to the physical environment would occur regardless of any changes to management measures. Benefits to the physical environment would largely be due to lower fishing effort and less gear interactions with habitat. However, because most red snapper are harvested with hook-and-line gear and the recreational red snapper fishery accounts for only a small fraction of the overall reef fish fishery harvest, any benefits are expected to be small. If a 10 percent or 25-percent reduction in fishing effort/landings occurs in the short-term (next few years), benefits to the biological environment would include decreases in landings and discards. If these decreases in landings and discards allow target reductions in fishing mortality to be achieved, then rebuilding progress would continue to be made, allowing overfishing to end consistent with the timeframe specified in the rebuilding plan. If however, the reduction in effort/landings is less than 10 percent or 25-percent, or diminishes overtime, then negative impacts to the biological environment would occur. Negative direct impacts would include landings and discards exceeding levels needed to rebuild the red snapper fishery, which would result in quota overages. **Alternative 2** and **Preferred Alternative 3** are not expected to greatly affect the administrative environment if in fact specified percent reductions in fishing effort occur. However, if reductions in effort and landings are less than 10 or 25-percent or diminish over time, then the Regional Administrator would be required to close the recreational fishery once the quota is projected to be met (Section 407(d) M-SFCMA). This would result in negative effects to the administrative environment by requiring additional staff time to monitor the quota and issue quota closure notices.

Alternative 1, which would assume historic baseline effort levels in the evaluation of management measures considered under Action 1, does not affect previously estimated changes in net fishing effort and in economic values. Though it could potentially establish stricter than required management measures thereby limiting short-term economic benefits, **Alternative 1** would be consistent with a precautionary approach to management. **Alternative 2**, which assumes a 25-percent reduction in post-hurricane fishing effort, may establish management measures that could jeopardize the rebuilding of the resource and significantly delay its recovery. While it would potentially increase short- term benefits derived from the fishery, it could impose sizeable long term adverse economic benefits. **Preferred Alternative 3**, which assumes a 10-percent reduction in post-hurricane fishing effort may also establish management measures that could jeopardize the rebuilding of the resource and significantly delay its recovery. However, the effects on rebuilding and time of recovery would be less than that of **Alternative 2**.

Additionally, a stock assessment update for red snapper through the SEDAR process is scheduled for 2009. Through this assessment, effort and landings levels will be re-evaluated, and management measures can be implemented that would minimize the potential that a current 10-percent reduction assumption would jeopardize the rebuilding plan in the long term.

Alternative 1 does not consider any potential reduction in effort and landings. By not assuming any reduction, the season should not have to close early because the TAC was met sooner than expected. By not considering any possible reductions, there is a greater chance the TAC will not be met during the year.

Alternative 2 assumes a 25 percent reduction in fishing effort and landings. If there is not a 25 percent reduction, the TAC may be met sooner requiring an early closure of the fishery. If effort and landings have indeed been reduced by 25 percent then fishermen would benefit from a longer fishing season.

Preferred Alternative 3 assumes a 10 percent reduction in fishing effort and landings. If there is not a 10 percent reduction, the TAC may be met sooner requiring an early closure of the fishery. If effort and landings have indeed been reduced by 10 percent then fishermen would benefit from a longer fishing season.

Table 2.4. Length of the recreational red snapper fishing season for Alternatives 2-4 in Action 1 if captain and crew are prohibited from retaining bag limits of red snapper while under charter (see Action 3) and either a 10 or 25 percent post-hurricane reduction in landings/effort is assumed (Action 2). (Note: the table does not include season lengths for alternatives in Action 1 that have weekend openings and weekday closings).

		Rec. Fishing Season based on Various Assumed Hurricane Reductions		
Rec. quota	Alternative	0%	10%	25%
3.43 mp	Alt 2(a)(i)	May 15 - Oct 7	May 1 - Oct 15	Apr 21 - Nov 7
(7.0 mp TAC)	Alt 2(b)(i)	May 15 - Oct 31	May 1 - Oct 31	Apr 21 - Nov 30
	Alt 2(b)(ii)	June 1 - Oct 24	May 15 - Oct 31	Apr 21 - Oct 25
	Alt 2(c)(i)	May 15 - Oct 31	May 1 - Oct 31	Apr 21 - Dec 10
	Alt 2(c)(ii)	May 15 - Sept 24	May 15 - Oct 22	Apr 21 - Oct 31
2.45 mp	Alt 3(a)(i)	June 1 - Sept 30	May 15 - Oct 15	May 1 - Oct 31
(5.0 mp TAC)	Alt 3(a)(ii)	May 1 - Aug 10	May 1 - Sept 15	Apr 21 - Oct 15
	Alt 3(b)(i)	May 15 - Aug 31	May 15 - Oct 15	May 1 - Oct 31
	Alt 3(c)	May 15 - Aug 15	May 15 - Sept 15	May 1 - Oct 15
	Alt 3(d)(i)	May 15 - Aug 5	May 15 - Aug 31	May 15 - Oct 15
	Alt 3(d)(ii)	June 1 - Aug 20	June 1 - Sept 10	June 1 - Oct 31
	Alt 3(d)(iii)	May 1 - July 14	May 1 - Aug 7	May 1 - Sept 15
	Alt 3(e)	June 1 - Aug 7	May 15 - Aug 15	May 15 - Sept 30
	Alt 3(f)(i)	June 1 - Oct 3	May 22 - Oct 31	Apr 25 - Oct 31
	Alt 3(f)(ii)	May 1 - Aug 15	May 1 - Sept 15	Apr 25 - Oct 31
	Alt 3(g)(i)	May 15 - Oct 22	Apr 21 - Oct 31	Apr 1 - Nov 30
	Alt 3(g)(ii)	May 1 - Sept 25	Apr 21 - Oct 31	Apr 1 - Nov 30
1.47 mp	Alt 4(a)(i)	Aug 1 - Sept 22	May 1 - Jun 30	June 1 - Sept 30
(3.0 mp TAC)	Alt 4(b)	Aug 1 - Sept 15	Aug 1 - Oct 22	June 1 - Sept 15
	Alt 4(c)	Aug 1 - Sept 11	Aug 1 - Oct 15	July 1 - Oct 31
	Alt 4(d)	Aug 1 - Sept 7	Aug 1 - Oct 7	July 1 - Oct 20

Action 3. Establish separate bag limit restrictions for the captain and crew of for-hire vessels

Alternative 1. No action – The captain(s) and crew of a for-hire vessel may retain the same daily bag limit of red snapper as allowed for each passenger.

Preferred Alternative 2. The red snapper bag limit for captain(s) and crew of for-hire vessels is zero.

<u>Comparison of Physical, Biological, and Ecological Consequences</u>

Alternative 1 would allow captains and crew to continue to retain recreational bag limits of red snapper while under charter. It is estimated captain and crew on for-hire vessels account for approximately 2 percent of the annual red snapper harvest, which is equivalent to an additional 3-7 fishing days (SERO 2006a). If the red snapper bag limit is reduced (see **Action 1**), captain and crew could and potentially would supplement the catch of their clients and negate some of the reductions expected from a lower daily bag limit. Continuing to allow captain and crew to retain a daily bag limit of red snapper may increase the potential harvest by recreational for-hire anglers and prevent necessary reductions in harvest from being achieved. The amount of fish they catch adds to the TAC and reduces the amount of fish for non-working, recreational fishermen. If the captain and crew keep a share, the number of days in the fishing season is shortened to meet the TAC.

Alternative 1 is not expected to result in any additional impacts to the physical environment caused by gear interactions. No impacts to the administrative environment are expected since regulations would not change and there would be no additional burden on enforcement. Because reductions in TAC will be achieved through management measures considered in **Action 1** (or a combination of alternatives in Action 1 and **Alternative 2** below), **Alternative 1** will not directly affect progress made toward rebuilding red snapper. However, because the primary objective of setting the captain and crew bag limit to zero would be to extend the fishing season, **Alternative 1** may increase closed season discards because a longer closed season would be necessary to achieve reductions in landings.

Preferred Alternative 2 would reduce the captain and crew bag limit to zero, which would reduce red snapper landings by approximately 2 percent and allow the fishing season to be extended. Table 2.1.1 shows the length of the fishing season for various alternatives in **Action 1** if the captain and crew bag limit is set to zero. If the red snapper bag limit is reduced (see **Action 1**), **Preferred Alternative 2** increases the likelihood reductions from lower red snapper bag limits are achieved, because captain and crew would no longer be able to supplement the catch of their clients. **Preferred Alternative 2** would also increase consistency among regulations and make them more equitable among user groups. NMFS recently implemented Amendment 18A to the Reef Fish FMP, which prohibits commercial fishermen from retaining bag limits of reef fish while possessing commercial quantities of reef fish. Also, a regulatory amendment to the Reef Fish FMP was recently implemented in summer 2006 that prohibited captain and crew from retaining bag limits of grouper while under charter.

Preferred Alternative 2 is expected to result in benefits to the physical environment through reduced effort and less gear interactions with habitat. However, because for-hire captain and crew harvest represents a small fraction of the overall reef fish fishery, any benefits to the physical environment are expected to be immeasurably small. Reductions in landings resulting from a zero captain and crew bag limit in combination with management alternatives considered in **Action 1** will directly benefit the biological environment by reducing red snapper mortality rates in the directed fishery. Closed season discards will also be slightly reduced because the season would be extended by a few additional days (see Table 2. 1).

<u>Comparison of Socioeconomic and Administrative Consequences</u>

Alternative 1 would maintain the status quo and continue to allow for-hire captains and crew to keep a bag limit while conducting a for-hire trip. The additional harvest from this source of mortality, however, would be expected to require more severe restrictions on the general angling public in order to accomplish required harvest reductions and fishery recovery goals. **Preferred Alternative 2** would eliminate this source of mortality, and be expected to allow more liberal restrictions for the fishery as a whole, and increase the likelihood of achieving recovery goals. Although captains and crew would be expected to experience a more restrictive household food budget, although not quantified, the benefits associated with less restrictive measures for anglers and greater success associated with meeting recovery goals are expected to exceed these costs. Neither alternative is expected to greatly effect the administrative environment, because bag limits are routinely used to restrict harvest and similar regulations exist for other reef fish species.

In the social environment, **Alternative 1** would benefit captain and crew because they could continue to keep the bag limit. The amount of fish they catch adds to the TAC and reduces the amount of fish available for non-working, recreational fishermen. If the captain and crew keep a share, the number of days in a fishing season is shortened to meet the TAC. **Preferred Alternative 2** would prevent the captain and crew from keeping red snapper. Captain and crew will not be able to supplement their food budget with fish they can keep under current rules. The amount of fish the captain and crew kept previously will be available to non-working, recreational fishermen. The fishing season can be open a few days longer without the captain and crew keeping a share. **Preferred Alternative 2** may have negative impacts for captain and crew because they can no longer keep fish and it may make it harder for captains to retain crewmembers who may consider fishing and keeping red snapper one of the benefits of the job.

Action 4. Reduce the red snapper minimum size limit in the commercial fishery

Alternative 1. No action. Maintain the 15-inch TL commercial minimum size limit for red snapper.

Preferred Alternative 2. Reduce the minimum size limit in the commercial red snapper fishery to 13 inches TL.

Alternative 3. Eliminate the commercial red snapper minimum size limit

Discussion: As described in the purpose and need for this amendment, reductions in red snapper bycatch (regulatory discards) are needed in all sectors of the red snapper fishery for the stock to recover over the long term and to reduce overfishing in the short term. **Action 4** examines changing minimum size limits for the commercial fishery as a method to reduce discards in the directed red snapper fishery. Section 5.4 examines the effects of the various **Action 4** alternatives relative to each other within the physical, biological/ecological, socioeconomic, and administrative environments. Important factors to this discussion include:

- Discards in the commercial red snapper fishery are highest for vessels using bandit gear (84 percent), followed by handline (15 percent) and longline (1 percent) (Poffenberger and McCarthy, 2004).
- Logbook data indicates all reported discarded red snapper were regulatory discards (Poffenberger and McCarthy, 2004).
- Red snapper discarded during open seasons (likely undersized) were numerically greater (SEDAR 7, 2005) but overall weighed less than fish discarded during the closed seasons (undersized- and legal-sized fish).
- One study (Wilson et al., 2004) found over half of undersized red snapper released during the open period were 13 inches or greater (61 percent), and 86 percent were 12 inches or greater.
- Porch (2005) estimated the number of regulatory discards based on size would decrease by 42 percent if the commercial size limit were reduced to 13 inches, and by 61 percent if reduced to 12 inches.
- Based on the range of size limits analyzed (12- to 15-inches total length), analyses suggest YPR is maximized for the western Gulf at 12 inches assuming an 82 percent discard mortality rate, while YPR is maximized at 15 inches for the eastern Gulf assuming a 71 percent discard mortality rate (although the difference in YPR between 12 and 15 inches is negligible) (SERO, 2006b).
- Most of the commercial catch occurs in the western Gulf (SEDAR 7, 2005).
- Stock recovery occurs at a slightly faster rate if the minimum size is reduced (Porch 2005).
- Economic consequences of reducing the minimum size limit must consider the level of TAC established in **Action 1**.

Alternative 1 (no action) would not reduce discard rates in the commercial red snapper fishery. Some reductions will occur through Reef Fish Amendment 26, which has established an IFQ program beginning January 1, 2007. This program allocates IFQ shares to individual fishermen and allows fishermen to fish their shares when they want. Thus, regulatory discards associated with closed seasons would cease. Some discards would still occur from the 15-inch minimum size limit and from fishermen targeting reef fish after using all of their annual allocation of IFQ shares.

Preferred Alternative 2 sets the size limit at 13 inches TL. Wilson et al. (2004) and Porch (2005) examined the size distribution of undersized red snapper caught by the commercial fishery. Their estimates of the number of fish caught between 13 and 15 inches was between 62 and 41 percent, respectively. Thus selecting this alternative would reduce the number of discards from the current 15-inch minimum size limit.

Alternative 3 eliminates the minimum size limit for red snapper. Porch (2005) indicated red snapper less than 12 inches were not considered marketable and would unlikely be retained by the commercial fishery. Wilson et al. (2004) estimated 14 percent of undersized fish measured from commercial catches at sea were less than 12 inches. Thus, this measure would not completely eliminate discards, although the number of discards would be less than **Preferred Alternative 2**. Porch (2005) and Wilson et al. (2004) estimated the number of commercially caught red snapper between 12 and 15 inches was 61 percent and 86 percent, respectively.

Effects of these alternatives on the physical environment should be minimal (see Section 5.3.1). Impacts result from gear interacting with bottom structure. Hook-and-line and longline gear, the predominate gear types of the fishery, minimally interact with the bottom compared to other gears such as trawls and traps. Effects from gear are related to fishing effort, thus alternatives reducing effort would have less of an impact on the physical environment. **Alternatives 2 and 3** would be more favorable to the physical environment than **Alternative 1** because they would allow fishermen to keep more fish and should result in an overall decrease in fishing effort.

Alternative 3 (no size limit) would be most beneficial to the biological environment because stock rebuilding would occur more quickly than the current 15-inch size limit. Porch (2005) reported the current 15-inch size limit contributes little towards stock rebuilding. This is because benefits derived from harvesting a larger fish are nullified by the high discard mortality rates associated with the commercial fishery. In a comparison between a 15-inch and 12-inch minimum size with recreational harvest parameters held constant, stock recovery occurred faster at the smaller size limit. Porch (2005) did not examine the effects of a commercial 13-inch size limit (**Preferred Alternative 2**) under similar recreational conditions; however, the effects should be intermediate to **Alternatives 1 and 3**.

Reducing the commercial red snapper size limit from the current 15-inch minimum is expected to result in increased economic benefits to the fishery and associated industries. These benefits are expected to accrue to increased operational efficiency of commercial vessels and to a potential price premium for smaller fish. This expectation holds regardless of the TAC. In the short term, **Alternative 3** is expected to result in slightly greater economic benefits than **Preferred Alternative 2**. However, perceptions of inequity between no commercial minimum size limit (**Alternative 3**) and the current minimum size limit in the recreational sector (16 inches) may result in unquantifiable future adverse economic impacts that erode the benefits attributable to increased commercial vessel efficiency. Thus, overall, the economic benefits of **Preferred Alternative 2** are expected to exceed those of **Alternative 3**. For the preferred TAC (5.0 MP, **Preferred Alternative 3**) and minimum size combination (13 inches, **Preferred Alternative 2**), the commercial fishery is projected to consist of 22-52 vessels and generate approximately $14.5 million in net revenue. These net revenues are approximately 0.08 percent greater than under the status quo minimum size limit.

Alternative 1 maintains the 15-inch TL minimum size limit and would not have any short-term effects on the social environment. **Preferred Alternative 2** would reduce the minimum size limit to 13-inches TL. This would allow fishermen to keep more of the fish they catch and would reduce bycatch of fish that are too small to be kept now. **Preferred Alternative 2** may lead to commercial fishermen filling their IFQ shares more quickly, which could impact the fishermen and communities dependent on the fishery. **Alternative 3** would eliminate the commercial red snapper minimum size limit and would reduce the waste of fish that are now less than 15 inches. Commercial fishermen will benefit from being able to keep all of the fish they catch, making the fishery more efficient by requiring less time fishing, and less expenditure on fuel and bait. Overall, **Preferred Alternative 2** would benefit the participants in the fishery, while reducing potential user conflicts associated with the entire elimination of the minimum size limit

Alternatives 2 and 3 would result in some minor adjustments to the Reef Fish FMP and fall within the scope and capacity of the current management system and are not expected to significantly affect the administrative environment. Because **Alternative 3** would eliminate the commercial minimum size limit, one less regulation would need to be enforced, reducing the administrative burden on red snapper management and enforcement.

Action 5. Modify fishing gear restrictions

Alternative 1. No action. Do not implement further fishing gear modifications to reduce bycatch in the directed red snapper fishery.

Preferred Alternative 2. Require the use of non-stainless steel circle hooks when using natural baits, and require the use of venting tools and dehooking devices when participating in one of the following EEZ fisheries:

Option a. Commercial red snapper fishery
Option b. Recreational red snapper fishery
Option c. Both commercial and recreational red snapper fisheries
Preferred Option d. All commercial and recreational reef fish fisheries

Alternative 3. Require a minimum hook size when participating in one of the following EEZ fisheries:

Option a. Commercial red snapper fishery
Option b. Recreational red snapper fishery
Option c. Both commercial and recreational red snapper fisheries
Option d. All commercial and/or recreational reef fish fisheries

The minimum required hook size would be:

Suboption i. A hook with an outside diameter of at least 2.5 cm and a hook point to shank (gap) measurement of no more than 1.0 cm.

Suboption ii. A hook with an outside diameter of at least 2.8 cm and a hook point to shank (gap) measurement of 1.1 cm.

Suboption iii. A hook with an outside diameter of at least 3.3 cm and a hook point to shank (gap) measurement of 1.2 cm.

Suboption iv. A hook with an outside diameter of at least 3.7 cm and a hook point to shank (gap) measurement of 1.4 cm.

Discussion: Section 5.5 examines the effects of the various Action 5 alternatives relative to each other within the physical, biological/ecological, socioeconomic, and administrative environments. Factors considered in this discussion include:

- For many species, circle hooks reduce hooking mortality rates more than J-style hooks (Cooke and Suski 2004).
- Reduction in release mortality associated with the use of circle hooks results primarily from the tendency of circle hooks to jaw-hook fish (Cooke and Suski 2004).
- Some studies indicate catch rates and mean length at capture for red snapper are greater for circle hooks compared to J-hooks (Sullivan et al. 1999; Henwood et al. 2006); however, Powers and Shipp (personal communication.), found similar mean length at capture, but lower catch rates for red snapper caught with circle hooks compared to J-hooks.
- More red snapper caught with rod-and-reel gear die from hook mortality caused by J-hooks than all other causes combined, including depth, stress, and handling (Burns et al. 2002). Additionally, Burns (personal communication.) has shown tag return rates for red snapper caught on circle hooks to be greater than J-hooks.
- Preliminary data suggest that venting increases survival in red snapper caught in deep water (Burns and Porch, personal communication).
- Ease of hook removal is a major contributor to release survival (Cooke and Suski 2004).
- Venting, when properly executed, increases survival of released fish.
- Large hooks in general result in some size selectivity towards larger fish; however, they do hook smaller fish as well (Cooke and Suski 2004).
- There is no industry standardization of hook size.

Alternative 1 (no action) would not require any additional gear or gear modifications for the directed red snapper fishery or reef fish fishery to reduce bycatch or bycatch mortality. Anecdotal information suggests circle hook use is common in the commercial fishery and some sectors of the recreational fishery. Dehooking devices are required in the commercial and for-hire fisheries through Amendment 18A; however, this requirement is aimed at protected species, such as sea turtles. The extent these sectors would also use dehookers to assist in releasing fish is unknown. Selecting various gears to reduce bycatch should provide long-term benefits to the stock.

Preferred Alternative 2, Preferred Option d would require the use of circle hooks, venting tools, and dehooking devices when harvesting reef fish from the EEZ. Cooke and Suski (2004) reviewed studies on circle hook effectiveness to determine the usefulness of circle hooks for fisheries management. Overall, they found mortality rates were lower for circle hooks than J-style hooks. Hooking depth, anatomical hooking location, amount of bleeding, and ease of hook removal were identified as major contributors to mortality. These factors were thought to be reduced by the use of circle hooks. Circle hooks typically hook fish around the maxilla for red snapper (SEDAR 7, 2005), and are less likely to be swallowed. Burns (personal communication) has shown that tag return rates for fish caught on circle hooks are greater than fish caught on J-hooks (8.6 percent return vs. 7.97 percent, respectively) suggesting greater survival.

Testimony provided to the Council indicates commercial red snapper fishermen primarily use circle hooks already, therefore requiring these hooks only in this fishery (**Preferred Alternative 2, Option a**) would do little to reduce discard mortality by the directed fishery. Requiring their possession in the recreational fishery (**Preferred Alternative 2, Option b**) would reduce discard mortality for some sectors where circle hooks are not typically used. Requiring the possession of circle hooks in both the recreational and commercial red snapper fisheries (**Preferred Alternative 2, Option c**), or the entire reef fish fishery (**Preferred Alternative 2, Preferred Option d**), would further decrease discard mortality of red snapper and/or other reef fish species. This would be particularly important over the long term during red snapper closed seasons when all caught red snapper are released.

Preferred Alternative 2 would also require the use of venting tools when harvesting red snapper from the EEZ. Venting, when properly executed, increases survival of released fish. Preliminary data from a 15-year study conducted at Mote Marine Lab (Burns and Porch, personal communication) suggests that venting increases survival in red snapper caught in deep water. A venting tool can be any hollow, sharpened instrument that allows gases to escape. Ice picks and knives are not suitable because simply puncturing the fish is undesirable and can result in mortal injury (Florida Sea Grant 2005). The Sea Grant/Novak Venting Tool designed and developed by Florida Sea Grant in cooperation with Mote Marine Laboratory, can be purchased from Aquatic Release Conservation, Inc. Alternatively, a venting tool can be created out of a hypodermic needle syringe with the plunger removed, or by cementing a 16-gauge needle into a hollow wooden dowel (Florida Sea Grant 2005) (Figure 2.3).

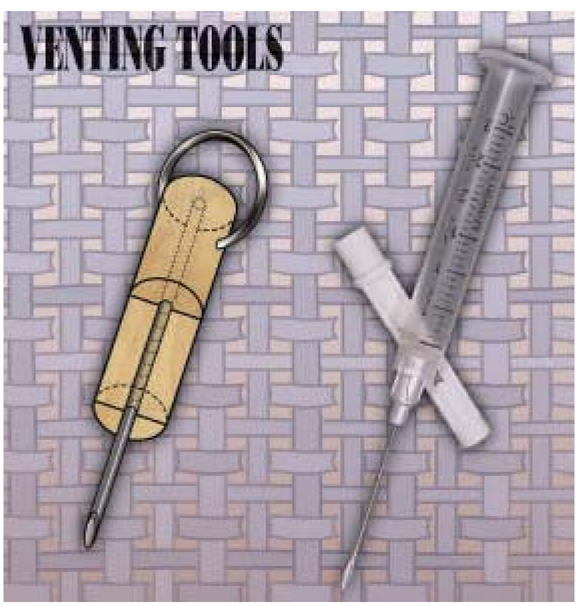


Figure 2.3. Two examples of venting tools described by Florida Sea Grant (2005).

To properly vent a fish with an expanded swimbladder, protocols developed by Florida Sea Grant (2005) have the fisherman holding the fish gently but firmly on its side and inserting the venting tool at a 45-degree angle approximately one to two inches from the base of the pectoral fin (Figure 2.4.). The tool should be inserted deep enough to release the gases, which, when done properly, is accompanied by an audible sound of gas escaping with a noticeable deflation of the body cavity. For fish extremely bloated, gentle pressure on the fish's abdomen, using the hand holding the fish, aids deflation (Florida Sea Grant 2005).

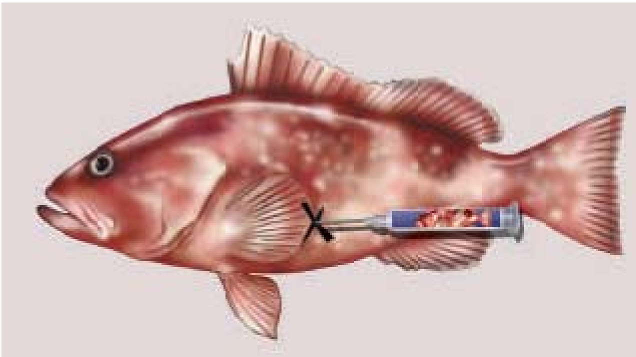


Figure 2.4. Anatomical location for inserting a venting tool into a fish with an over expanded swimbladder (Florida Sea Grant, 2005).

A third requirement of **Preferred Alternative 2** would be dehooking devices. Dehooking devices are any device intended to remove a hook embedded in a fish in order to release the fish with minimum damage. Several devices may be used to remove hooks depending on the depth and location of hooking (Figure 2.5). Cooke and Suski (2004) identified ease of hook removal as a major contributor to mortality; therefore, the use of dehookers to remove hooks and lines would likely reduce serious injury and post-release mortality of targeted species, and other incidentally caught species.

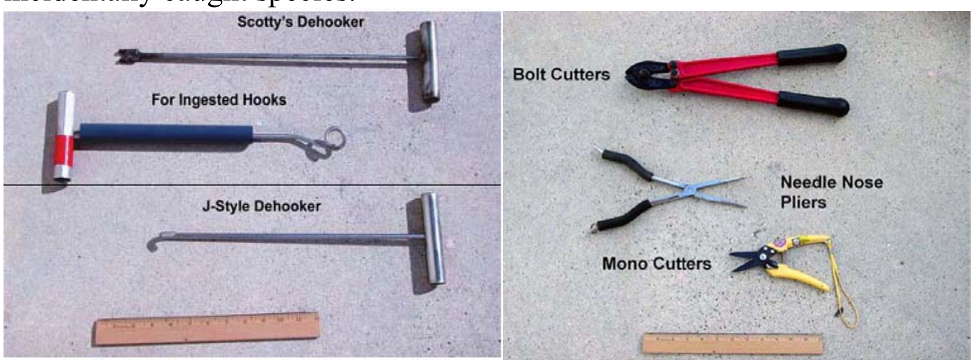


Figure 2.5. Some examples of dehooking devices that can be used to remove fishing hooks. The type of dehooking device used depends on hooking location and depth.

Options a-c in **Alternative 3** specify a minimum hook size to be used in the directed red snapper fishery, while **Alternative 3, Option d** expands the requirement to all reef fish fisheries. Specifications for hook size are given under the various sub-options instead of traditional manufacturers' sizing to eliminate confusion caused by the discrepancies found between manufacturers' hook sizes. As seen in Table 2.5, there is a wide discrepancy between manufacturers' hook sizes in relation to the outside diameter and hook point to shank measurements.

Cooke and Suski's (2004) review found large hooks in general result in some size selectivity towards larger fish; however, they do hook smaller fish as well. Specifically for red snapper, Gledhill and Driggers (2006), found the mean length at capture was greater when caught with circle hooks (Mustad 15/0) compared to J-hooks. They also found a significant difference in fish length between circle hook sizes (Mustad 11/0 versus Mustad 15/0), with larger hooks catching larger fish. Thus selecting a minimum hook size could possibly reduce the number of undersized fish discarded. Suboption iv would require the largest minimum hook size, and therefore is expected to reduce discards the most relative to the other suboptions.

Table 2.5. Manufacturer hook size and outside diameter and hook point to shank measurements.

Manufacturer hook size	Hook Style	Outside diameter (cm)	Hook point to shank (cm)
Owner - 2/0	Circle	2.25	1.05
Owner - 3/0	Circle	2.5	1.15
Owner - 4/0	Circle	2.6	1.3
Owner - 5/0	Circle	2.95	1.5
Owner - 7/0	Circle	2.8	1.65
Owner - 8/0	Circle	2.95	1.9
Owner - 9/0	Circle	3.2	2
Eagle Claw - 2/0	Circle	1.8	1
Eagle Claw - 3/0	Circle	2.05	1.2
Eagle Claw - 4/0	Circle	2.3	1.4
Eagle Claw - 5/0	Circle	2.55	1.45
Gamakatsu - 2/0	Circle	1.95	1.2
Gamakatsu - 3/0	Circle	2.05	1.4
Gamakatsu - 4/0	Circle	2.2	1.5
Gamakatsu - 5/0	Circle	2.4	1.6
Mustad - 10/0	Circle	2.5	1
Mustad - 11/0	Circle	2.8	1.1
Mustad - 12/0	Circle	3.3	1.2
Mustad - 13/0	Circle	3.7	1.4

The intended effects of the gear modifications in **Preferred Alternative 2 and Alternative 3** are to reduce bycatch and discard mortality, which would be expected to decrease effort in the fishery, thereby benefiting the physical environment compared to **Alternative 1**. **Preferred Alternative 2** is expected to benefit the physical environment because circle hooks snag the bottom less often due to their design. **Alternative 3** would require a minimum hook size while fishing for red snapper and/or reef fish. Specifying a minimum hook size reduces the capture of undersized fish, but would not greatly benefit the physical environment unless the size of the hook increases or decreases interactions with bottom habitat.

Though anecdotal evidence suggests circle hook use is widespread in the commercial sector, and increasing in popularity in the recreational sector, it appears mandatory use of circle hooks in all fisheries would benefit the biological environment of red snapper by reducing acute and long-term mortality caused by J-hook usage. Also, it is believed that venting, when properly executed, could increase survival of released fish. The use of venting tools may also reduce predation on red snapper and other bycatch species. The use of dehooking devices to remove hooks and lines would likely reduce serious injury and post-release mortality of sea turtles, marine mammals, targeted species, and other incidentally caught species. Larger hooks result in some size selectivity towards larger fish, which would reduce the number of fish discarded as regulatory discards and would allow for a quicker stock recovery time. Thus, **Preferred Alternative 2 and Alternative 3** are both expected to be more beneficial to the red snapper stock than the current regulations for gear requirements.

Alternative 1 would not impose any additional gear requirements or restrictions on either the red snapper or reef fish fisheries and would not, therefore result in any direct or indirect short-term economic impacts to participants in the directed fisheries or associated businesses. The gear requirements and restrictions considered by **Preferred Alternative 2 and Alternative 3** have the intended purpose of reducing bycatch and bycatch mortality, with attendant gains in long-term stock conditions and economic benefits. Each alternative comes with attendant costs, through new gear purchases, though such costs are not expected to be substantial.

Continued mortality associated with the absence of gear modifications would be expected, however, to result in slower recovery and more restrictive harvest allowances than would otherwise be possible, with attendant loss in economic benefits. Continuation of the status quo through Council action would, therefore, be expected to delay rebuilding, where applicable, and reduce allowable harvests and associated economic benefits to the directed fisheries and associated businesses. From the long-term perspective, the expected impacts of the hook specification, dehooking gear, and venting gear alternatives are largely indistinguishable when considered for application to a specific fishery. However, the expected benefits of potentially applying the requirements to all reef fish fisheries (**Preferred Alternative 2, Preferred Option d** and **Alternative 3, Option d** are expected to exceed the benefits when compared with such requirements being applied only to the red snapper fishery or a sector thereof (**Options 2(a-c)** and **Options 3(a-c)**).

Alternative 1 would not have any direct or indirect effects on the social environment in the short run because it maintains the status quo. **Preferred Alternative 2 and Alternative 3** require the use of certain gear for the red snapper and reef fish fisheries that will help to protect and preserve the species. Although fishermen will be required to purchase new hooks, venting tools and dehooking devices, this action will have minimal impacts on the fishermen and fishing communities while allowing the fishery to be rebuilt.

All alternatives would require adjustments to the Reef Fish FMP, which fall within the scope and capacity of the current management system. **Alternative 1** would continue current gear requirements while **Preferred Alternative 2 and Alternative 3** would modify these requirements. Defining and enforcing these requirements would increase the administrative burden of red snapper and/or reef fish management.

Action 6. Establish a Target Reduction Goal for Juvenile Red Snapper Mortality in the Shrimp Fishery of the northern and western Gulf of Mexico

Alternative 1: No Action - do not establish a target reduction goal for the shrimp fishery of the northern and western Gulf of Mexico

Alternative 2: Establish a target reduction of shrimp trawl bycatch mortality on red snapper 50 percent less than the benchmark years of 2001-2003.

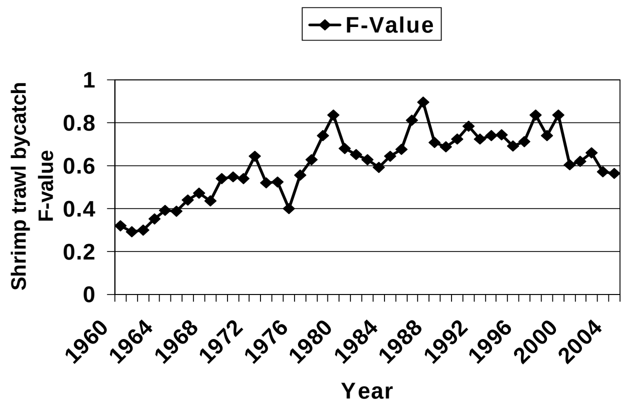
Alternative 3: Establish a target reduction of shrimp trawl bycatch mortality on red snapper 60 percent less than the benchmark years of 2001-2003.

Alternative 4: Establish a target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003.

Alternative 5: Establish a target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003 and then adjust it to the appropriate percent as determined by the red snapper stock assessment updates.

Preferred Alternative 6: Establish a target reduction of red snapper shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003 for the years 2008 through 2010. Reduce the target goal to 67 percent beginning in 2011, and thereafter reduce the target goal, as necessary, to achieve a target reduction goal of 60 percent by 2032.

Discussion: The 2005 assessment for red snapper indicated a need for a 74 percent reduction in shrimp trawl bycatch mortality, beginning in 2007, compared to levels of effort and mortality experienced during the 2001-2003 period to end overfishing between 2009 and 2010. Fishing mortality during the 2001-2003 time period was estimated at 0.617 for the western Gulf of Mexico, and that includes the contributions attributable to BRDs; therefore fishing mortality needs to be reduced to 0.160 (Figures 2.5 and 4.1.4). The most commonly used BRD, the Fisheye positioned greater than 10.5 feet from the codend tie-off, was expected to reduce mortality by 44 percent from the mortality level during the 1984-1989 time period. In previous red snapper assessments, this magnitude of bycatch reduction was expected to be sufficient for the stock to rebuild, assuming it was achieved from 1998 onward. However, recent evaluations of the Fisheye BRD indicate it is reducing F by only approximately 11 percent. Given that the target level of reduction from BRDs was not achieved, even greater reductions are now required. Based on a new BRD certification criterion to be established in 2007, new and more effective BRDs will be certified for use in the fishery. The BRDs most likely to be used by the industry reduce mortality on juvenile red snapper by greater than 20 percent (Table 2.6); therefore, the new BRDs should reduce mortality from shrimp trawls by at least an additional 10 percent over the contribution of the current industry standard, the Fisheye. However, BRDs by themselves, will not meet the new reduction needs to achieve rebuilding of the red snapper stock. Consequently, a target reduction goal and measures to achieve this goal need to be established.



Shrimp trawl bycatch F- values from 1960 – 2004.

Figure 2.5. Shrimp Trawl Bycatch F-values (Red Snapper)

Table 2.6. Performance and Average Price of Bycatch Reduction Devices Tested in the Gulf of Mexico

BRD TYPE	**REDUCTION CRITERION**			**Shrimp Loss (Percent)**	**Average Price per Unit**
	Percentage Reduction in Red Snapper (Ages 0 - 1) Mortality	Percentage Reduction in CPUE on Red Snapper (Ages 0 – 1)	Percentage Reduction in Total Finfish Bycatch (by weight)		
Fisheye Legal 8.5'-10.5'	**26.6** (5.5 - 47.8)	**26.6** (5.5 - 47.5)	**22.8** (18.0- 27.5)	**6.3** (4.0- 8.7)	$45
Fisheye Legal 10.6'-12.5'	**10.8** (-1.3 - 22.9)	**8.8** (1.1 – 16.5)	**13.5** (11.1– 15.9)	**1.6** (-0.4-3.6)	$45
Fisheye – All	**9.4** (3.3 - 15.5)	**6.2** (0.1 - 12.2)	**17.0** (16.1- 17.9)	**1.2** (0.4- 2.1)	$45
Jones Davis	**52** (* *)	**40.0** (30.0–50.0)	**58.0** (53.0 –63.0)	**4.0** (0.0 –9.0)	$425
Modified Jones Davis	**30.6** (25.6 -35.7)	**24.1** (18.6 -29.6)	**33.1** (30.3 –36.0)	**3.2** (1.4 -4.9)	$200
Extended Funnel	**25.1** (11.8 –38.4)	**17.4** (6.5 – 28.2)	**26.6** (21.7 -31.6)	**2.2** (-1.7-6.0)	$350

Source: Dan Foster, NMFS – 95% confidence interval in parentheses;
** based on Goodyear model: confidence interval not available.

The following summary discussion is based on several factors discussed elsewhere in this document:

- Shrimp fishing effort has a strong correlation to the levels of red snapper mortality attributable to the shrimp fishery (Figure 2.6 and Table 2.7), and is a more appropriate tool to manage red snapper mortality than bycatch quotas (see Figure 4.1.3) or restrictions on the number of federal shrimp vessel permits.

- Juvenile red snapper are more common in the 10 to 30-fathom depth strata (Section 3.2.1), and the benefits of reducing juvenile red snapper mortality are best achieved by addressing shrimp effort in this depth stratum (Figure 4.1.2).

- Shrimp fishing effort in 2005 in areas where red snapper are abundant was reduced by 50 to 60 percent from the baseline 2001-2003 period (Figure 3.2.1.3 and Table 2.7), and was reduced by approximately 65 percent in 2006.

- The number of vessels participating in the offshore shrimp fishery is expected to continue declining until at least 2012, and has been further reduced by the impacts of Hurricanes Katrina and Rita (Section 3.2).

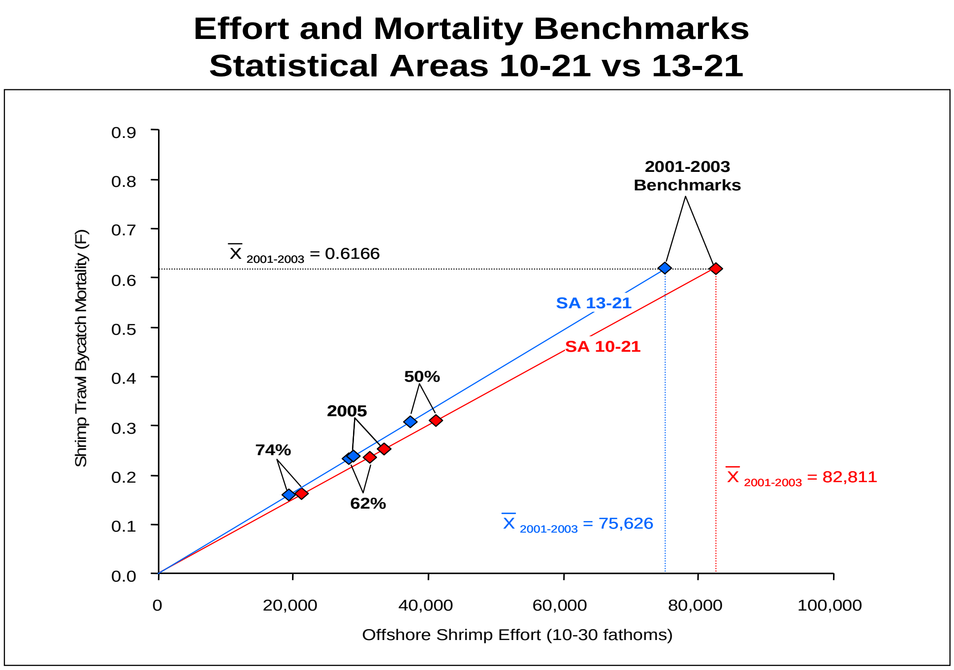
The effort declines illustrated in Tables 3.2.1 and 3.2.2 are anticipated to continue given the current economic environment, but they may not be permanent. To that end, **Alternative 1** (No action) may not ensure consistent reductions in bycatch mortality on juvenile red snapper by the shrimp fishery over the time of the current rebuilding program. In addition, as noted above, although reducing bycatch mortality on juvenile red snapper through the use of BRDs is a practical action, it does not appear (Table 2.6) that current technology will have the potential, in the near future, to develop BRDs that meet the overall reduction goals. Therefore, the Council is considering additional measures to reduce bycatch in the shrimp fishery, recognizing additional bycatch mortality reduction may continue to occur from continued effort reductions.

As discussed in detail in Sections 3.2.1 and 4.1, options for the red snapper stock to recover depend on reducing bycatch mortality in both the directed and shrimp fisheries. Analyses by the NMFS Southeast Fisheries Science Center, Galveston Laboratory, demonstrated that there is only a weak relationship between mortality on ages 0 and 1 red snapper and shrimp landings (Figure 4.1.3). These estimates indicate that brown shrimp landings only explain 25 percent of the variation observed in juvenile red snapper mortality. Using total shrimp landings would be even more ineffective because of the multi-species nature of the fishery. Effort inside 10 fathoms, targeting white shrimp (and seabobs), would not directly affect red snapper. Very limited numbers of juvenile red snapper occur inside of the 10-fathom contour (Branstetter 1997; Gallaway et al. 1998). In addition, approximately 10 percent of all shrimp landed (brown, pink, and white shrimp) are landed in the eastern Gulf of Mexico (east of Cape San Blas, Florida), and juvenile red snapper are not common there. To that end, monitoring total shrimp landings as a proxy for bycatch levels would not provide accurate estimate of impacts to red snapper.

Analysis of the observer data collected by NMFS and the Gulf and South Atlantic Fisheries Foundation, Inc. confirm that catch rates of juvenile red snapper are highest at depths between 10 and 30 fathoms in the western Gulf (Figure 3.2.1.2). . There is a very good relationship between shrimp effort and red snapper bycatch mortality, especially in the offshore areas between 10 and 30 fathoms where juvenile red snapper are most abundant (Figure 2.6 and Table 2.7). Additional reductions in red snapper mortality attributable to the shrimp fishery could be achieved through direct reductions in shrimp fishing effort; especially effort expended in these areas where juvenile red snapper are commonly taken. Consequently, for the purposes of monitoring the reduction in red snapper fishing mortality, the level of effort in the 10 to 30-fathom depth zone of statistical subzones 10-21 is considered as a proxy for F.

In developing alternatives for an interim rule to begin reducing fishing mortality from the directed red snapper and shrimp fisheries, NMFS established a target reduction goal of 50 percent for the shrimp fishery. This target was based on initial estimates of fishing mortality on juvenile red snapper attributable to shrimp effort in areas where red snapper are abundant (Figure 3.2.1.3). Initial estimates suggested effort was down by 58 percent in these areas, which translated to a 52 percent reduction in fishing mortality on juvenile red snapper. **Alternative 2** in this amendment would maintain the target established in the interim rule. It does not meet the 74 percent target mortality reduction level recommended by the 2005 red snapper stock assessment to end overfishing between 2009 and 2010, and it would likely result in TAC for red snapper having to be set at approximately 2.8 MP for 2008 and 2009. Nevertheless, a 50 percent reduction target would allow the industry some additional flexibility in achieving OY, as it is currently defined for the fishery.

Figure 2.6. Juvenile Red Snapper F vs. Shrimp Effort in 10 to 30 Fathoms in the Gulf of Mexico.



Subsequent analyses of 2005 shrimp effort data revised the reduction estimates (Table 2.7), suggesting effort and fishing mortality was reduced by approximately 60 percent from the benchmark 2001-2003 period. In addition, as noted in Section 3.2, effort is expected to continue declining in the near future. Numerous vessels were stranded or damaged during the intense 2005 hurricane season, and many of these vessels may never return to the fishery. Estimates of effort in 2006 support these assumptions. The 2006 effort in the 10 to 30-fathom depth strata was approximately 65% lower than the benchmark 2001-2003 period. Early estimates for 2007 suggest effort in 2007 may be lower than in 2006.

Table 2.7. Juvenile Red Snapper F vs. Shrimp Effort in the 10 to 30 Fathoms in the Western Gulf of Mexico

Benchmark Comparisons

Stat Areas 10-21

Table 1. Shrimp effort data for Statistical Areas 10-21 (depth 10-30 fms) and west Gulf mortality values (F).

Category	Statistical Areas 10-21	West F Value	
Benchmark	82,811	0.6166	
50% Reduction	41,406	0.3083	
62% Reduction	31,468	0.2343	
74% Reduction	21,531	0.1603	
2005	33,799	0.2517	(59% Reduction)

Stat Areas 13-21

Table 2. Shrimp effort data for Statistical Areas 13-21 (depth 10-30 fms) and west Gulf mortality values (F).

Category	Statistical Areas 13-21	West F Value	
Benchmark	75,262	0.6166	
50% Reduction	37,631	0.3083	
62% Reduction	28,600	0.2343	
74% Reduction	19,568	0.1603	
2005	29,229	0.2395	(61% Reduction)

Alternative 3 would establish a target mortality reduction of 60 percent from the benchmark years; this reduction level reflects the level of effort reductions associated with 2005, and in the near future, it is expected that fishing mortality will remain below this level. The revised BRD criterion is expected to further reduce bycatch mortality by an additional 10 percent. Furthermore, The Council also expects effort and participation in the fishery to continue to decline due to potential reductions in permits from the implementation of the shrimp vessel permit moratorium and the current external economic factors. As mentioned above, in the discussion for **Alternative 2**, estimates of 2006 shrimp effort support the expectation of continuing declines. These declines are detailed in the Regulatory Impact Review section, and are anticipated to continue at least through 2012. As discussed in **Action 8**, NMFS annually would develop effort estimates, and consider management actions to keep shrimp effort below the selected threshold, if needed.

Alternative 4, **Alternative 5, and Preferred Alternative 6** would establish a target aligned with the recommended 74 percent reduction in red snapper fishing mortality from the benchmark years of 2001-2003. Each differs slightly. **Alternative 4** would maintain the 74% mortality reduction target throughout the rebuilding period, whereas **Alternatives 5 and Preferred Alternative 6** would allow the Council and NMFS the flexibility to modify the mortality reduction target over time, based on new information and analyses. **Preferred Alternative 6** is simply more specific in illustrating the Council's intent to adjust the targets over time to appropriate levels while maintaining the red snapper rebuilding schedule.

Even so, **Preferred Alternative 6** would require the Council to re-evaluate the bycatch reduction target periodically throughout the red snapper rebuilding timeframe in the context of red snapper rebuilding. This future target could be adjusted if changing conditions in either the red snapper fishery or shrimp fishery indicate that a 74 percent red snapper bycatch reduction mortality goal is no longer practicable. Nevertheless, based on the conclusions of the bycatch practicability analysis contained in Section 4.1, for the immediate future, it is currently practicable to reduce shrimp fishery bycatch by 74 percent.

Although limited expansion of the fishery is anticipated in the near future, actions may be needed in the future to maintain these reductions in effort in areas where red snapper are abundant, such as those identified in **Action 7.** A restriction on effort in the mid-shelf region, which only affects the ability of the fishery to utilize a portion of the shrimp grounds for a limited time frame during the year, should not preclude the fishery from having the opportunity to achieve OY, as currently defined, on a continuing basis. Should it be necessary to implement a time-area closure to restrict fishing mortality on red snapper, fishing effort can shift either inshore or offshore of the closed areas with highest red snapper abundance. However, currently, with no closures, the shrimp fishery is not achieving optimum yield because of external economic factors, such as increasing fixed costs (fuel, ice, etc.) and stagnant shrimp prices, resulting in reduced levels of effort. Therefore, time-area closures may not be necessary, or may be of limited duration, as fishing mortality on juvenile red snapper is already reduced substantially. Should external economic factors continue to impact the fishery, fishing effort could decline even further and generate even smaller fishery mortality impacts on juvenile red snapper.

On the other hand, should economic conditions improve and effort increase in the shrimp fishery, especially in the mid-shelf region where juvenile red snapper are abundant, then a time-area closure might have to be implemented to maintain the current 74 percent reduction target. If the closure was for an extended period of time, especially a closure concurrent to the Texas Closure, it might restrict the fishery from achieving OY by precluding the fishery from being able to target larger-sized shrimp in the mid-shelf region. Moving the fishery into shallower water would lead to catches of smaller shrimp, which could result in reduced profits. Alternatively, if better BRDs are developed in the future and result in more substantial reductions in red snapper F then it would be possible to reduce the extent of time-area closures even if effort increases. This could then allow the shrimp F target to be achieved while simultaneously allowing effort to increase to a level that allows OY to be caught.

However, whereas the directed red snapper fishery would benefit from increased yields over time as the red snapper stock rebuilds, the shrimp fishery would not directly benefit from increased red snapper abundance because shrimp trawl bycatch of red snapper cannot be retained and has no economic value. Therefore, **Preferred Alternative 6** would allow the shrimp fishery to derive some benefit by relaxing the fishing effort and fishing mortality restrictions over time. Such an action might be necessary if, in the future, it became apparent that the proposed time area closures prevented the fishery from achieving optimum yield (OY) as currently defined in the Council's Shrimp Fishery Management Plan. As noted earlier, the specific reduction target values identified in **Preferred Alternative 6** may not be appropriate in the future following new assessments and scientific advice, much like future adjustments to TAC in the directed fishery. Nevertheless, any future adjustment would need to be made through the framework procedures outlined in **Action 8.**

There would be no direct biological impacts from setting a target reduction goal for red snapper bycatch mortality in the Gulf shrimp fishery. This is an administrative action that would allow managers to monitor a specific portion of the total shrimp effort in the northern and western Gulf that has a direct impact on juvenile red snapper. If the target effort level is being exceeded to the point where managers determine further actions are needed, there would be indirect effects only in the sense that this action would serve as the basis for future actions. Any biological impacts would result from options presented in **Action 8**. Such impacts would be identified and discussed in a regulatory amendment or in supporting documents for action delegated to the RA, depending on the Council's choice of a preferred option.

Alternative 4, **Alternative 5, and Preferred Alternative 6** could result in a long-term restriction of effort in the mid-shelf regions of the western Gulf of Mexico, compared to the baseline 2001-2003 period, or the documented level of effort in 2005. The fishery in the 20 to 50-fathom depth zone is primarily for brown shrimp. Because of economic issues facing the shrimp fishery today, brown shrimp landings are below the Council's designation of OY. However, these proposed effort restrictions in the mid-shelf region should not prevent the fishery from achieving OY as it is currently defined. It would not preclude the fishery from targeting brown shrimp in waters deeper than 30 fathoms, or inshore of 10 fathoms. And depending on the length of any time-area closure, such as proposed in **Action 7**, the areas in the mid-shelf area would also be open probably most of the year.

Since this is an administrative action, none of the alternatives would be expected to result in any direct adverse economic or social impacts in the short-term or long-term. **Alternatives 1, 2, and 3** would also not be expected to result in any indirect short-term adverse economic and social impacts. **Alternative 1** would not establish a benchmark on which to base subsequent effort control. Current effort reductions are believed to be within the benchmarks that would be established by **Alternatives 2 and 3** and, hence, no additional restriction on the shrimp fishery would be required at this time. However, increases in or changes in the spatial distribution of effort in the shrimp fishery could require future effort restrictions under **Alternatives 2 and 3**, particularly if these changes increase effort in areas where juvenile red snapper are abundant. Thus, **Alternatives 2 and 3** could indirectly cause adverse economic and social impacts in the long-term. Whether and to what extent these restrictions mirror those considered under **Action 7** cannot be determined at this time. But, if so, the discussion for **Action 7** provides a range of potential impacts. Due to shrimpers exiting the fishery and the damage caused by the hurricanes of 2005, as reflected by continuing declines in effort for 2006, it is also possible that the target established by **Alternative 4, Alternative 5, and Preferred Alternative 6** will be achieved in 2007 and thus no additional restrictions on the shrimp fishery would be required in 2008.

However, if the bycatch target is not achieved, measures may be required in the future which could impact fishermen and communities that depend on the fishery. Thus, **Alternative 4, Alternative 5, and Preferred Alternative 6** could potentially result in indirect adverse economic and social impacts due to the effort restrictions that would need to be placed on the fishery, the range of which is described under **Action 7**. The need for future actions will be assessed in reports based on the preferred alternatives selected in **Action 7** and **Action 8**.

Action 7. Consider establishing shrimp fishing restrictions to reduce effort to achieve a fishing mortality reduction target for juvenile red snapper in the northern and western Gulf of Mexico established in Action 6

Alternative 1. No action – do not consider establish fishing restrictions for the Gulf shrimp fishery

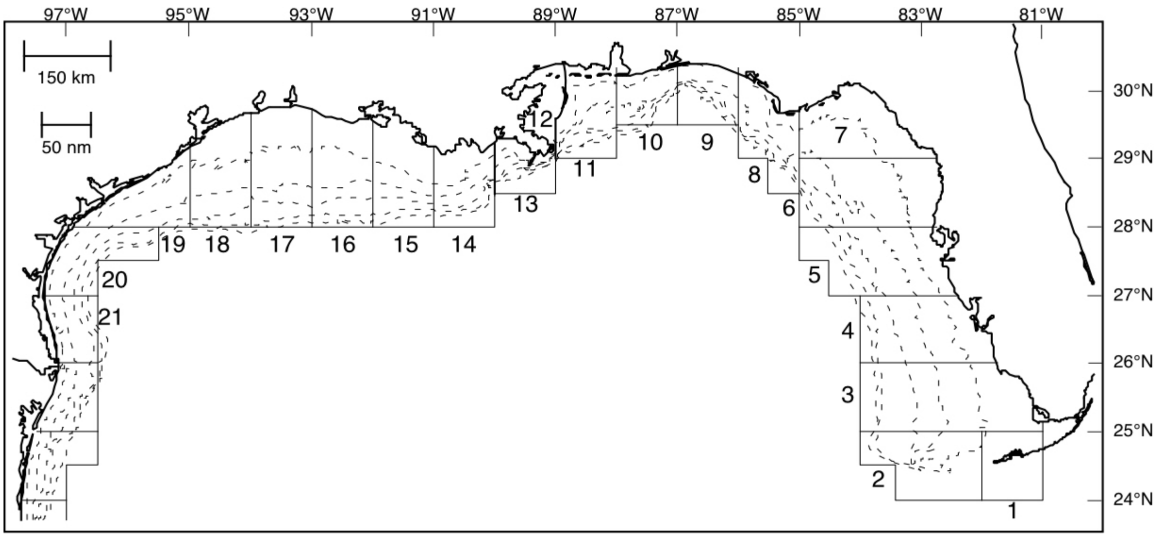
Preferred Alternative 2: Establish if necessary a seasonal closure beginning on the same start date as the closure of the EEZ off Texas in the 10 to 30-fathom zone of selected areas within statistical zones 10-21 in the Gulf of Mexico. The need for the closure and its extent and duration will be determined based on the annual evaluation of the level of shrimp effort and associated red snapper mortality, taking into consideration mortality reductions associated with improved BRDs and other gear improvements. Any closure would be implemented in accordance with the framework outlined in Action 8.

Alternative 3: Establish if necessary a seasonal closure within the January 1 through April 30 timeframe in the 10 to 30-fathom zone of selected areas within statistical zones 10-21 in the Gulf of Mexico. The need for the closure and its extent and duration will be determined based on the annual evaluation of the level of shrimp effort and associated red snapper mortality, taking into consideration mortality reductions associated with improved BRDs and other gear improvements. Any closure would be implemented in accordance with the framework outlined in Action 8.

Alternative 4: Establish if necessary a seasonal closure within the October 1 through November 30 timeframe in the 10 to 30-fathom zone of selected areas within statistical zones 10-21 in the Gulf of Mexico. The need for the closure and its extent and duration will be determined based on the annual evaluation of the level of shrimp effort and associated red snapper mortality, taking into consideration mortality reductions associated with improved BRDs and other gear improvements. Any closure would be implemented in accordance with the framework outlined in Action 8.

Discussion: The same four factors bulleted at the beginning of the discussion section for **Action 6** apply to **Action 7.** The statistical zones referred to in the Alternatives are illustrated in Figure 2.7.

Figure 2.7. Diagram of the various statistical zones across the Gulf of Mexico, used for record keeping purposes in regard to fishery landings.



Because of the relatively high bycatch of juvenile red snapper in the shrimp trawl fishery, managers have, on several occasions, considered alternatives to minimize such bycatch through area and seasonal closures. It should be noted that the Council rejected broad time-area closures and bycatch reduction options for the shrimp fishery in Amendment 1 to the Reef Fish FMP in 1990, and again in Amendment 9 to the Shrimp FMP in 1998 and again in Amendment 10 to the Shrimp FMP in 2004. Any seasonal closure intended to reduce the catch of juvenile red snapper would have to assume a consistent and proportional relationship across years for shrimp effort, shrimp and red snapper distribution, and juvenile red snapper recruitment. In addition, to be effective the seasonal or area closure must include the time period just prior to the migration of these juvenile red snapper from shrimp grounds to areas of greater relief.

More importantly, depending on the amount of effort allowed, there could be a change in the fishing behavior of the shrimp fleet and a redistribution of effort around a closed area. Shrimp effort could be expected to move to state and nearshore federal waters if a closure as with **Preferred Alternative 2** and **Alternatives 3 and 4** is implemented. This is particularly true off Louisiana and northeast Texas where white shrimp (that occur closer to shore) are dominant in the fall and early winter months, after the high brown shrimp effort period of July and August. Finally, the impacts of Hurricanes Katrina and Rita may have reduced effort due to vessel damage and loss to the extent that any reasonable cap on effort to control the level of bycatch may not be reached, and a closure may not be needed, or it could be reduced in scope.

As noted above, any season or area closure must provide the ability for the affected size/age class of red snapper to escape the shrimp fishery. Closed areas would be most effective if they are large (for enforceability and to effectively address the broad distribution of red snapper in the northern and western Gulf) because juvenile red snapper are associated with the shrimp grounds for 14 months or longer. The geographic scope of the closure would also need to include documented areas where juvenile red snapper are found to be consistently abundant across years. As discussed in detail in Sections 3.2 and 4.1, recent evaluations of catch and bycatch data (Gallaway et al. 1998; Gallaway et al. 1999) indicate substantial portions of the total juvenile red snapper bycatch occurs in shrimp trawls fished in the mid-shelf depth zones of the northern and western Gulf of Mexico (west of Cape San Blas, Florida). Juvenile red snapper occur infrequently inside of 10 fathoms (Branstetter 1997; Gallaway et al. 1998). Gallaway et al (1998, 1999) found the greatest densities of juvenile red snapper catches occurred in the areas between 10 and 25 fathoms. Therefore, the Council is not considering closures in the entire EEZ of the northern and western Gulf.

Alternative 1 (No Action) would not provide for the establishment of a time/area closure and would allow the shrimp fishery to continue, with the only anticipated reductions in red snapper mortality being associated with any further declines in effort because of external factors. While these declines are anticipated, they are not assured; at least, not in the long term. If fishing effort and bycatch mortality levels in 2007 do not meet the 74 percent reduction target **(Action 6: Preferred Alternative 6)** or if effort increases in the future and exceeds the target, the choice of **Alternative 1** would not provide the Council with an immediate means to address the issue. Additional action, through a plan amendment or other action by NMFS (interim rule or emergency action) would be needed to return fishing effort and thus bycatch mortality to the threshold level.

Preferred Alternative 2 would provide for a potential closure in the northern and western Gulf (Statistical Subzones 10-21) within the 10 to 30-fathom zone in conjunction with the beginning of the Texas Closure, which closes the entire EEZ off Texas from typically May 15 to July 15. This depth range is where red snapper are known to be most abundant and the area that contains the most suitable juvenile red snapper habitat (see Figures 3.2.1.1 and 3.2.1.2). It is important to emphasize that while the starting date of the potential closure considered under this alternative is set to coincide with the beginning of the Texas closure, no ending date is specified. In other terms, this alternative could potentially result in a short closure, i.e., a few days or result in a closure lasting up to a full year. Similarly, within the 10-21 statistical zones, the scope of the closure could be limited to a few statistical zones or cover the entire area (from Mobile Bay to Brownsville).

Assuming the area closure coincided with the Texas Closure (ca. 60 days), it would provide as much as a 24 percent reduction in annual effort in the 10 to 30-fathom zone from Mobile Bay to Brownsville (Table 2.7). As noted under the discussions for **Alternative 3** for **Action 6**, effort in 2006 for the 10 to 30-fathom depth range was less than it was in 2005, and preliminary estimates for 2007 suggest effort for 2007 may be lower still. If so, at least for the immediate future, a closure associated with the beginning of the Texas Closure might be of very limited duration or areal scope.

The potential seasonal closure considered under **Preferred Alternative 2** would encompass the beginning of the time red snapper reach biological age 1, attain a size of approximately 120-150 mm, and begin emigrating off the shrimp grounds to areas of high relief (see Figures 4, 5, and 6 in Gallaway and Cole 1999). While the overall abundance and catch rate of red snapper are not particularly high during the Texas closure, almost all the red snapper caught are age 1 fish. A closure during this time period would allow a large number of them to migrate off the shrimp grounds to their sub-adult habitats. The age 0 fish on the grounds at this time are very small because spawning occurs in the Spring, and small (ca. 50 mm) juvenile red snapper are just beginning to settle on the shrimp grounds at this time. This new age class is not as vulnerable to trawl gear, being of a size where they can pass through the webbing of the net. Recent analyses by NMFS suggests as many as 65 percent of small Age-0 red snapper may pass through standard sized (1-7/8”) mesh bags used by the fishery.

Shrimp trawl mortality in the 10 to 30-fathom depth zone has a significant linear relationship with annual fishing effort in 10 to 30 fathoms (Figure 2.6). The 2005 red snapper stock assessment considered the mouth of the Mississippi River as a dividing line to separate the Gulf of Mexico into a western and eastern zone. Approximately 11 percent of the total effort expended in the 10 to 30-fathom zone in statistical subzones 10-21 (Mobile Bay to Brownsville) comes from statistical subzones 10-12 (east of the Mississippi River), and primarily from statistical subzone 11. While this fishing effort is substantial, the impact of a 10 to 30-fathom closure in this area on juvenile red snapper mortality is low (Figure 3.4.1.2); recreational fishing mortality is the dominating impact in this eastern area. Reductions in effort and in shrimp trawl mortality in the western Gulf (statistical subzones 13-21) would provide the vast majority of the potential benefits of a closure because reductions in effort are commensurate with reductions in fishing mortality (Figure 3.4.1.2).

Closures established under the provisions of **Preferred Alternative 2** could alleviate fishing mortality problems stemming from shifts in fishing effort to Louisiana mid-shelf regions during the Texas Closure each year. Substantial amounts of effort have been redirected to the Louisiana shelf area (Table 2.8; see also Table 3.2.2). A closure of the mid-shelf area off Louisiana beginning with the start of the Texas Closure could provide the potential to reduce red snapper mortality from direct reductions in effort (Table 2.7.2) in the areas where red snapper are abundant. The alternative would not prohibit all shrimping off Louisiana; substantial portions of the shelf are inshore of the 10-fathom contour and are fished during this time period, and substantial effort occurs seaward of the 30-fathom contour as well (Gallaway et al. 1999). Thus, none of the proposed closures should preclude the fishery from achieving OY as it is currently defined.

Table 2.8. Nominal effort (24-hr days fished) by sub-region in the 10 to 30-fathom depth zone of the Gulf of Mexico for 2005 and 2006 compared to average annual effort for the benchmark 2001-2003 period.

2001-2003	Stat Zones	Jan - Apr	May - Aug	Sep - Dec
Florida	1 - 9	8,542	5,722	4,409
FL-AL-MS	10 – 12	603	3,150	2515
Louisiana	13 – 17	3,117	25,342	5,948
Texas	18 – 21	6,201	15,680	17,938

2005	Stat Zones	Jan - Apr	May - Aug	Sep - Dec
Florida	1 - 9	7,356	4,055	3,494
FL-AL-MS	10 – 12	799	2,864	917
Louisiana	13 – 17	1,641	10,489	1,282
Texas	18 – 21	1,028	7,889	6,900

2006	Stat Zones	Jan - Apr	May - Aug	Sep - Dec
Florida	1 - 9	NA	NA	NA
FL-AL-MS	10 – 12	862	1,567	1151
Louisiana	13 – 17	1,133	7,151	2,492
Texas	18 – 21	1,581	4,247	8,890

Table 2.9. Percent of total shrimp effort for 2004-2006 per month in the 10 to 30 fathom depth zone for Statistical Zones 10-21 (Mobile Bay to Texas), 10-12 (east of the Mississippi River), and 13-21 (west of the Mississippi River).

MONTH	Area 10-21	Area 10-12	Area 13-21
January	3.6	11.6	3.9
February	2.4	3.6	2.1
March	1.4	2.0	1.1
April	1.3	1.7	1.3
May	7.6	2.6	13.9
June	11.4	15.7	23.8
July	15.9	13.3	25.0
August	22.6	23.0	11.3
September	11.1	6.8	4.6
October	8.5	7.2	4.3
November	7.5	5.9	4.9
December	6.6	6.5	3.8

Alternative 3 would provide for a potential closure in the northern and western Gulf of Mexico within the 10 to 30-fathom zone during January through April of the year. This is a time period when limited shrimp effort and lowest red snapper catch by shrimp trawls occurs in the Gulf of Mexico (Table 2.9). While this alternative brackets potential closures between January 1 and April 30, it neither provides a definite starting date nor indicates a specific ending date. As in **Preferred Alternative 2**, the scope of potential closures could include a limited number of statistical zones or cover the entire northern and western Gulf. A complete four-month closure for the entire area (Statistical Zones 10-21) would approximate an 8 to 9 percent reduction in effort in the 10 to 30-fathom zone where juvenile red snapper are more abundant.

Biological impacts resulting from **Alternative 3** would be primarily determined by the timing of the proposed closure. As noted in the introductory discussion for **Action 7**, an area-season closure needs to ensure the target species has the ability to disperse from the area before the closure ends. In the case of a winter trimester closure, the majority of the red snapper on the shrimp grounds at this time are biologically age-0 (age 1 as of January 1 for stock assessment purposes), and at a size less than 120 mm in length. A closure during this period would reduce fishing mortality on these individuals, but the fish would still be on the shrimp grounds when the closure ends, May 1. Individuals off Texas would again be protected with the May 15 start of the Texas Closure, but individuals off Alabama, Mississippi, and Louisiana would be susceptible to potentially intensified fishing effort, particularly concentrated off Louisiana during June (Table 2.8).

On the positive side, shrimp trawls have a distinct size selectivity. Trawls are towed at approximately 3 knots; fish greater than 150 mm in length can swim faster than 3 knots and have a greater opportunity to successfully avoid the trawls. By June, when this effort shift to Louisiana waters would occur, many of the fish would be approaching this size. But, with an intensified trawling effort during May through July, particularly off Louisiana, increased numbers of surviving juveniles would be susceptible to capture.

Alternative 4 would provide for a potential closure in the northern and western Gulf of Mexico within the 10 to 30-fathom zone between October and November. This is the time period that has historically represented heavy shrimp activity in the mid-shelf region as brown shrimp complete their offshore migrations. As with **Alternative 3**, **Alternative 4** does not specify starting and ending dates but provides a set time interval for a potential closure. Assuming the entire area was closed for the two-month period, it would approximate a 16 percent reduction in shrimp trawl effort in the 10 to 30-fathom depth zone of the northern and western Gulf of Mexico. The primary difference between **Preferred Alternative 2** and **Alternative 4** is the timing of the closure. The potential biological benefits of a closure as with **Preferred Alternative 2 and Alternative 4** are similar. **Preferred Alternative 2** focuses on the early phase of the time period when age 1 red snapper are emigrating off the shrimp grounds, and attaining a size to avoid capture, whereas **Alternative 4** focuses on the late phase of the emigration period. Plus, **Alternative 4** potentially would provide protection for the next age class, which has begun to dominate the overall bycatch by this time. However, the benefits of increasing the survival of age 0 fish during the fall, while they remain on the shrimp grounds for another 9 months, may not be substantial, primarily due to the high natural mortality rate on age 0 fish.

Seasonal closures during peak shrimping periods, such as provided for under **Preferred Alternative 2 and Alternative 4**, could cause some relocation of effort by the shrimp fleet. Fishermen would not be allowed to fish in the closed offshore waters, and some could opt for fishing in shallower waters inshore of the closure area. Travel to areas offshore of the closed area would be costly under current fuel prices. Branstetter (1997) and NMFS (1998) have documented that finfish bycatch levels are higher in nearshore waters (inshore of 10-15 fathoms) than for offshore areas. Branstetter (1997) noted finfish to shrimp ratios (in biomass) were 7.6:1 off Louisiana inshore of 10 fathoms compared to 3.3:1 offshore of 10 fathoms. Similarly, off Texas, finfish to shrimp biomass ratios were 4:1 for waters inshore of 10 fathoms, and 3.3:1 offshore of 10 fathoms. Therefore, shifts in effort to nearshore waters during a closure would increase the overall bycatch of finfish, assuming there is no reduction in overall effort for the closure period. This issue may be ameliorated to some extent in that many of the common nearshore fishes can be excluded at relatively high rates from the use of BRDs.

Alternative 1 would not be expected to result in any direct adverse economic and social impacts since no effort restrictions would be imposed on the shrimp fishery. However, if status quo effort reductions in the fishery are not sufficient to achieve target goals, continuation of this alternative may result in more severe future restrictions, resulting in potentially greater adverse economic impacts than the adoption of effort restrictions at this time. Each of the alternatives that could enact effort controls would be expected to result in greater adverse economic impacts in the future relative to **Alternative 1**. Among these alternatives, **Alternative 3** would be expected to result in the least adverse economic impacts on the shrimp fishery, affecting fewer vessels, fewer pounds of shrimp, and less shrimp revenues. Ranking of **Preferred Alternative 2** and **Alternative 4** is less clear. However, since **Preferred Alternative 2** would be expected to potentially result in more firms exiting the industry than **Alternative 4**, the adverse economic impacts associated with **Preferred Alternative 2** would be expected to exceed those of **Alternative 4**. Longer term benefits derived from expected improvements to the red snapper stock are expected to outweigh these adverse impacts. **Preferred Alternative 2**, which is expected to have the largest impact on red snapper mortality reduction, is expected to result in greater long-term benefits. Greater positive impacts associated with **Preferred Alternative 2** are attributable to the specified starting date of a potential closure, which would coincide with the movement of age 1 snapper from shrimp grounds to larger structures.

Action 8. Establish a framework procedure to adjust shrimp fishing effort in the northern and western Gulf of Mexico

Alternative 1. No action – do not establish a framework.

Preferred Alternative 2. Establish a framework procedure to adjust the effort target and closed season for the shrimp fishery in the Gulf of Mexico within the scope of the preferred alternatives identified in Actions 6 and 7.

Option a. The SEFSC will provide an annual report to the Council on the previous year's assessment of shrimp effort for the 10- to 30-fathom area in the Gulf

(statistical subzones 10-21). The Council may recommend the area and duration of a closure for the subsequent year.

Preferred Option b. The SEFSC will conduct an annual assessment of the previous year's shrimp effort for the 10- to 30-fathom area in the Gulf (Statistical Subzones 10-21) and determine the area and duration of a closure and report this to the Regional Administrator for administrative action.

Option c. A shrimp effort assessment team of scientists, appointed by the Council, will provide an annual report to the Council on the previous year's assessment of shrimp effort for the 10- to 30-fathom area in the Gulf (statistical subzones 10-21). The Council may recommend the area and duration of a closure for the subsequent year.

Discussion: **Preferred Alternative 6** in **Action 6** in combination with **Preferred Alternative 2** in **Actions 7 and 8** establish a target red snapper mortality reduction, as well as a time/area closure and procedure that would provide managers with the ability to address future changes in the shrimp fishery of the Gulf of Mexico through potential closures in specified areas to reduce shrimping effort and thus bycatch mortality on juvenile red snapper in a timely manner. The purpose of such closures would be to maintain an effort control on the shrimp fishery and thus maintain a level of bycatch reduction that allows the red snapper stock to rebuild in compliance with the rebuilding plan and end overfishing between 2009 and 2010.

The information regarding the level of effort for a given calendar year would not be available for analysis until some time in the middle of the following year. An appropriate area closure would need to be implemented by a notice in the *Federal Register* prior to the start of the Texas Closure under **Preferred Alternative 2, Preferred Option b.** Therefore, to provide for timely response by the SEFSC and the Regional Administrator, it would be more appropriate to utilize the most recent 12-month period of data and have the SEFSC provide that information prior to March 1 of each year. It is difficult to determine what the current (2007) status of the fishery is or what it will be in the near future; however the number of participants and the associated effort and bycatch are expected to continue to decline through at least 2012 due to economic factors related to competition with imports and high operating expenses (Travis and Griffin 2004). Should this decline be realized in subsequent years, there may not be a need to establish additional closures as with **Action 7, Preferred Alternative 2**. On the other hand, if the preferred target of a 74 percent reduction in bycatch mortality from the 2001-2003 baseline average is not being achieved at the time that this action is implemented or if in the future, the economic climate improves or other factors cause an increase in effort such that the target is no longer being achieved, **Preferred Alternative 2** provides a mechanism for implementing closures based on the criteria established in **Action 7, Preferred Alternative 2**. Under **Option a or Preferred Option b** of **Preferred Alternative 2**, the SEFSC would conduct analyses of effort in the 10 to 30-fathom depth zone of statistical subzones 10-21 and develop an annual report of effort and bycatch mortality relative to the target 74 percent reduction. With **Option a**, the report would be provided to the Council for its review and consideration of regulatory actions to implement a closure conforming with the guidelines established by **Action 7, Preferred Alternative 2**, if needed. **Preferred Option b** would assign authority to the RA of the SERO, NMFS to determine the area and duration of a closure, if needed, within the guidelines established by **Action 7, Preferred Alternative 2**. Under **Option c** the Council would appoint a Shrimp Effort Assessment Team (SEAT) of scientists that would review the SEFSC's analyses of effort and develop a report to the Council. The Council in turn would review the SEAT report and determine the need for and the location/duration of any closure in conformance with the guidelines established by **Action 7, Preferred Alternative 2**.

If a closure is determined to be needed, **Preferred Option b** would provide the most expedient means of implementation in that the SEFSC's report would be submitted to the RA who in turn would implement the closure through a similar procedure as has been used to implement the Texas Closure in the past. **Option c** would provide the least expedient means of implementing a closure in that the SEFSC's report would have to be reviewed by the SEAT and then the Council before regulatory action could be initiated. **Preferred Option b** would provide a middle of the road approach with regard to the expediency of implementing a closure.

Alternative 1 would not establish a framework procedure to potentially implement additional closures within the guidelines established by **Action 7, Preferred Alternative 2**. Not establishing a framework action would render the preferred alternatives in **Action 6** and **Action 7** moot because there would be no other means of implementing a closure other than a separate amendment, or an emergency or interim rule action by the RA. This action could benefit the shrimp fishermen in that they would be able to continue to shrimp without the potential for further restrictions, at least in the short term. On the other hand, if there is no framework procedure to quickly adjust effort to meet the bycatch reduction target in the future, there may be a higher mortality on juvenile red snapper, and it may be more difficult to end overfishing and continue to rebuild the red snapper stock in accordance with the established rebuilding plan. This would be detrimental to the recreational and commercial red snapper fishery and the people who depend on it since there may be a need for further reduction on the directed red snapper fishermen. It could also impact fishermen and fishing communities that depend on the shrimp fishery if this lack of action results in the need for further reductions in the future to reduce the amount of bycatch of juvenile red snapper.

Action 8 is an administrative action. Hence, no direct short-term or long-term adverse economic impacts would be expected to result from either **Alternative 1** or **Preferred Alternative 2**. The adoption of a framework procedure for addressing effort in the shrimp fishery would generally be expected to facilitate faster corrective action, reducing both the cost of action and pace at which benefits for the action would be received. Thus, **Preferred Alternative 2** would be expected to result in greater indirect economic benefits than **Alternative 1**. Impacts to the administrative environment would occur as a result of the SEFSC's analysis of effort and the development of the appropriate reports to support the potential actions as contemplated by **Option a, Preferred Option b, or Option c**. Economic and social impacts would result from the determination of the area and duration of a closure, if needed, based on the guidelines established by **Action 7, Preferred Alternative 2** and would be evaluated in the appropriate analyses based on the Council's choice of **Option a, Preferred Option b, or Option c.**

3.0 DESCRIPTION OF THE FISHERY AND AFFECTED ENVIRONMENT

3.1 Description of the Red Snapper Fishery

3.1.1 General Features

Since 1990, the red snapper fishery has been managed through the setting of an annual TAC. An implicit TAC of about 6.0 MP was set in 1990, followed by explicit TACs of 4.0 MP in 1991 and 1992, 6.0 MP in 1993 through 1995, and 9.12 MP from 1996 through the present. Table 3.1.1.1 shows a comparison of TACs and actual harvests from 1990 through 2005.

Table 3.1.1.1 Total Allowable Catch vs. total directed red snapper harvest.

Year	TAC	Total Directed Harvest
1990	No TAC was explicitly specified	3.99 MP
1991	4.0 MP	4.52 MP
1992	4.0 MP plus emergency season	6.96 MP
1993	6.0 MP	9.69 MP
1994	6.0 MP	8.25 MP
1995	6.0 MP	7.52 MP
1996	9.12 MP	8.20 MP
1997	9.12 MP	9.85 MP
1998	9.12 MP	9.37 MP
1999	9.12 MP	9.48 MP
2000	9.12 MP	8.12 MP
2001	9.12 MP	8.52 MP
2002	9.12 MP	9.80 MP
2003	9.12 MP	9.21 MP
2004	9.12 MP	9.76 MP
2005	9.12 MP	8.63 MP

3.1.2 The Commercial Red Snapper Fishery

In the Gulf of Mexico, red snapper are primarily harvested commercially with hook-and-line and bandit gear, with bandit gear being more prevalent. Longline gear capture a small percentage of total landings (< 5 percent) and are prohibited from use inside of 50 fathoms west of, and 20 fathoms east of, Cape San Blas, Florida. Additionally, the fishery typically operates in association with natural or artificial structures with higher relief from the bottom. Red snapper are a long-lived species (over 50 years); consequently, fish of various sizes and multiple year classes may be found in the same location. On the other hand, older red snapper have been known to move away from structures. Red snapper are caught commercially in both state and federal waters, but predominantly in federal waters.

Waters (2003) reviewed the history and status of the commercial red snapper fishery. U.S. fishermen have fished commercially for red snappers since the mid 1800s. During the modern period, landings of red snapper exhibited an almost uninterrupted decline between 1965 and 1980, from 14.0 MP to 5.0 MP. Landings increased for three consecutive years to 7.3 MP in 1983, primarily due to increased catches with bottom longlines, but then dropped to 2.7 MP in 1990. The decline in landings was due in part to a decline in catches from foreign fishing grounds (GMFMC 1981) and a decline in the size of the domestic fish population (Goodyear and Phares 1990). Since 1990, the commercial fishery has been managed with annual quotas established as 51 percent of TAC. Table 3.1.2.1 shows a comparison of commercial quotas and commercial landings from 1990 through 2005 and the number of days that commercial fishing occurred.

Between 1990 and 2006, the principal method of managing the commercial fishery for red snapper was with quotas set at 51 percent of TAC and seasonal closures after each year's quota was filled. The result was a race for fish in which fishermen are compelled to fish as quickly as possible to maximize their catch of the overall quota before the season was closed. The number of days taken to reach the quota decreased through 2001 despite implementation of trip limits in 1992 and larger minimum size limits in 1994 and 1996. The fishing year was characterized by short periods of intense fishing activity with large quantities of red snapper landed during the open seasons rather than lower levels of activity with landings spread more uniformly throughout the year. The fishery has been managed with separate spring (beginning in February) and fall (beginning in October) quotas with 10-day open seasons at the beginning of each month, which spread industry landings over a greater number of months during the year. For example, the season in 2002 through 2004 lasted approximately one third longer than it did for the 1997 through 2001 period (Table 3.1.2).

Trip limits were also implemented in an effort to slow the race for fish. At the beginning of the 1993 season, 131 boats qualified for red snapper endorsements on their reef fish permits that entitled them to land up to 2,000 pounds of red snapper per trip, while boats without endorsements were limited to 200 pounds per trip. The endorsement system remained in effect until formalized into a license limitation system in 1998. Boats with endorsements were granted Class 1 licenses that entitled them to land up to 2,000 pounds per trip. Other boats with a history of landing red snapper qualified for Class 2 licenses to land up to 200 pounds per trip. Boats that did not qualify for either type of license were restricted to the recreational bag limit when the recreational red snapper season was open.

Table 3.1.2.1. Commercial red snapper harvest vs. commercial quota (from Appendix 1 in SEDAR 7 [2005])

Year	Commercial Quota	Commercial Harvest	Days Open (days that open or close at noon are counted as half-days) ("+" = split season)
1990	3.1 MP	2.65 MP	365
1991	2.04 MP	2.21 MP	236
1992	2.04 MP plus emergency season	3.03 MP	52 + 42 = 94
1993	3.06 MP	3.37 MP	104
1994	3.06 MP	3.22 MP	78
1995	3.06 MP	2.93 MP	50 + 2 = 52
1996	4.65 MP	4.31 MP	64 + 22 = 86
1997	4.65 MP	4.81 MP	53 + 18 = 71
1998	4.65 MP	4.68 MP	39 + 28 = 67
1999	4.65 MP	4.86 MP	42 + 22 = 64
2000	4.65 MP	4.84 MP	33 + 25 = 58
2001	4.65 MP	4.63 MP	56 + 23 = 79
2002	4.65 MP	4.78 MP	67 + 27 = 94
2003	4.65 MP	4.41 MP	67 + 27 = 94
2004	4.65 MP	4.67 MP	63 + 32 = 95
2005	4.65 MP	4.04 MP	80 + 51 = 131

Currently, the red snapper fishery is managed through a recently implemented IFQ program; therefore, it is difficult to characterize the commercial fishery. However, IFQ shares were awarded based on past participation in the red snapper fishery when it was managed under different license clases. In this scheme, there were 136 Class 1 licenses and 628 Class 2 licenses. Some landings history for Class 1 licenses can be traced back to 1990 while Class 2 histories can be effectively traced back only to 1998. The longer date for Class 1 was made possible by the adoption of an endorsement system in 1993, which used landings in 1990, 1991, and 1992 as the qualifying criterion. Prior to the implementation of license limitation in the commercial red snapper fishery in 1998, any vessel without an endorsement but with a valid commercial reef fish permit could land up to 200 pounds of red snapper per trip. Since then until the implementation of the IFQ program, only vessels with Class 1 or Class 2 licenses could land commercial amounts of red snapper. While all 136 Class 1 licenses reported some landings over the period 1990 through 2004, only 480 of the 628 Class 2 licenses reported some landings during the period 1998 through 2004. Average annual red snapper landings vary from 3,698 pounds to 74,599 pounds for Class 1 and from 0.42 pounds to 8,084 pounds for Class 2 licenses over the aforementioned periods.

As part of the license limitation program, Class 1 licenses were issued to qualifying historical captains. Several individuals applied under this criterion but only seven were determined to have qualified and were thus issued Class 1 licenses. All historical captain licenses were sold to other fishing entities, and they are now simply part of the 136 outstanding Class 1 licenses.

Red snapper licenses were not stand-alone licenses for fishing purposes. They could be used only by vessels with a valid commercial reef fish permit on board. This condition has set the stage for various types of license transactions, such as placements, which have to be registered with NMFS. A placement is a transfer (usually temporary) and is a lease arrangement. A placement occurs when an owner of a Class 1 license allows his license to be used, but not purchased, by another fisherman on the latter's vessel in order to fish for red snapper. Thus, in any given year, more than one vessel may use the same license, although not at the same time. The majority of Class 1 licenses have undergone transfers over time. Since 1990, only twenty six Class 1 licenses have remained with the same owner. The remaining Class 1 licenses involved at least one transfer; three licenses were transferred 11 times, and 10 licenses were transferred nine times.

The 136 Class 1 licenses were associated with 95 owners, thus some entities may be classified as fleet operations. There were 17 such entities that own a total of 58 licenses, with some possessing as many as 6 licenses. Total red snapper landings of the 17 fleet operations did increase from a little over 0.5 MP in 1990 to slightly below 2.0 MP in 2004. Part of such increase is due to some operations buying up licenses. The average landing per operation also increased from 29,779 pounds in 1990 to 115,848 pounds in 2004, indicating additional licenses brought in more than proportionate additional landings. The standard deviation from the mean is relatively large each year, implying the rather wide variation in landings from one fleet operation to another in any given year. Relative to the red snapper commercial quota, the share of the 17 fleet operations grew from 16 percent in 1990 to 42 percent in 2004. It appears, though, that this share has settled at approximately 40 percent over the past few years.

Commercial vessels landing reef fish, including red snapper, may sell their catch only to fish dealers with federal reef fish permits. Based on information from the permit file, there are 227 dealers possessing permits to buy and sell reef fish species. Most of these dealers are located in Florida (146), with 29 in Louisiana, 18 in Texas, 14 in Alabama, and 5 in Mississippi. Fifteen dealers are out of the Gulf States region. There are no specific income or sales restrictions to secure a federal permit for dealers, so the total number of dealers can vary from year to year. Some may be operational one year but not in another year.

3.1.3 The Recreational Red Snapper Fishery

The recreational component of the red snapper fishery in the Gulf includes charter boats, headboats (or party boats), and private anglers fishing primarily from private or rental boats. As with the commercial fishery, red snapper are primarily caught with hook-and-line gear in association with bottom structures. Recreational red snapper harvest allocations since 1991 have been set at 49 percent of the TAC, or 1.96 MP in 1991 and 1992, 2.94 MP for 1993 through 1995 and 4.47 MP from 1996 through 2004 (Table 3.1.3.1). Before 1997, the recreational red snapper fishery was mainly managed through size and bag limits. In 1997, the recreational red snapper allocation was converted into a quota with accompanying quota closure should the sector exceed its quota. Recreational quota closures occurred in 1997, 1998, and 1999. Fixed closures were subsequently established beginning in 2000.

Actual recreational harvests in pounds of red snapper have exceeded the allocation every year except 1996, 2000, and 2001. Changes in sampling methodology of the charter boat fishery indicate that landings may have been historically overestimated by 25 percent to 30 percent for this sector (Van Voorhees, personal communication[1]).

Table 3.1.3.1. Recreational red snapper harvest vs. recreational quota (1990-2003 landings from Turner (2005); 2004-2005 landings from Patty Phares (personal communication[2]).

Year	Recreational Allocation/Quota	Recreational Harvest	Days Open
1990	No allocation was explicitly specified	1.34 MP	365
1991	1.96 MP	2.31 MP	365
1992	1.96 MP	3.93 MP	366
1993	2.94 MP	6.32 MP	365
1994	2.94 MP	5.03 MP	365
1995	2.94 MP	4.59 MP	365
1996	4.47 MP	3.89 MP	366
1997	4.47 MP (quota begins)	5.04 MP	330 (closed 11/27/97)
1998	4.47 MP	4.69 MP	272 (closed 9/30/98)
1999	4.47 MP	5.62 MP	240 (closed (8/29/99)
2000	4.47 MP (seasonal closure begins)	3.28 MP	194 (4/21/00 to 10/31/00)
2001	4.47 MP	3.89 MP	194 (4/21/01 to 10/31/01)
2002	4.47 MP	5.02 MP	194 (4/21/02 to 10/31/02)
2003	4.47 MP	4.80 MP	194 (4/21/03 to 10/31/03)
2004	4.47 MP	5.08 MP	194 (4/21/03 to 10/31/03)
2005	4.47 MP	4.59 MP	194 (4/21/03 to 10/31/03)

For-hire vessels are currently under a limited access system with respect to the issuance of new for-hire permits for fishing reef fish or coastal migratory pelagics. A total of 3,340 permits were issued under the moratorium, and they are associated with 1,779 vessels. Of these vessels, 1,561 have both reef fish and coastal migratory pelagics permits, 64 have only reef fish permits, and 154 have only coastal migratory pelagics permits. About one-third of Florida charter boats

[1] David Van Voorees, Marine Recreational Fisheries Statistics Survey, NMFS, Silver Springs, Maryland
[2] Patty Phares, Southeast Fisheries Science Center, NMFS, 75 Virginia Beach Drive Miami, Florida

targeted three or less species; two-thirds targeted five or less species; and 90 percent targeted nine or less species. About 40 percent of these charter boats did not target particular species. The species targeted by the largest proportion of Florida charter boats were king mackerel (46%), grouper (29%), snapper (27%), dolphin (26%), and billfish (23%). In the eastern Gulf, the species receiving the most effort were grouper, king mackerel, and snapper. About one-fourth of Florida headboats targeted three or less species; three-fourths targeted four or less species; and 80 percent targeted five or less species. About 60 percent of headboats did not target any particular species. The species targeted by the largest proportion of Florida headboats are snapper and other reef fish (35%), red grouper (29%), gag grouper (23%), and black grouper (16%). In the eastern Gulf, the species receiving the most effort were snapper, gag, and red grouper.

The majority of charter boats in Alabama, Mississippi, Louisiana, and Texas reported targeting snapper (91%), king mackerel (89%), cobia (76%), tuna (55%), and amberjack. The species receiving the largest percentage of effort by charter boats in the four-state area were snapper (49%), king mackerel (10%), red drum (6%), cobia (6%), tuna (5%), and speckled trout (5%). The majority of headboat/party boat operators reported targeting snapper (100%), king mackerel (85%), shark (65%), tuna (55%), and amberjack (50%). The species receiving the largest percentage of total effort by headboats/party boats in the four-state area were snapper (70%), king mackerel (12%), amberjack (5%), and shark (5%) (Sutton et al. 1999).

3.2 Description of the Shrimp Fishery

The FEIS for the original Shrimp FMP and the FMP as revised in 1981 contain a description of the Gulf shrimp fishery. In its appendix, the FEIS of February 1981 includes the Habitats, Distribution, and Incidental Capture of Sea Turtles. This material is incorporated by reference and is not repeated here in detail. Shrimp Amendment 9 (GMFMC 1997) which included an SEIS, updated this information. As an overview, the management unit of this FMP consists of brown, white, pink, and royal red shrimp. Seabobs and rock shrimp occur as incidental catch in the fishery.

Brown shrimp is the most important species in the U.S. Gulf fishery with principal catches made from June through October. Annual commercial landings in recent years range from approximately 61 to 103 million pounds of tails depending on environmental factors that influence natural mortality. The fishery extends offshore to about 40 fathoms.

White shrimp, second in value, are found in near shore waters to about 20 fathoms from Texas through Alabama. There is a small spring and summer fishery for overwintering individuals, but the majority is taken from August through December. Recent annual commercial landings range from approximately 36 to 71 million pounds of tails.

Pink shrimp are found off all Gulf states but are most abundant off Florida's west coast and particularly in the Tortugas grounds off the Florida Keys. Most landings are made from October through May with annual commercial landings ranging from approximately 6 to 19 million pounds of tails. In the northern and western Gulf states, pink shrimp are landed mixed with brown shrimp and are usually counted as browns. Most catches are made within 30 fathoms.

The commercial fishery for royal red shrimp has expanded in recent years with the development of local markets. This deep-water species is most abundant on the continental shelf from about 140 to 275 fathoms east of the Mississippi River. Thus far, landings have not reached the MSY, OY, or TAC (392,000 pounds of tails) in any year and have varied from approximately 200,000 to 300,000 pounds with a high of approximately 336,000 pounds in 1994.

The three principal species (penaeids) in the fishery are short-lived and provide annual crops; however, royal red shrimp live longer, and several year classes may occur on the grounds at one time. The condition of each shrimp stock is monitored annually, and none has been classified as being overfished for over 40 years.

Brown, white, and pink shrimp are subjected to fishing from inland waters and estuaries, through the state-regulated territorial seas, and into federal waters of the EEZ. Royal red shrimp occur only in the EEZ. Management measures implemented under the M-SFCMA apply only to federal waters in the EEZ. Cooperative management occurs when state and federal regulations are consistent. Examples are the seasonal closure off Texas, the Tortugas Shrimp Sanctuary, and the shrimp/stone crab seasonally closed zones off Florida.

The NMFS has classified commercial shrimp vessels comprising the near shore and offshore fleet into size categories from under 25 feet to over 85 feet. More than half fall into a size range from 56 to 75 feet.

Federal permits for shrimp vessels are currently required, and state license requirements vary. A moratorium on the federal permits was recently approved through Shrimp GMFMC (2005b). Many vessels maintain licenses in several states because of their migratory fishing strategy. The number of vessels in the fishery at any one time varies due to economic factors such as the price and availability of shrimp and cost of fuel. In addition to the federal shrimp vessel permits, the NMFS maintains two types of vessel files, both of which are largely dependent on port agent records. One is for vessels that are recorded as landing shrimp, the shrimp landings file (SLF); the other is the vessel operating units file (VOUF) that lists vessels observed at ports. The number of commercial vessels participating in the Gulf shrimp fishery is not known but approximately 2,951 vessels obtained a permit sometime within the period from implementation of Shrimp Amendment 11 (December 2002) and May 5, 2005. The NMFS estimates fishing effort independently from the number of vessels fishing. The NMFS uses the number of hours actually spent fishing from interview data with vessel captains to develop reports as 24-hour days fished. These estimates have been controversial and not well understood because the effort reported does not necessarily reflect the number of active vessels in the fleet.

Based on factors external to the fishery management arena, such as low shrimp prices, rising fuel costs, competition with imported products, and the impacts of recent hurricanes in the Gulf of Mexico, the size of the shrimp industry and its total effort has been substantially reduced (Table 3.2.1) since the benchmark 2001-2003 time period; as much as 50 percent for offshore waters of the Gulf of Mexico. This effort reduction reflects both a reduction in the number of vessels estimated to be participating in the fishery, and a reduction in the level of activity for those vessels remaining in the fishery. There are currently approximately 2,300 valid shrimp vessel permits as compared with 1990's estimates of 4,000 vessels identified in the SLF and VOUF. GMFMC (2005b) estimated the number of vessels participating in the offshore shrimp fishery will continue to decline until approximately 2012. Not only have a substantial number of vessels moved out of the fishery, a number of currently permitted vessels are not operating because high fuel costs and low shrimp prices make shrimping unprofitable. For example, preliminary estimates of effort during the Texas Closure period of 2005 (Table 3.2.2) for the western Gulf of Mexico, indicate continuing declines in effort, and these data were prior to the 2005 hurricanes. Offshore effort and landings for the May through August period in the western Gulf were about 30 percent lower than in 2004, and were from one-half to two-thirds of the effort for the same months during 2001 through 2003. The impacts of Hurricanes Katrina and Rita on the number of vessels that will likely be fishing in the near future are unknown, but it is expected that there will be a reduced number of active vessels at least in the short term.

Table 3.2.1. Total shrimp effort, in net-days fished for the offshore component of the shrimp fishery of the Gulf of Mexico. 1960-1980 - old method; 1981-2005 pooled method.

Old Method		New Method	
Year	Effort	Year	Effort
1960	95,745	1981	176,727
1961	94,118	1982	173,894
1962	92,003	1983	171,311
1963	106,040	1984	191,739
1964	117,481	1985	196,628
1965	117,156	1986	226,798
1966	127,756	1987	241,902
1967	131,712	1988	205,812
1968	127,383	1989	221,165
1969	155,545	1990	211,860
1970	152,189	1991	223,388
1971	146,914	1992	216,669
1972	168,730	1993	204,482
1973	145,970	1994	195,742
1974	148,325	1995	176,589
1975	121,598	1996	189,653
1976	154,650	1997	207,912
1977	174,135	1998	216,999
1978	205,843	1999	200,475
1979	221,956	2000	192,073
1980	185,702	2001	197,644
		2002	206,621
		2003	168,135
		2004	146,696
		2005	102,840
		2006	91,330

Table 3.2.2. Summary of offshore fishing effort for Louisiana (13-17) and Texas (18-21) during the Texas Closure period, 1991-2005 (Nance, personal communication).

Fishing Effort (1000 Days)

	Area 13 - 17			Area 18 - 21		
	May-June	**July**	**August**	**May-June**	**July**	**August**
1991	34.7	4.1	3.9	2.5	8.2	7.6
1992	22.2	7.0	5.2	1.7	8.7	8.6
1993	25.0	6.6	4.9	2.4	7.1	8.2
1994	24.1	5.9	3.7	1.9	7.0	9.3
1995	20.8	7.9	2.7	2.6	5.4	8.4
1996	18.8	9.4	5.6	3.0	3.8	10.0
1997	20.9	13.2	8.4	1.4	4.2	9.7
1998	13.6	3.7	3.2	1.0	3.9	8.5
1999	15.0	7.6	2.3	1.2	2.2	7.9
2000	19.2	4.6	4.3	1.9	6.3	9.8
2001	22.7	6.7	3.8	1.4	6.0	10.4
2002	24.2	8.3	1.8	1.5	3.0	8.8
2003	21.2	8.2	3.2	1.0	2.8	9.5
2004	13.3	6.8	1.4	1.2	1.7	9.1
2005	8.1	7.1	0.8	0.6	1.2	5.8

A recreational shrimp trawl fishery occurs seasonally and almost entirely in state waters. There are about 8,000 small boats participating using trawls up to 16 feet in width. About half the boats are licensed in Louisiana.

Bait landings of juvenile brown, pink, and white shrimp, occur in all states and are not routinely included in the NMFS statistics. Estimates from the original FMP suggest landings of about 5 MP (whole weight) in 1980.

Various types of gear are used to capture shrimp including, but not limited to, cast nets, haul seines, stationary butterfly nets, wing nets, skimmer nets, traps, and beam trawls. The otter trawl with various modifications, is the dominant gear used in offshore waters. A basic otter trawl consists of a heavy mesh bag with wings on each side designed to funnel the shrimp into the codend or tail. A pair of otter boards or trawl doors positioned at the end of each wing holds the mouth of the net open by exerting a downward and outward force at towing speed.

The two basic otter trawl designs used by the Gulf shrimp fleet are the flat and the semi-balloon trawls (Klima and Ford 1970). The mouth of the flat trawl is rectangular in shape, whereas the mouth of the semi-balloon design forms a pronounced arch when in operation.

Try nets are small otter trawls about 12 to 16 feet in width that are used to test areas for shrimp concentrations. These nets are towed during regular trawling operations and lifted periodically to allow the fishermen to assess the amount of shrimp and other fish and shellfish being caught. These try net tows in turn determine the length of time the large trawls will remain set or whether more favorable locations will be selected.

Until the late 1950s, most shrimp vessels pulled single otter trawls ranging from 80 to 100 feet in width (Idyll 1963). Double-rig trawling was introduced into the shrimp fleet during the late 1950s. The single large trawl was replaced by two smaller trawls, each 40 to 50 feet in width, towed simultaneously from stoutly constructed outriggers located on the port and starboard sides of the vessel. The port trawl was towed about 150 feet behind of the starboard trawl to prevent fouling. The advantages of double-rig trawling include: (1) increased CPUE, (2) fewer handling problems with the smaller nets, (3) lower initial gear costs, (4) a reduction in costs associated with damage or loss of the nets, and (5) greater crew safety (Idyll 1963).

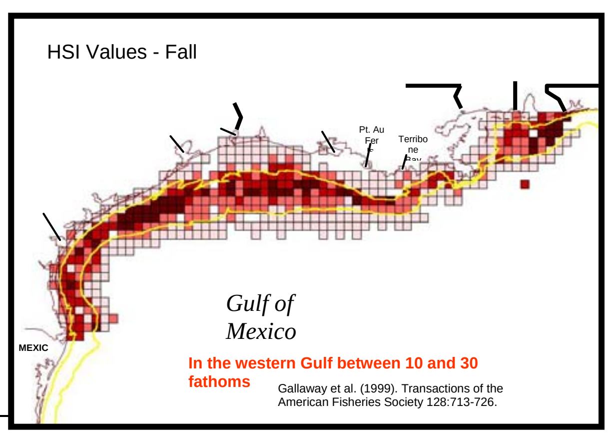
In 1972, the quad rig was introduced in the shrimp fishery, and by 1976 it became widely used in the EEZ of the western Gulf. The quad rig consists of a twin trawl pulled from each outrigger. One twin trawl typically consists of two 40-foot trawls connected to a center sled and spread by two outside trawl doors. Thus, the quad rig with two twin trawls has a total spread of 160 feet versus the total spread of 110 feet in the old double rig of two 55-foot trawls. The quad rig has less drag and is more fuel-efficient. For some designs, a lower opening reduces fish bycatch (David Harrington, personal communication[3]).

Although the industry continuously works to develop more efficient gear designs and fishing methods, the quad rig is still the primary gear used in federal waters. In recent years, the skimmer trawl has become a major gear of the inshore shrimp fishery in the northern Gulf.

3.2.1 Relationship between the Shrimp Fishery and Red Snapper

Fishery-independent, habitat-related density data are available for age 0 and age 1 red snapper in the western Gulf of Mexico, the main range for the red snapper population. Catch-per-unit-effort (CPUE) data and associated environmental data have been collected by NMFS in the western Gulf of Mexico on a consistent regional and seasonal basis since 1985. Galloway et al. (1999) analyzed these data and mapped habitat utilization patterns of juvenile red snapper (Figure 3.2.1.1), which clearly illustrated the majority of this habitat occurs in the 10 to 30-fathom depth zones of the western Gulf of Mexico.

Figure 3.2.1.1: Habitat suitability for juvenile red snapper densities (by depth) in the western Gulf. Depth contour lines represent 10 and 30 fathom boundaries.



[3] David Harrington, Marine Extension, University of Georgia, Brunswick, Georgia (deceased)

This zone of high red snapper abundance was determined based on random sampling across all habitats. Shrimp trawling is not random but rather targets areas where shrimp catch is likely to be high. Therefore, fishery-dependent data are necessary to determine if the 10- to 30-fathom depth zone of the western Gulf is also characterized by the highest juvenile red snapper bycatch rates in the shrimp fishery. Analysis of the observer data collected by NMFS and the Gulf and South Atlantic Fisheries Foundation, Inc. confirm that catch rates of juvenile red snapper are highest at depths between 10 and 30 fathoms in the western Gulf (Figure 3.2.1.2). Mean annual catch rate at these depths was on the order of 3.3 fish per hour trawled, whereas the mean annual catch rate in water <10 fathoms was only about 0.5 fish per hour. The catch rates at depths >30 fathoms was on the order of about 1.0 fish per hour.

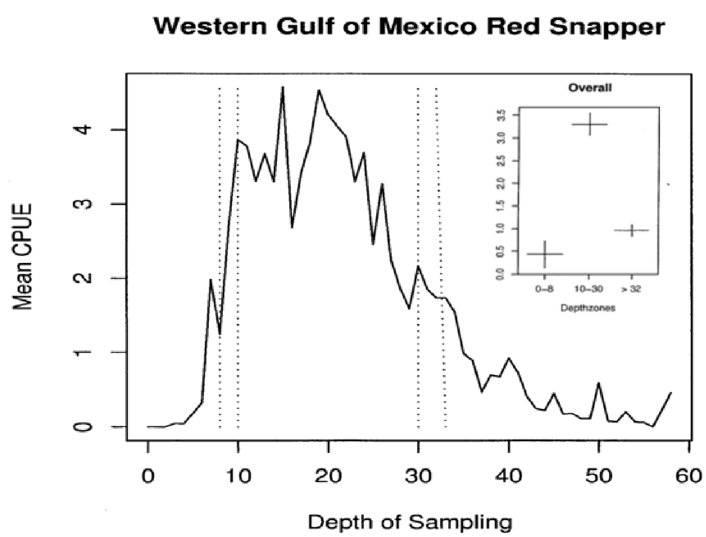


Figure 3.2.1.2: Distribution of juvenile red snapper CPUE by depth (from Gallaway presentations to GMFMC).

According to the best available landings data, of the 2,666 vessels expected to qualify for federal Gulf shrimp moratorium permits, 2,264 were found to have at least some shrimp landings from the Gulf in 2002 (GMFMC 2005b). In 2005, this figure fell to 1,806 vessels. However, many of these 1,806 vessels were only active prior to the intense hurricane season in 2005. Even though catch rates were historically high in the months of October-December, the number of active, qualifying vessels was only 1,208 during the quarter. In addition, of those 1,806 vessels active during 2005, the U.S. Coast Guard reports that nearly 150 of them were damaged and not salvaged following the 2005 hurricane season. These figures suggest that effort and participation in the fishery are continuing to decline, and that the fleet was severely impacted by the hurricanes of 2005.

In addition, NMFS estimates effort in the fishery will continue to decline because of the continuing economic impacts associated with stagnant and low shrimp prices and rising fuel costs, and the impacts of the 2005 hurricane season. Effort in 2006 was less than the effort documented for 2005. Not only has effort in general been in decline, effort is also moving away from the area of high red snapper abundance (Figure 3.2.1.3). A Shrimp Effort Working Group (SEWG) documented that in 2005, effort shifted to more nearshore waters, in an attempt to reduce fuel costs associated with running offshore and trawling in deeper waters. This trend toward increasing effort in nearshore waters (inshore of the 10 fathom contour), and decreasing effort in deeper water is likely to continue. Effort in the 10 to 30-fathom depth zone has declined by 58 percent since the benchmark years of 2001-2003 and was 65 percent lower than the benchmark years in 2006. This effort shift reduces pressure on red snapper as juveniles are not found in abundance inshore of the 10 fathom contour (Gallaway et al. 1998). It is reasonable to expect the effort in 2007 to be similar, especially in the 10 to 30-fathom depth zone.

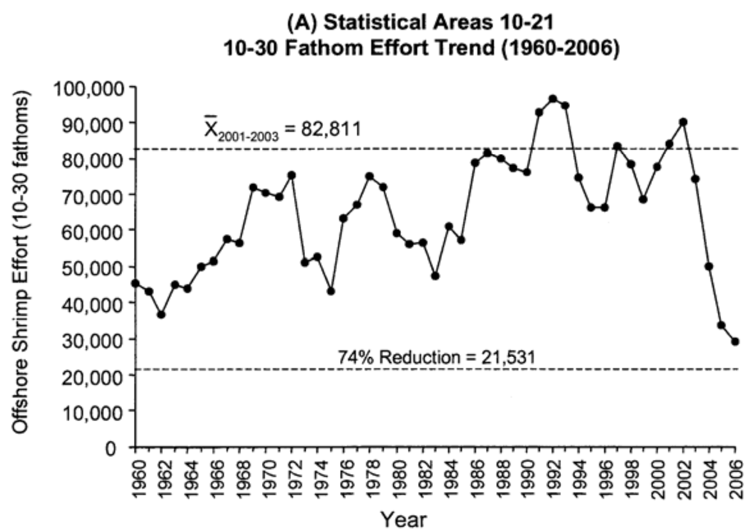


Figure 3.2.1.3: Shrimp Effort in the 10 to 30-Fathom Depth Zone

3.3 Description of the Affected Physical Environment

The physical environment for reef fish, including red snapper, and shrimp has been described in detail in the EIS for the Generic Essential Fish Habitat Amendment and is incorporated here by reference (GMFMC 2004c). The Gulf has a total area of approximately 600,000 square miles (1.5 million km2), including state waters (Gore 1992). It is a semi-enclosed, oceanic basin connected to the Atlantic Ocean by the Straits of Florida and to the Caribbean Sea by the Yucatan Channel. Oceanic conditions are primarily affected by the Loop Current, the discharge of freshwater into the Northern Gulf, and a semi-permanent, anticyclonic gyre in the western Gulf. Gulf water temperatures range from 12º C to 29º C (54º F to 84º F) depending on time of year and depth of water. In the Gulf, adult red snapper are found in submarine gullies and depressions; over coral reefs, rock outcrops, and gravel bottoms; and are associated with oilrigs and other artificial structures (GMFMC, 2004c). Adult penaeid shrimp are found in nearshore and offshore silt, mud, and sand bottoms while juveniles are found inhabiting estuaries.

Environmental Sites of Special Interest Relevant to Red Snapper and Penaeid Shrimp (Figure 3.3.1)

Cooperative Texas Shrimp Closure– A shrimp nursery ground off Texas cooperatively closed by the Council and the state of Texas for 45 to 60 days out to either 15 or 200 miles. The closure results in shrimp growing to approximately 39 count/pound (5,474 square nautical miles).

Tortugas Shrimp Sanctuary - A shrimp nursery ground in the Florida Keys permanently closed to use of trawls and harvest or possession of shrimp. Results in shrimp growing to about 47 count/pound before harvest (3,652 square nautical miles).

Southwest Florida Seasonal Closure (Shrimp/Stone Crab) - Closure of federal and state waters to shrimping from November 1 through May 20 inshore of the boundary to protect juvenile stone crab and prevent loss of stone crab traps in trawls (4,051 square nautical miles).

Central Florida Shrimp/StoneCrab Separation Zones - Closure of state and federal waters to either shrimping or crabbing from October 5 to May 20. Crab or shrimp fishing alternate in Zones IV and V (174 square nautical miles).

Longline/Buoy Gear Area Closure - Permanent closure to use of these gears for reef fish harvest inshore of 20 fathoms off the Florida shelf and inshore of 50 fathoms for the remainder of the Gulf (72,300 square nautical miles).

Madison/Swanson and Steamboat Lumps Marine Reserves - No-take marine reserves sited on gag spawning aggregation areas where all fishing except for surface trolling during May through October is prohibited (219 square nautical miles).

Tortugas North and South Marine Reserves - No-take marine reserves cooperatively implemented by the state of Florida, National Ocean Service (NOS), the Council, and the National Park Service (see jurisdiction on chart) (185 square nautical miles). In addition, Generic Amendment 3 for addressing EFH requirements, Habitat Areas of Particular Concern (HAPC), and adverse effects of fishing in the following FMPs of the Gulf: Shrimp, Red Drum, Reef Fish, Stone Crab, Coral and Coral Reefs in the Gulf and Spiny Lobster and the Coastal Migratory Pelagic resources of the Gulf and South Atlantic (GMFMC 2005a) prohibited the use of anchors in these HAPCs.

Individual reef areas and bank HAPCs of the northwestern Gulf including: East and West Flower Garden Banks, Stetson Bank, Sonnier Bank, MacNeil Bank, 29 Fathom, Rankin Bright Bank, Geyer Bank, McGrail Bank, Bouma Bank, Rezak Sidner Bank, Alderice Bank, and Jakkula Bank - Pristine coral areas protected by preventing use of some fishing gear that interacts with the bottom (263.2 square nautical miles). Subsequently, some of these areas were made a marine sanctuary by NOS and this marine sanctuary is currently being revised. 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 the significant coral resources on Stetson Bank.

Florida Middle Grounds HAPC - Pristine soft coral area protected from use of any fishing gear interfacing with bottom (348 square nautical miles).

Pulley Ridge HAPC - A portion of the HAPC 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 (2,300 square nautical miles).

Stressed Areas for Reef Fish - Permanent closure Gulf-wide of the near shore waters to use of fish traps, power heads, and roller trawls (i.e., “rock hopper trawls”) (48,400 square nautical miles).

Alabama Special Management Zone (SMZ) - In the Alabama SMZ, fishing by a vessel 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, is limited to hook-and-line gear with no more than 3 hooks. Nonconforming gear is restricted to bag limits, or for reef fish without a bag limit, to 5 percent by weight of all fish aboard.

Additionally, Generic Amendment 3 for addressing EFH requirements (GMFMC 2005a) requires a weak link in the tickler chain of bottom trawls on all habitats throughout the Gulf EEZ. 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. Also, the amendment establishes an education program on the protection of coral reefs when using various fishing gears in coral reef areas for recreational and commercial fishermen.

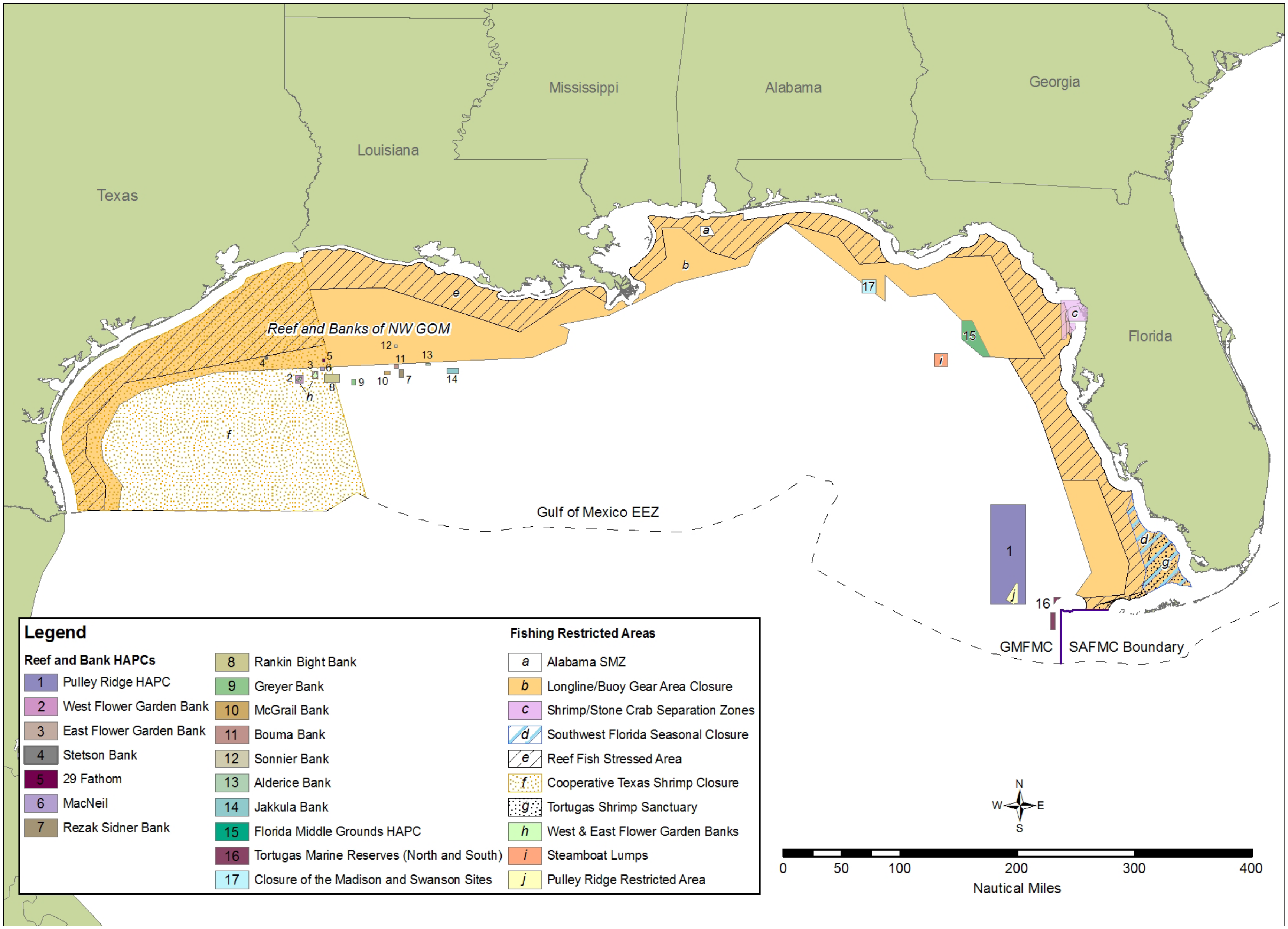


Figure 3.3.1 Map of most fishery management closed areas in the Gulf of Mexico

3.4 Description of the Affected Biological Environment

The biological environment of the Gulf of Mexico, including the species addressed in this amendment, is described in detail in the final EIS for the Generic Essential Fish Habitat amendment and is incorporated here by reference (GMFMC 2004c).

3.4.1 Red Snapper and Reef Fish

3.4.1.1 Red Snapper Life History and Biology

Red snapper demonstrate the typical reef fish life history pattern (Table 4.1). Eggs and larvae are pelagic while juveniles are found associated with bottom features or over barren bottom. Spawning occurs over firm sand bottom with little relief away from reefs during the summer and fall. Adult females mature as early as 2 years and most are mature by 4 years (Schirripa and Legault 1999). Red snapper have been aged up to 57 years, but most caught by the directed fishery are 2- to 4-years old (Wilson and Nieland 2001). A more complete description of red snapper life history can be found in the Council's EFH EIS (GMFMC 2004c)

3.4.1.2 Status of the Red Snapper Stock

The current red snapper rebuilding plan approved in Amendment 22 was based on the 1999 stock assessment (Schirripa and Legault 1999), which concluded red snapper continue to be overfished and undergoing overfishing. This assessment linked the fishing mortality rates associated with the directed and shrimp trawl bycatch component of the red snapper fishery, and required both rates be reduced proportionally to maximize yield. The estimates of biomass at maximum sustainable yield (MSY) produced by the assessment were highly uncertain and much higher than historical yields (GMFMC 2004a). The assessment's conclusions of stock status were greatly affected by assumptions about the stock-recruitment relationship, juvenile natural mortality rates, and fishery selectivity. Because of these uncertainties, the assessment recommended a range of stock status values linked to stock productivity, acknowledging future changes in fishery selectivity assumptions would allow more realistic estimates of MSY to be developed.

The most recent red snapper stock assessment (Porch 2004; SEDAR 7 2005), completed in 2005, was based on a different model than that employed in the 1999 assessment. This new model (CATCHEM) was a generalization of the previous approach, and was selected by the SEDAR panel because it allowed for more flexibility and greater mathematical rigor than other models (SEDAR 7 2005). For continuity, the 1999 stock assessment model was updated and re-run, but found to be unstable and sensitive to various model parameters. In contrast, the CATCHEM model fit most data well, and produced stock productivity estimates which were much less sensitive than those provided by past assessments (SEDAR 7 2005).

Several key changes were made in the 2005 assessment, which resulted in significant differences in red snapper stock status parameter estimates relative to past assessments. These included incorporation of an ultra-historic time series of landings data, separation of red snapper into eastern and western stocks, higher assumed natural mortality rates for age-0 and age-1 red snapper, higher estimates of discard mortality in the directed fishery, and de-linked directed and shrimp trawl fishing mortality selectivities. The use of an ultra-historic landings time series allowed for greater data contrast and better fitting of model parameters. Modeling separate eastern and western stocks allowed for incorporation of differing life history characteristics of red snapper living east and west of the Mississippi River (Cowan et al. 2002; Fischer et al. 2004). Increased natural mortality rates for juvenile red snapper reduced the bycatch fishing mortality rates attributed to the shrimp trawl fishery, as more juvenile red snapper were assumed to die from natural causes. Higher discard mortality estimates in the directed fishery increased the mortality rate attributed to that fishery. Finally, de-linking fishing mortality selectivities allowed for examination of a greater range of MSY estimates.

Overall, the 2005 assessment concluded the red snapper stock remains overfished and is undergoing overfishing. These conclusions are consistent with those of past assessments, despite changes in methodology and status determination criteria (SEDAR 7 2005). According to the assessment, red snapper fishing mortality rates are too high in both the directed and shrimp fisheries. While the directed fishery contributes a greater portion of fishing mortality than previously thought because of higher juvenile natural mortality estimates and directed fishery release mortality rates of regulatory discards, shrimp trawl bycatch of red snapper remains a significant source of mortality in the western Gulf. Recovery of the red snapper in the western Gulf is more sensitive to reductions in shrimp trawl fishing mortality, whereas recovery of red snapper in the eastern Gulf is more sensitive to reductions in recreational fishing mortality and bycatch. Catch in numbers of fish is dominated by shrimp trawl bycatch, mainly consisting of age-0 and age-1 red snapper (SEDAR 7 2005). The shrimp fishery annually removes 25-45 million red snapper, whereas the directed fisheries land on average 3-4 million red snapper and discard dead an additional 1.8-2.1 million red snapper. In terms of weight, the directed fishery harvests approximately 9 MP annually, while the shrimp fishery discards approximately 2-5 MP of red snapper annually.

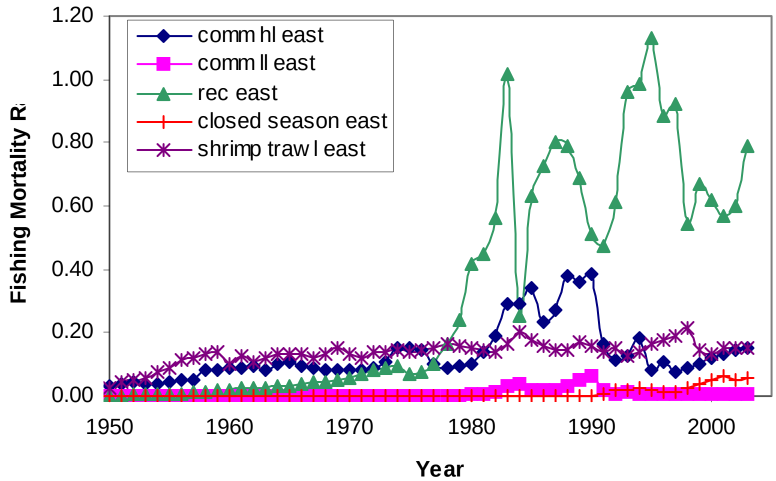
The assessment model estimated fishing mortality rates for 10 fleets: commercial handline east and west, commercial longline east and west, recreational east and west, closed season east and west, and shrimp trawl east and west. Figure 3.4.1. summarizes trends in fishing mortality since 1950. The recreational fishery accounts for the greatest source of fishing mortality in the eastern Gulf. Recreational fishing mortality rates have been at or above 0.6 since the mid-1980s. Fishing mortality rates for other fleets in the eastern Gulf have been at or below 0.2 throughout the last decade. In the western Gulf, the shrimp trawl fishery and the commercial handline fishery represent the greatest sources of red snapper mortality. Shrimp trawl fishing mortality rates peaked in the late 1980s near 0.9, but have declined thereafter (F = 0.57 in 2003). In recent years (post-assessment), fishing mortality rates have likely declined even further because of reduced shrimp effort due to high fuel prices, competition from imports, and impacts of the 2005 hurricane season. In contrast, fishing mortality rates in the western Gulf commercial handline fishery increased through 2002 to 0.5, but then dropped to 0.34 in 2003. Recreational fishing mortality rates in the western Gulf have declined from a peak in the mid-1980s of 0.57 to near 0.11 in 2003.

Red snapper spawner abundance relative to unfished conditions (S/So – proxy for SPR) has slightly increased in both the eastern and western Gulf since the early 1990s. Spawner abundance in 2003 relative to unfished levels was 1.5 percent for the entire Gulf, 3.2 percent for the eastern Gulf, and 1.1 percent for the western Gulf (SEDAR 7 2005). The Council has adopted a preliminary objective of rebuilding red snapper to levels between 20 to 35 percent SPR; the SPR at MSY is 26 percent. Reductions in fishing mortality rates across all fisheries (directed, closed season, and shrimp trawl) necessary to rebuild red snapper to these SPR levels range from 68-80 percent. The maximum allowable biological catch that would allow the Gulf-wide stock to attain the expected $F_{30\%SPR}$ trajectory by 2012 is 7 MP (Thompson 2005). A 7 MP TAC would end overfishing by 2009 (assuming fishing mortality across all sources can be reduced to F_{MSY} levels), which is consistent with the Council's approved rebuilding plan (GMFMC 2004a). Lower TACs would end overfishing sooner, allowing the stock to recover faster (Thompson 2005).

The assessment indicated recruitment increased noticeably after 1980 in both the eastern and western Gulf. During this time recruitment was above the long-term average level, despite estimated spawning stock biomass levels much lower than historical levels. The SEDAR review panel did not recommend using the long-term spawner-recruit relationship to predict future recruitment. Rather, it was recommended average recruitment between 1984 and 2003 be used for stock projections. The SEDAR review panel considered recruitment the greatest source of uncertainty in stock projections. The SEDAR review panel also noted biomass benchmarks remained highly uncertain and were contingent on management strategies and allocation decisions made by the Council. Recognizing the problems inherent in managing red snapper and estimating benchmarks, the SEDAR report recommended fishery managers focus attention on "short term (5-10 years) directions of management advice, and how to tend toward a more desired state, without unduly emphasizing specific targets and how to attain them (SEDAR 2004)."

The MSY estimates produced by the 2005 assessment are significantly less than those produced by the 1999 assessment, and vary greatly based on the level of directed and shrimp trawl fishery bycatch reduction. Under a scenario of 0 to 60 percent additional bycatch reduction in the shrimp fishery and no additional bycatch reduction in the directed fishery, MSY is estimated to range from 11.3 to 20.0 MP (Thompson 2005). Conversely under the most optimistic bycatch reduction scenarios ($F_{20\%SPR}$ to $F_{35\%SPR}$), MSY is estimated to be 24.7 to 25.4 MP, if fishing mortality across all fisheries can be reduced by approximately 68-80 percent (Thompson 2005). Thus, MSY can be expressed as ranging from 11 to 25 MP. Estimates on the lower end of the range are undesirable and unlikely since economic factors and measures under development by the Council are expected to reduce bycatch. Conversely, estimates at the upper end of the MSY range may be unrealistic since they assume potentially impracticable levels of bycatch reduction in both the directed and shrimp trawl fishery. Optimal MSY levels likely lie within this range and are contingent on practicable levels of bycatch reduction in both the shrimp trawl and directed red snapper fishery.

Future assessments and management plans may require redefining MSY contingent on various levels of directed fishery and shrimp trawl bycatch. Currently, efforts are underway to determine optimal levels of effort to produce MSY and maximum economic yield (MEY) in the shrimp fishery. MSY and MEY estimates for shrimp may not be consistent with levels needed to rebuild red snapper, requiring managers to balance the tradeoffs of optimizing yield in one fishery potentially at the expense of the other fishery.



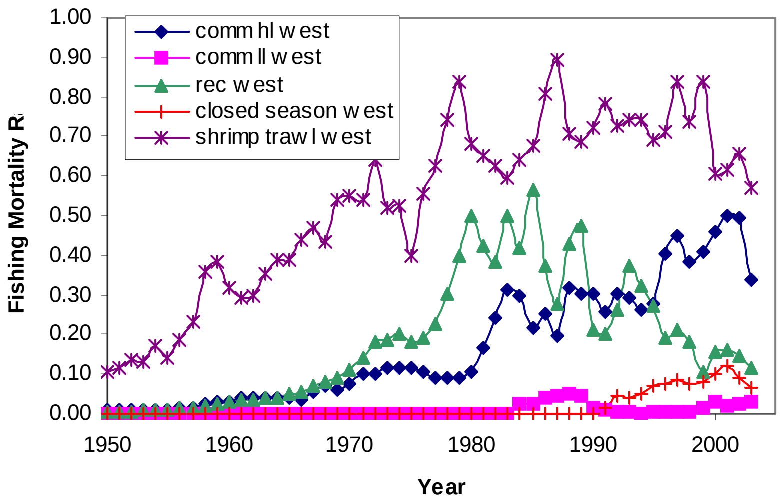


Figure 3.4.1.2. Trends in red snapper fishing mortality rate for the most vulnerable age-class for each fishing fleet modeled.

3.4.1.3 General Information on Reef Fish Species

The National Ocean Service (NOS) of NOAA collaborated with NMFS and the Council to develop distributions of reef fish (and other species) in the GOM (SEA 1998). NOS obtained fishery-independent data sets for the GOM, including 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 >25). NOS staff analyzed the data to determine relative abundance of the mapped species by estuary, salinity zone, and month. For some species not in the ELMR 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 GOM, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages are summarized in Table 3.4.1 and can be found in more detail in GMFMC (2004c). 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 (SAV). Juvenile and adult reef fish are typically demersal, and are usually associated with bottom topographies on the continental shelf (<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 off Texas through Alabama. Also, some juvenile snappers (e.g. mutton, gray, red, dog, lane, and yellowtail snappers) and groupers (e.g. goliath grouper, red, gag, and yellowfin groupers) have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems (GMFMC 1981). More detail on hard bottom substrate and coral can be found in the FMP for Corals and Coral Reefs (GMFMC and SAFMC 1982).

Table 3.4.1. Summary of habitat utilization by life history stage for species most species in the Reef Fish FMP. This table is adapted from Table 3.2.7 in the final draft of the EIS from the Council's EFH generic amendment (GMFMC 2004c).

Scientific name	Eggs	Larvae	Post-larvae	Early Juveniles	Late juveniles	Adults	Spawning adults
Red snapper	Pelagic	Pelagic		Hard bottoms, Sand/ shell bottoms, Soft bottoms	Hard bottoms, Sand/ shell bottoms, Soft bottoms	Hard bottoms, Reefs	Sand/ shell bottoms
Queen snapper	Pelagic	Pelagic				Hard bottoms	
Mutton snapper	Reefs	Reefs	Reefs	Mangroves, Reefs, SAV, Emergent marshes	Mangroves, Reefs, SAV, Emergent marshes	Reefs, SAV	Shoals/ Banks, Shelf edge/slope
Schoolmaster	Pelagic	Pelagic		Mangroves, SAV	Hard bottoms, Mangroves, Reefs, SAV, Emergent marshes	Hard bottoms, Reefs, SAV	Reefs
Blackfin snapper	Pelagic			Hard bottoms	Hard bottoms	Hard bottoms, Shelf edge/slope	Hard bottoms, Shelf edge/slope
Cubera snapper	Pelagic			Mangroves, Emergent marshes, SAV	Mangroves, Emergent marshes, SAV	Mangroves, Reefs	Reefs
Gray (mangrove) snapper	Pelagic, Reefs	Pelagic, Reefs	SAV	Mangroves, Emergent marshes, Seagrasses	Mangroves, Emergent marshes, SAV	Emergent marshes, Hard bottoms, Reefs, Sand/ shell bottoms, Soft bottoms	
Dog snapper	Pelagic	Pelagic		SAV	Mangroves, SAV	Reefs, SAV	Reefs
Mahogany snapper	Pelagic	Pelagic		Reefs, Sand/ shell bottoms	Reefs, Sand/ shell bottoms	Hard bottoms, Reefs, Sand/ shell bottoms, SAV	
Lane snapper	Pelagic		Reefs, SAV	Mangroves, Reefs, Sand/ shell bottoms, SAV, Soft bottoms	Mangroves, Reefs, Sand/ shell bottoms, SAV, Soft bottoms	Reefs, Sand/ shell bottoms, Shoals/ Banks	Shelf edge/slope
Silk snapper						Shelf edge	
Yellowtail snapper	Pelagic			Mangroves, SAV, Soft bottoms	Reefs	Hard bottoms, Reefs, Shoals/ Banks	

Scientific name	Eggs	Larvae	Post-larvae	Early Juveniles	Late juveniles	Adults	Spawning adults
Wenchman	Pelagic	Pelagic				Hard bottoms, Shelf edge/slope	Shelf edge/slope
Vermilion snapper	Pelagic			Hard bottoms, Reefs	Hard bottoms, Reefs	Hard bottoms, Reefs	
Gray triggerfish	Reefs	Drift algae	Drift algae	Drift algae, Mangroves	Drift algae, Mangroves, Reefs	Reefs, Sand/ shell bottoms	Reefs, Sand/ shell bottoms
Greater amberjack	Pelagic	Pelagic	Pelagic	Drift algae	Drift algae	Pelagic, Reefs	Pelagic
Lesser amberjack				Drift algae	Drift algae	Hard bottoms	Hard bottoms
Almaco jack	Pelagic			Drift algae	Drift algae	Pelagic	Pelagic
Banded rudderfish		Pelagic		Drift algae	Drift algae	Pelagic	Pelagic
Hogfish				SAV	SAV	Hard bottoms, Reefs	Reefs
Blueline tilefish	Pelagic	Pelagic				Hard bottoms, Sand/ shell bottoms, Shelf edge/slope, Soft bottoms	
Tilefish	Pelagic, Shelf edge/ slope	Pelagic		Hard bottoms, Shelf edge/slope, Soft bottoms	Hard bottoms, Shelf edge/slope, Soft bottoms	Hard bottoms, Shelf edge/slope, Soft bottoms	
Dwarf sand perch					Hard bottoms	Hard bottoms, Soft bottoms	
Sand perch						Reefs, SAV, Shoals/ Banks, Soft bottoms	
Rock hind	Pelagic	Pelagic				Hard bottoms, Reefs	Hard bottoms, Reefs
Speckled hind	Pelagic	Pelagic				Hard bottoms, Reefs	Shelf edge/slope
Yellowedge grouper	Pelagic	Pelagic			Hard bottoms	Hard bottoms	
Red hind	Pelagic	Pelagic		Reefs	Reefs	Hard bottoms, Reefs, Sand/ shell bottoms	Hard bottoms
Goliath grouper	Pelagic	Pelagic	Man-groves	Mangroves, Reefs, SAV	Hard bottoms, Mangroves, Reefs, SAV	Hard bottoms, Shoals/ Banks, Reefs	Reefs, Hard bottoms
Red grouper	Pelagic	Pelagic		Hard bottoms, Reefs, SAV	Hard bottoms, Reefs	Hard bottoms, Reefs	

Scientific name	Eggs	Larvae	Post-larvae	Early Juveniles	Late juveniles	Adults	Spawning adults
Misty grouper	Pelagic	Pelagic				Hard bottoms, Shelf edge/slope	Hard bottoms
Warsaw grouper	Pelagic	Pelagic			Reefs	Hard bottoms, Shelf edge/slope	
Snowy grouper	Pelagic	Pelagic		Reefs	Reefs	Hard bottoms, Reefs, Shelf edge/slope	
Nassau grouper		Pelagic		Reefs, SAV		Hard bottoms, Reefs, Sand/ shell bottoms	Hard bottoms, Reefs, Sand/ shell bottoms
Black grouper	Pelagic	Pelagic		SAV	Hard bottoms, Reefs	Hard bottoms, Mangroves, Reefs	
Yellowmouth grouper	Pelagic	Pelagic		Mangroves	Mangroves, Reefs	Hard bottoms, Reefs	
Gag	Pelagic	Pelagic		SAV	Hard bottoms, Reefs, SAV	Hard bottoms, Reefs	
Scamp	Pelagic	Pelagic		Hard bottoms, Mangroves, Reefs	Hard bottoms, Mangroves, Reefs	Hard bottoms, Reefs	Reefs, Shelf edge/slope
Yellowfin grouper				SAV	Hard bottoms, SAV	Hard bottoms, Reefs	Hard bottoms

3.4.1.4 Status of Reef Fish Stocks

The Reef Fish FMP currently encompasses 42 species (Table 3.4.1.4.1). Stock assessments have been conducted on 11 species: red snapper (SEDAR 7 2005), vermilion snapper (Porch and Cass-Calay 2001; SEDAR 9 2006a), yellowtail snapper (Muller et al. 2003; SEDAR 3 2003), gray triggerfish (Valle et al. 2001; SEDAR 9 2006b), greater amberjack (Turner et al. 2000; SEDAR 9 2006c), hogfish (Ault et al. 2003; SEDAR 6 2004a), red grouper (NMFS 2002a), gag (Turner et al. 2001; SEDAR 10 2006), yellowedge grouper (Cass-Calay and Bahnick 2002), and goliath grouper (Porch et al. 2003; SEDAR 6 2004b). A review of the Nassau grouper's stock status was conducted by Eklund (1994), and updated estimates of generation times were developed by Legault and Eklund (1998). A new stock assessment for red grouper will be conducted within the next year.

Of the 11 species for which stock assessments have been conducted, the 2005 Report to Congress on the Status of the U.S. Fisheries (NMFS 2006c) classifies five as overfished (greater amberjack, red snapper, vermilion snapper, goliath grouper, and Nassau grouper), and 4 as undergoing overfishing (red snapper, vermilion snapper, red grouper, and greater amberjack). The recent assessment for vermilion snapper (SEDAR 9 2006a) indicates this species is not overfished or undergoing overfishing. Recent assessments for gray triggerfish and gag (SEDAR 9 2006b and SEDAR 10 2006, respectively) suggest these two species are experiencing overfishing, and stock recovery for greater amberjack is occurring slower than anticipated. The Council is considering amendments to address overfishing for gag, gray triggerfish, and greater amberjack. Many of the stock assessments and stock assessment reviews can be found on the Council (www.gulfcouncil.org) and SEDAR (www.sefsc.noaa.gov/sedar) Websites.

Table 3.4.1.4.1. Species of the reef fish FMP. Species in bold have had stock assessments. *Deep-water groupers (Note: if the shallow-water grouper quota is filled, then scamp are considered a deep-water grouper) **Protected groupers

Common Name	Scientific Name	Stock Status
	Balistidae--Triggerfishes	
Gray triggerfish	***Balistes capriscus***	**Not overfished, overfishing**
	Carangidae--Jacks	
Greater amberjack	***Seriola dumerili***	**Overfished, overfishing**
Lesser amberjack	*Seriola fasciata*	Unknown
Almaco jack	*Seriola rivoliana*	Unknown
Banded rudderfish	*Seriola zonata*	Unknown
	Labridae--Wrasses	
Hogfish	***Lachnolaimus maximus***	**Unknown**
	Lutjanidae--Snappers	
Queen snapper	*Etelis oculatus*	Unknown
Mutton snapper	*Lutjanus analis*	Unknown
Schoolmaster	*Lutjanus apodus*	Unknown
Blackfin snapper	*Lutjanus buccanella*	Unknown
Red snapper	***Lutjanus campechanus***	**Overfished, overfishing**
Cubera snapper	*Lutjanus cyanopterus*	Unknown
Gray (mangrove) snapper	*Lutjanus griseus*	Unknown
Dog snapper	*Lutjanus jocu*	Unknown
Mahogany snapper	*Lutjanus mahogoni*	Unknown
Lane snapper	*Lutjanus synagris*	Unknown
Silk snapper	*Lutjanus vivanus*	Unknown
Yellowtail snapper	***Ocyurus chrysurus***	**Not overfishing, not overfished**
Wenchman	*Pristipomoides aquilonaris*	Unknown
Vermilion snapper	***Rhomboplites aurorubens***	**Not overfished, not overfishing**
	Malacanthidae--Tilefishes	
Goldface tilefish	*Caulolatilus chrysops*	Unknown
Blackline tilefish	*Caulolatilus cyanops*	Unknown
Anchor tilefish	*Caulolatilus intermedius*	Unknown
Blueline tilefish	*Caulolatilus microps*	Unknown
(Golden) Tilefish	*Lopholatilus chamaeleonticeps*	Unknown
	Serranidae--Groupers	
Dwarf sand perch	*Diplectrum bivittatum*	Unknown
Sand perch	*Diplectrum formosum*	Unknown
Rock hind	*Epinephelus adscensionis*	Unknown
Yellowfin grouper	*Mycteroperca venenosa*	Unknown
Scamp	*Mycteroperca phenax*	Unknown
Red hind	*Epinephelus guttatus*	Unknown
****Goliath grouper**	***Epinephelus itajara***	**Overfished, not overfishing**
****Nassau grouper**	***Epinephelus striatus***	**Overfished, not overfishing**
Red grouper	***Epinephelus morio***	**Not overfished, overfishing**
Gag	***Mycteroperca microlepis***	**Unknown, overfishing**
Yellowmouth grouper	*Mycteroperca interstitialis*	Unknown
Black grouper	*Mycteroperca bonaci*	Unknown
***Yellowedge grouper**	***Epinephelus flavolimbatus***	**Unknown**
*Snowy grouper	*Epinephelus niveatus*	Unknown
*Warsaw grouper	*Epinephelus nigritus*	Unknown
*Misty grouper	*Epinephelus mystacinus*	Unknown
*Speckled hind	*Epinephelus drummondhayi*	Unknown

3.4.2 Shrimp

3.4.2.1 Penaeid Shrimp Life History and Biology

Brown, white, and pink shrimp use a variety of habitats as they grow from planktonic larvae to spawning adults (GMFMC 1981). Brown shrimp eggs are demersal and occur offshore. The larvae occur offshore and begin to migrate to estuaries as postlarvae. Postlarvae migrate through passes on flood tides at night mainly from February - April with a minor peak in the fall. Postlarvae and juveniles are common to highly abundant in all U.S. estuaries from Apalachicola Bay in the Florida panhandle to the Mexican border. In estuaries, brown shrimp postlarvae and juveniles are associated with shallow vegetated habitats but also are found over silty sand and non-vegetated mud bottoms. Adult brown shrimp occur in neritic Gulf waters (i.e., marine waters extending from mean low tide to the edge of the continental shelf) and are associated with silt, muddy sand, and sandy substrates. More detailed discussion on habitat associations of brown shrimp is provided in Nelson (1992) and Pattillo et al. (1997).

White shrimp are offshore and estuarine dwellers and are pelagic or demersal, depending on life stage. The eggs are demersal and larval stages are planktonic; both occur in nearshore marine waters. Postlarvae migrate through passes mainly from May-November with peaks in June and September. Juveniles are common to highly abundant in all Gulf estuaries from Texas to about the Suwannee River in Florida. Postlarvae and juveniles inhabit mostly mud or peat bottoms with large quantities of decaying organic matter or vegetative cover. Migration from estuaries occurs in late August and September and appears to be related to size and environmental conditions (e.g., sharp temperature drops in fall and winter). Adult white shrimp are demersal and generally inhabit nearshore Gulf waters to depths less than 30 m on bottoms of soft mud or silt. See Nelson (1992) and Pattillo et al. (1997) for more detailed information on habitat associations of white shrimp.

Pink shrimp occupy a variety of habitats, depending on their life stage. Eggs and early planktonic larval stages occur in marine waters. Eggs are demersal, whereas larvae are planktonic until the postlarval stage when they become demersal. Juveniles inhabit almost every U.S. estuary in the Gulf but are most abundant in Florida. Juveniles are commonly found in estuarine areas with seagrass where they burrow into the substrate by day and emerge at night. Adults inhabit offshore marine waters with the highest concentrations in depths of 9 to 44 m.

3.4.2.2 Status of the Penaeid Shrimp Stocks

The three principal species (penaeids) of shrimp harvested by the shrimp fishery are short-lived and provide annual crops. The condition of each shrimp stock is monitored annually, and none has been classified as being overfished for over 40 years (Nance 2006a).

Brown shrimp is the most important species in the U.S. Gulf fishery with principal catches made from June through October. Annual commercial landings in recent years range from approximately 61 to 103 million pounds of tails depending on environmental factors influencing natural mortality. The fishery extends offshore to about 40 fathoms. White shrimp, second in value, are found in near shore waters to about 20 fathoms from Texas through Alabama. There is a small spring and summer fishery for overwintering individuals, but the majority is taken from August through December. Recent annual commercial landings range from approximately 36 to 71 million pounds of tails. Pink shrimp are found off all Gulf States but are most abundant off Florida's west coast and particularly in the Tortugas grounds off the Florida Keys. Most landings are made from October through May with annual commercial landings range from approximately 6 to 19 million pounds of tails. In the northern and western Gulf states, pink shrimp are landed mixed with brown shrimp and are usually counted as browns. Most catches are made within 30 fathoms.

3.4.3 Protected Species

There are 28 different species of marine mammals that may occur in the Gulf. All 28 species are protected under the MMPA and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback and North Atlantic right whales). Other species protected under the ESA occurring in the Gulf include five sea turtle species (Kemp's Ridley, loggerhead, green, leatherback, and hawksbill); two fish species (Gulf sturgeon and smalltooth sawfish), and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]). Information on the distribution, biology, and abundance of these protected species in the Gulf is included in final EIS to the Council's Generic EFH amendment (GMFMC 2004c) and the February 2005 ESA biological opinion on the reef fish fishery (NMFS 2005c). Marine Mammal Stock Assessment Reports and additional information are also available on the NMFS Office of Protected Species website: http://www.nmfs.noaa.gov/pr/species/.

The Gulf reef fish fishery and shrimp fishery are both classified in the 2007 Marine Mammal Protection Act List of Fisheries as Category III fisheries (71 FR 247). 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 percent of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Dolphins are the only species documented as interacting with these fisheries. Bottlenose dolphins may predate and depredate on the bait, catch, and/or released discards of the reef fish fishery. They are also a common predator behind shrimp boats, feeding on the discards or feeding on organisms that escape from the net as the gear is brought aboard.

All five species of sea turtles are adversely affected by both the Gulf reef fish and shrimp fisheries. Incidental captures in the reef fish fishery are relatively infrequent, but occur in all commercial and recreational hook-and-line components of the reef fishery. Captured sea turtles can be released alive or can be found dead upon retrieval of the gear as a result of forced submergence. 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, entangling, or otherwise still attached when they were released. Sea turtle release gear and handling protocols are required to minimize post-release mortality. The Gulf shrimp fishery affects more sea turtles than any other Gulf fishery. The extent of take is greatest for loggerhead and Kemps ridley sea turtles. Incidental capture and sea turtle mortality is dramatically reduced by the required use of TEDs, which incorporate an escape opening, usually covered by a webbing flap, allowing sea turtles to escape from trawl nets. To be approved by NMFS, a TED design must be shown to be at least 97 percent effective in excluding sea turtles during experimental TED testing (50 CFR 223.207(e)).

Smalltooth sawfish are also both affected by the Gulf reef fish and shrimp fisheries, but to a much lesser extent. Smalltooth sawfish primarily occur in the Gulf off peninsular Florida. Incidental captures in the commercial and recreational hook-and-line components of the reef fish fishery are rare events, with only eight smalltooth sawfish estimated to be incidentally caught annually, and none are expected to result in mortality (NMFS 2005c). Fishermen in this fishery are required to follow smalltooth sawfish safe handling guidelines. The long, toothed rostrum of the smalltooth sawfish causes this species to be particularly vulnerable to entanglement in netting gear, including the netting used in trawls. Otter trawls targeting pink shrimp are most likely to encounter smalltooth sawfish because they are targeted in waters offshore of the core range of smalltooth sawfish. Only one smalltooth sawfish is estimated to be incidentally caught each year, but this take is expected to be lethal (NMFS 2006a).

3.5 Description of the Economic and Social Environment

3.5.1 Economic Environment

3.5.1.1 Red Snapper Fishery

3.5.1.1.1 Commercial Sector

Additional information on the Gulf of Mexico commercial red snapper sector is provided in Section 3.1.1 and in GMFMC (2006) and is incorporated herein by reference.

As previously discussed, the fishery has been quota managed since 1990. A consequence of quota management has been low dockside prices that result from the race to fish. Nominal and real average annual dockside prices generally increased over time prior to quota management but, since the implementation of quota management, prices declined sharply during each open season both in nominal and real terms. The magnitude of the effect of quota management on real average annual dockside prices was estimated by Waters (2001) to be approximately $1.14 per pound.

An endorsement system establishing trip limits was implemented in 1993 in an effort to slow the race for fish. At the beginning of the 1993 season, 131 boats qualified for red snapper endorsements on their reef fish permits that entitled them to land up to 2,000 pounds of red snapper per trip, while boats without endorsements were limited to 200 pounds per trip. The endorsement system remained in effect until formalized into a license limitation system in 1998. Boats with endorsements were granted Class 1 licenses corresponding to a 2,000-lb trip-limit, while other vessels with a landing history for red snapper received a Class 2 license to land up to 200 pounds per trip. Boats that did not qualify for either type of license were restricted to the recreational bag limit when the recreational red snapper season was open. Additional attempts to extend the length of the commercial red snapper season and reduce price declines included the division of the quota into Spring (beginning February 1) and Fall (beginning October 1) allocations and allowing harvests only during the first 15 days of each month until the allocation was, both established by Amendment 15 (GMFMC 1997), and the reduction of the allowable fishing days to the first 10 days of the month, established by a regulatory amendment (GMFMC 2000).

Amendment 26 (GMFMC 2006) established an IFQ program for the commercial red snapper fishery. It is expected that under an IFQ system, there will be no need for trip limits and closed seasons, and, support reduction in operating costs and increased ex-vessel prices as product quality increases and market gluts are eliminated. It has been estimated that revenues would increase by 48 percent, from \$6.598 million to \$9.805 million following the implementation of a rights-based management system in the fishery (Weninger and Waters 2003), representing an annual revenue gain of \$4.20 million in 2004 dollars. Although the IFQ system is expected to result in significant changes in the operational characteristics of the fleet, the following description of the fishery from Waters (2006) is provided to describe conditions in the fishery to date.

"The consumer market for red snapper is supplied with imports as well as domestic production. Imports of fresh and frozen snappers (all species of snappers combined) averaged 15.7 million pounds from 1993-1995, increased to 22.6 million pounds in 1996, and continued to increase to 40.2 million pounds in 2005 (Table 3.5.1.1.1.1). Imports averaged 31.2 million pounds between 1998 and 2004, which was approximately 7 times the average quantity of red snapper landed by commercial fishermen in the Gulf of Mexico. The growth in imports was supplied by Mexico and Panama from 1996-1998, and by Brazil since then. The preponderance of imports in the total US supply of snappers suggests that consumer (retail) prices are unlikely to be significantly affected by additional regulation of the domestic red snapper fishery.

Boats that reported landing red snapper in the Gulf of Mexico were classified into three groups. Group 1 consists of the top 50 boats when ranked in terms of annual landings of red snapper. Group 2 consists of the next 81 boats, ranked 51 through 131. Group 3 consists of all other boats that reported landing red snapper, and ranged in number from a high of 487 in 1993 to a low of 318 in 1995, and numbered 341 in 2005 (Table 3.5.1.1.1.2). Separate rankings and groupings were performed for each year, 1993-2005, to account for changes in ownership and levels of participation in the red snapper fishery. Groups 1 and 2 approximately correspond to boats with red snapper endorsements from 1993-1997 or Class 1 licenses from 1998-2005, and hence were eligible to land up to 2000 pounds of red snapper per trip. Group 3 approximately corresponds to boats that were restricted to the bycatch limit of 200 pounds of red snapper per trip.

The top 50 boats accounted for a disproportionately large share of industry landings of red snapper. Between 2002 and 2004, the top 50 boats averaged 2.77 million pounds of red snapper, or 64 percent of the total industry catch (Table 3.5.1.1.1.2). Boats ranked 51-131 averaged 1.29 million pounds, or 30 percent of the industry total, while boats in group 3 averaged only 0.27 million pounds, despite their large numbers. Boats with vertical lines landed most of the red snapper, although the share of landings by boats with bottom longlines has increased since 1999 and represented approximately 10 percent of the total harvest of red snapper in 2004 (Table 3.5.1.1.1.3). Most of the growth in the share of landings with longlines occurred among the top 50 boats that landed red snapper. Since 2000, 4 or 5 boats among the top 50 used bottom longlines to harvest red snapper, except in 2004 when 8 of the top 50 boats used longlines to land approximately 387,000 pounds.

Table 3.5.1.1.1.1. (Table 1) Annual landings and dockside revenues for red snapper landed in the U.S. Gulf of Mexico, and annual imports of fresh and frozen snappers. Dockside revenues were adjusted for inflation with the CPI-U and 2004 base period.

YEAR	GULF LANDINGS RED SNAPPER (1000 lbs)	DOCKSIDE REVENUES RED SNAPPER (1000 $)	2004 DOLLARS RED SNAPPER (1000 $)	IMPORTS FRESH SNAPPERS (1000 lbs)	IMPORTS FROZEN SNAPPERS (1000 lbs)
1993	2,758	5,801	7,624	13,967	2,107
1994	2,741	6,006	7,713	12,380	1,517
1995	2,786	6,026	7,509	15,680	1,412
1996	4,031	8,213	9,943	20,927	1,687
1997	4,356	8,516	10,037	24,244	2,283
1998	4,462	10,326	11,984	22,194	2,882
1999	4,280	9,365	10,642	22,824	2,684
2000	4,427	10,572	11,615	24,496	5,496
2001	4,414	10,813	11,542	25,230	7,610
2002	4,517	11,182	11,743	25,619	8,399
2003	4,328	11,376	11,678	27,043	9,013
2004	4,162	11,538	11,535	26,274	8,513
2005	3,310	10,123	9,786	27,530	12,703
2002-04	4,336	11,365	11,652	26,312	8,642

Source: NMFS SEFSC Logbook Data and Accumulated Landings System, and Census Bureau Foreign Trade Division.

Time series data are not available about the costs of operating and owning red snapper boats. Waters (1996) reported harvesting costs for red snapper trips taken in 1993. More recently, in mid-2005, the NMFS began collecting trip costs and annual operation and ownership costs for boats in the reef fishery. However, these data are not available yet.

Table 3.5.1.1.1.2. (Table 2) Total annual landings of red snapper in the U.S. Gulf of Mexico, (thousands of pounds, eviscerated weights).

	TOP 50 BOATS		BOATS RANKED 51-131		OTHER BOATS			TOTAL
Year	1000 lbs	Pct	1000 lbs	Pct	Boats	1000 lbs	Pct	1000 lbs
1993	1,783	65%	740	27%	487	235	9%	2,758
1994	1,701	62%	868	32%	425	172	6%	2,741
1995	1,886	68%	779	28%	318	121	4%	2,786
1996	2,656	66%	1,259	31%	335	116	3%	4,031
1997	2,738	63%	1,466	34%	355	152	3%	4,356
1998	2,692	60%	1,543	35%	322	227	5%	4,462
1999	2,470	58%	1,538	36%	377	272	6%	4,280
2000	2,517	57%	1,534	35%	381	376	8%	4,427
2001	2,673	61%	1,476	33%	366	265	6%	4,414
2002	2,848	63%	1,403	31%	361	266	6%	4,517
2003	2,744	63%	1,317	30%	358	267	6%	4,328
2004	2,711	65%	1,161	28%	363	290	7%	4,162
2005	2,274	69%	835	25%	341	201	6%	3,310
Avg. 2002-04	2,768	64%	1,294	30%	361	274	6%	4,336

Source: NMFS SEFSC Logbook Data

Table 3.5.1.1.1.3. (Table 3) Total annual landings of red snapper with vertical lines and bottom longlines in the U.S. Gulf of Mexico, thousands of pounds, eviscerated weights. Some boats reported fishing with both vertical lines and longlines.

	VERTICAL LINES			LONGLINES			ALL GEARS
Year	Boats	RS Pounds (1000s)	Pct of Total RS Pounds	Boats	RS Pounds (1000s)	Pct of Total RS Pounds	RS Pounds (1000s)
1993	512	2,717	99%	105	26	1%	2,758
1994	465	2,710	99%	85	20	1%	2,741
1995	396	2,755	99%	54	29	1%	2,786
1996	400	3,943	98%	66	37	1%	4,031
1997	419	4,254	98%	73	33	1%	4,356
1998	387	4,391	98%	61	32	1%	4,462
1999	426	4,172	97%	79	89	2%	4,280
2000	448	4,250	96%	74	171	4%	4,427
2001	439	4,277	97%	73	129	3%	4,414
2002	433	4,356	96%	68	158	3%	4,517
2003	433	4,129	95%	67	197	5%	4,328
2004	444	3,735	90%	68	423	10%	4,162
2005	417	3,053	92%	67	255	8%	3,310
Avg 2002-04	437	4,073	94%	68	259	6%	4,336

Source: NMFS SEFSC Logbook Data

Waters (2006) also summarized average performance characteristics by license type and gear (vertical lines versus longlines), and with respect to just red snapper performance and across all fisheries in which the red snapper vessels operate. The more detailed summary tables are available in Waters (2006) and are incorporated herein by reference. The following is a summary of select characteristics and refer to performance from 2002-2004 unless otherwise specified. It should be noted the commercial red snapper fishery is operating under an IFQ program as of January 1, 2007.

The top 50 boats in the commercial red snapper fishery averaged more trips per year than the boats ranked 51-131, 31.9 trips per boat versus 18.7 trips per boat, and landed more pounds of red snapper per trip, across both gear types. Within the top 50 boats, boats with vertical lines among the top 50 boats averaged 1,722 pounds of red snapper per trip, the boats ranked 51-131 averaged 850 pounds, and the remaining boats with recorded landings averaged 149 pounds. Among boats with longlines, the top 50 boats averaged 1,680 pounds of red snapper per trip, the mid-volume boats averaged 1,009 pounds, and the remaining boats averaged 92 pounds. Average pounds of red snapper per trip for vertical line boats among the top 50 have declined since 2002 and since 1999 for boats with vertical lines among the second tier group. The reverse is true, however, for boats with longlines among the top 50, with increases seen since 2001.

Among the higher volume red snapper vessels, red snapper contributed a relatively large share of landings and dockside revenues, accounting for 80 percent of weight and 85 percent of value for boats fishing vertical lines, and 66 percent of weight and 69 percent of value for boats fishing longlines. Vermilion snapper was the second most important species (10 percent by weight and 9 percent by value) for vertical line boats, while deep water groupers (primarily yellowedge grouper; 24 percent by weight and 24 percent by value) were the second most important species for longline boats. Among the second tier boats, vertical line trips averaged 67 percent red snapper, 14 percent vermilion snapper, 5 percent shallow water groupers and 5 percent jacks by weight 75 percent red snapper, 12 percent vermilion snapper, 5 percent shallow water groupers, and 2 percent jacks by value. Longline trips in this group averaged approximately 31 percent red snapper, 49 percent shallow water groupers, and 15 percent deep water groupers, by weight, and 35 percent red snapper, 46 percent shallow water groupers, and 16 percent deep water groupers by value. Among the remaining boats in the fishery, shallow water groupers were the dominant species, accounting for 48 percent of harvests by weight for vertical line trips and 84 percent longline trips.

Boats also take trips on which red snapper were not caught and, consistent with the rankings of performance within the red snapper fishery, the incidence of trips without red snapper declines as performance within the red snapper fishery increases. From 2002-2005, the top 50 red snapper producing boats reported red snapper landings on 85 percent of all trips, compared to 72 percent and 39 percent for the second and third tier boats, respectively. Top tier boats fishing with vertical lines tended to land primarily vermilion snapper, longline trips harvested primarily yellowedge grouper and (golden) tilefish. Overall, across all trips for the top tier boats, red snapper contributed approximately 65 percent of total overall landings and 73 percent of dockside revenues for vertical line trips, and 33 percent of overall landings and 38 percent of dockside revenues on all trips with longlines. For trips that did not land red snapper for second tier boats, boats with vertical lines harvested primarily the same species as the top tier boats, but with different emphasis, landing slightly less vermilion snapper and slightly more jacks and shallow water groupers. Among this tier, boats with longlines harvested primarily shallow water groupers. Overall, across all trips for the second tier boats, red snapper contributed approximately 43 percent of total overall landings and 53 percent of dockside revenues for trips with vertical lines, and 10 percent of overall landings and 13 percent of dockside revenues on all trips with longlines. Finally, among the third tier boats, red snapper contributed approximately 7 percent of landings and 9 percent of dockside revenues on all trips, either with or without red snapper for trips with vertical lines, and 0.4 percent of landings and 0.6 percent of dockside revenues on all trips with longlines. Among trips without red snapper, boats with vertical lines harvested primarily red grouper and gag, while trips with longlines harvested primarily red grouper.

As indicated, the previous information was derived from Waters (2006) and represents the most recent quantitative assessment of fishery performance characteristics. The following information is from Amendment 26 (GMFMC 2006) and evaluates fishery performance from a license class perspective.

Table 3.5.1.1.1.4 shows red snapper landing averages for Class 1 and Class 2 licenses. While all 136 Class 1 licenses registered landings over the period evaluated, only 482 of 628 Class 2 licenses registered landings. Average red snapper landings varied from 3,698 pounds to 74,599 pounds for Class 1 and from 0.42 pounds to 8,084 pounds for Class 2 licenses. On average, a Class 1 license holder has substantially higher red snapper landings than a Class 2 license holder. Of particular note, however, is the fact that some Class 2 licenses landed more red snapper than some Class 1 licenses.

Table 3.5.1.1.1.4. Average annual landings (pounds) of Class 1 and Class 2 license holders.

Period	No. of Entities	Mean Landings	Min Landings	Max Landings
Class 1				
1990-2004	136	25,633	3,698	74,599
Class 2				
1998-2004	482	636	0.42	8,084

Source: NMFS SERO Permit Files and NMFS SEFSC Logbook Data.

The 136 Class 1 licenses are associated with 95 owners, thus, some entities may be classified as fleet operations. Seventeen such entities owning a total of 58 licenses have been identified, with some entities possessing up to 6 licenses. Table 3.5.1.1.1.5 provides red snapper landings totals for all 58 licenses combined. Since 1990, total red snapper landings of these operations have increased from a little more than 500,000 pounds to slightly less than 2 million pounds in 2004. The average landing per operation also increased from 29,779 pounds in 1990 to 115,848 pounds in 2004. The standard deviation from the mean is relatively large each year, implying a wide variation in landings from one fleet operation to another in any given year. Relative to the red snapper commercial quota, the share of the 17 fleet operations increased from 16 percent in 1990 to 42 percent in 2004.

Table 3.5.1.1.1.5. Landings characteristics of 17 Class 1 fleet operations, 1990-2004.

Year	Total	Mean	Std. Deviation	% to Comm. Quota
1990	506,251	29,779	27,225	16
1991	740,257	43,544	47,631	36
1992	726,798	42,752	38,865	36
1993	1,295,634	76,213	53,872	42
1994	1,173,544	69,032	46,937	38
1995	1,269,711	74,688	54,027	41
1996	1,798,211	105,777	70,274	39
1997	1,926,894	113,346	82,321	41
1998	1,937,429	113,966	73,149	42
1999	1,929,861	113,521	70,339	42
2000	1,852,406	108,965	68,598	40
2001	1,931,928	113,642	89,095	42
2002	1,986,153	116,832	89,107	43
2003	1,949,528	114,678	83,609	42
2004	1,969,429	115,848	109,657	42
1990-2004	22,994,034	90,172	26,800	40

Source: NMFS SERO Permit Files and NMFS SEFSC Logbook Data

Commercial vessels landing reef fish, including red snapper, can only sell their catch to federally permitted fish dealers. There were 227 reef fish permitted dealers identified at the time Amendment 26 was prepared, with most located in Florida (146), and 29 in Louisiana, 18 in Texas, 14 in Alabama, 5 in Mississippi. An additional 15 permitted dealers are located outside the Gulf States region. Since there are no specific income or sales restrictions to qualify for a federal dealer permit, the total number of dealers can vary from year to year.

3.5.1.1.2 Recreational Sector

Additional information on the Gulf of Mexico recreational red snapper sector and the recreation sector in general is provided in Section 3.1.3, in Reef Fish Amendment 25/Coastal Migratory Pelagics Amendment 17 (GMFMC 2005b) and the 2005 recreational fishery grouper regulatory amendment (GMFMC 2005d) and is incorporated herein by reference.

3.5.1.1.2.1 Anglers

In 2003, approximately 3.3 million in-state anglers (anglers who fished within their state of residence) took almost 23 million trips and caught over 167 million fish. These totals do not include activity occurring solely in Texas (all modes) or in the headboat sector (all Gulf states). More than 70 percent of these anglers fished in Florida, followed by, in decreasing order, Louisiana, Alabama, and Mississippi. Similarly, Florida accounted for a large percentage of the trips (70 percent), followed in order by Louisiana, Alabama, and Mississippi. The most commonly caught non-bait species were spotted seatrout, red drum, gray snapper, white grunt, sand seatrout, sheepshead, red snapper, king mackerel, and Spanish mackerel.

Estimates of red snapper target effort from 1986-2004, as evaluated from the Marine Recreational Fisheries Statistics Survey, are provided in Tables 3.5.1.1.2.1-3.5.1.1.2.2. Target demand for red snapper has experienced a dramatic increase over this period, with overall demand increasing four-fold since 1986 and increasing three-fold as a percentage of total recreational effort (Table 3.5.1.1.2.1). Demand has been greatest in Alabama and Florida (Table 3.5.1.1.2.2), and by private/rental boat anglers, though on a percentage basis demand is greatest in the charter sector (Table 3.5.1.1.2.3). Tables 3.5.1.1.2.4 and 6.5.1 include Texas target effort and contrast target effort for red snapper with that of grouper (all shallow water species), dolphin, and king mackerel for 2003 by state and mode, respectively. Finally, the Headboat data do not support the estimation of target effort. Nevertheless, Table 3.5.1.1.2.6 provides estimates of the number of headboat angler days from 1987 through 2003.

Social and economic characteristics of recreational anglers are collected periodically as an add-on survey to the MRFSS. Holiman (1999) and Holiman (2000) summarize the data from the 1997-1998 survey. Table 3.14 contains some of the major findings of this survey.

The typical Gulf marine recreational angler was 44 years old, male (80%), white (90%), employed full time (92%), and had an average annual household income of \$42,700. The average number of years fished in the state was 16. The average number of fishing trips taken in the 12 months preceding the interview was approximately 38 and these trips were mostly (75%) one-day trips. The average expenditure on the intercepted trip was less than \$50. Seventy-five percent of the surveyed anglers reported they held saltwater licenses, and 59 percent owned boats used for recreational saltwater fishing. Those anglers who did not own their own boat spent an average of \$269 per day on boat fees when fishing on a party/charter or rental boat. About 76 percent of the surveyed anglers were employed or self-employed and the majority of those unemployed were retired.

Using the 1997-1998 socioeconomic data, Haab et al. (2001) estimated three types of economic values: 1) Value of access to sites for individual anglers; 2) value of access to species for individual anglers; and, 3) value associated with changes in the ability of anglers to catch fish. The value for site access is generally interpreted as the value lost when a fishing site is closed to fishing. An analogous interpretation holds for the species access value; that is, it is the value associated with a prohibition for fishing for a specific fish species. The value of a unit increase in species caught and kept refers to the angler's valuation of the worth of an extra fish caught and kept above expenditures.

Haab et al. (2001) estimated the following values associated with the private/rental fishing mode. The economic loss per trip from closing a fishing site ranged from \$1.44 in Alabama to \$71.84 in West (Gulf) Florida. The loss was also estimated to be relatively high in Louisiana. The economic loss per trip from unavailability (closure) of snapper-grouper ranged from \$0.30 in Alabama to \$5.24 in West Florida, whereas the value of a unit increase in the catch of snapper-grouper ranged from \$0.27 in Alabama to \$4.15 in West Florida. For all fishing modes, the economic loss per trip from closing a fishing site ranged from \$1.84 in Alabama to \$54.14 in West Florida, whereas the economic value from a unit increase in the catch of bottom fish (which include other reef fish species) ranged from \$3.47 in Alabama to \$3.65 in West Florida.

Table 3.5.1.1.2.1. Gulf of Mexico recreational red snapper target effort trips, MRFSS data, assessment program.

	TARGET EFFORT TRIPS		TOTAL TRIPS
	TOTAL	%	TOTAL
YEAR			
1986	105,555	0.55	19,039,944
1987	175,673	1.09	16,089,446
1988	114,975	0.58	19,743,299
1989	137,903	0.88	15,622,510
1990	109,142	0.82	13,310,226
1991	170,056	0.94	18,173,598
1992	186,310	1.03	18,079,250
1993	277,158	1.59	17,431,009
1994	213,504	1.22	17,503,737
1995	201,099	1.16	17,390,316
1996	155,137	0.91	17,032,778
1997	187,247	1.01	18,593,084
1998	146,073	0.87	16,703,364
1999	264,572	1.66	15,893,729
2000	269,016	1.28	21,017,783
2001	385,273	1.68	22,889,697
2002	388,199	1.97	19,665,578
2003	378,831	1.65	22,956,673
2004	436,569	1.79	24,451,338

Table 3.5.1.1.2.2. Gulf of Mexico red snapper target effort trips, by state, MRFSS data, assessment program by

	STATE														
	ALABAMA			FLORIDA			LOUISIANA			MISSISSIPPI			TOTAL		
	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS
	TOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL	%	TOTAL
YEAR															
1986	26,152	3.02	866,722	32,456	0.23	14,367,176	42,323	1.40	3,029,420	4,624	0.60	776,626	105,555	0.55	19,039,944
1987	23,039	3.70	622,080	133,202	1.08	12,321,111	17,669	0.75	2,370,674	1,763	0.23	775,582	175,673	1.09	16,089,446
1988	18,207	1.54	1,182,515	53,093	0.36	14,730,478	32,765	1.12	2,922,611	10,910	1.20	907,695	114,975	0.58	19,743,299
1989	46,406	7.45	622,719	35,542	0.30	12,031,576	47,588	2.10	2,263,719	8,367	1.19	704,496	137,903	0.88	15,622,510
1990	48,963	6.77	722,805	16,257	0.16	9,922,602	32,229	1.63	1,978,380	11,693	1.70	686,439	109,142	0.82	13,310,226
1991	45,425	7.00	648,774	72,281	0.51	14,261,115	29,632	1.22	2,419,805	22,718	2.69	843,905	170,056	0.94	18,173,598
1992	90,101	11.81	763,018	17,137	0.12	13,763,989	33,522	1.31	2,550,806	45,549	4.55	1,001,436	186,310	1.03	18,079,250
1993	115,657	12.40	933,061	43,877	0.34	12,928,092	58,107	2.15	2,703,754	59,517	6.87	866,103	277,158	1.59	17,431,009
1994	94,067	10.61	886,949	20,890	0.16	13,166,982	56,099	2.26	2,485,308	42,448	4.40	964,498	213,504	1.22	17,503,737
1995	89,669	8.98	998,539	32,046	0.26	12,396,870	61,794	2.10	2,941,473	17,589	1.67	1,053,434	201,099	1.16	17,390,316
1996	87,583	9.40	931,884	13,034	0.11	12,331,873	36,972	1.31	2,823,868	17,548	1.86	945,154	155,137	0.91	17,032,778
1997	90,066	8.79	1,024,177	52,007	0.39	13,384,436	23,129	0.73	3,185,378	22,045	2.21	999,093	187,247	1.01	18,593,084
1998	62,740	6.48	968,485	40,808	0.33	12,234,580	24,242	0.91	2,672,764	18,283	2.21	827,536	146,073	0.87	16,703,364
1999	123,405	10.55	1,169,914	81,111	0.72	11,296,851	50,057	1.91	2,621,446	9,999	1.24	805,518	264,572	1.66	15,893,729
2000	97,193	8.94	1,086,818	103,711	0.69	15,086,213	56,691	1.51	3,751,609	11,422	1.04	1,093,144	269,016	1.28	21,017,783
2001	136,331	8.33	1,635,798	187,161	1.14	16,388,611	38,639	1.07	3,615,244	23,142	1.85	1,250,045	385,273	1.68	22,889,697
2002	183,657	15.43	1,190,004	140,839	0.98	14,418,275	24,555	0.81	3,018,946	39,148	3.77	1,038,353	388,199	1.97	19,665,578
2003	170,541	11.37	1,499,989	135,936	0.85	16,008,974	40,868	0.96	4,270,921	31,485	2.68	1,176,788	378,831	1.65	22,956,673
2004	171,881	8.34	2,061,578	192,493	1.17	16,476,655	47,446	0.99	4,801,185	24,749	2.23	1,111,919	436,569	1.79	24,451,338

Table 3.5.1.1.2.3. Gulf of Mexico red snapper target effort trips, by mode, MRFSS data, assessment program

	MODE											
	SHORE			PARTY/CHARTER			PRIVATE/RENTAL			TOTAL		
	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS	TARGET EFFORT TRIPS		TOTAL TRIPS
	TOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL	%	TOTAL	TOTAL	%	TOTAL
YEAR												
1986	8,382	0.08	10,405,962	31,480	6.32	497,740	65,694	0.81	8,136,242	105,555	0.55	19,039,944
1987	28,963	0.42	6,923,388	44,227	6.82	648,271	102,483	1.20	8,517,788	175,673	1.09	16,089,446
1988	5,942	0.07	8,524,356	23,964	4.60	520,412	85,069	0.80	10,698,532	114,975	0.58	19,743,299
1989	11,926	0.19	6,419,667	25,638	5.23	490,536	100,339	1.15	8,712,307	137,903	0.88	15,622,510
1990	17,620	0.31	5,706,778	26,438	6.83	386,941	65,083	0.90	7,216,506	109,142	0.82	13,310,226
1991	50,686	0.59	8,642,251	31,667	7.12	444,609	87,702	0.97	9,086,738	170,056	0.94	18,173,598
1992	3,558	0.04	8,265,502	34,553	7.84	440,494	148,199	1.58	9,373,254	186,310	1.03	18,079,250
1993	2,648	0.03	7,642,451	81,431	10.90	747,252	193,080	2.14	9,041,306	277,158	1.59	17,431,009
1994	2,918	0.04	7,293,305	53,048	6.43	825,632	157,538	1.68	9,384,801	213,504	1.22	17,503,737
1995	5,064	0.07	6,925,453	64,695	7.24	893,967	131,340	1.37	9,570,896	201,099	1.16	17,390,316
1996	0	0.00	6,800,513	47,909	5.44	881,248	107,227	1.15	9,351,017	155,137	0.91	17,032,778
1997	0	0.00	7,423,022	82,497	8.46	974,979	104,750	1.03	10,195,083	187,247	1.01	18,593,084
1998	4,896	0.07	6,861,289	59,056	6.54	903,170	82,121	0.92	8,938,905	146,073	0.87	16,703,364
1999	3,864	0.07	5,918,885	60,615	6.91	877,041	200,093	2.20	9,097,803	264,572	1.66	15,893,729
2000	7,980	0.09	8,477,685	59,419	7.32	811,634	201,617	1.72	11,728,464	269,016	1.28	21,017,783
2001	13,060	0.13	9,776,174	64,271	8.66	742,386	307,942	2.49	12,371,138	385,273	1.68	22,889,697
2002	1,998	0.03	7,266,262	112,192	14.68	764,222	274,009	2.36	11,635,095	388,199	1.97	19,665,578
2003	4,367	0.05	8,155,304	95,355	13.79	691,362	279,109	1.98	14,110,007	378,831	1.65	22,956,673
2004	2,827	0.03	9,529,938	79,059	10.10	782,446	354,683	2.51	14,138,953	436,569	1.79	24,451,338

Table 3.5.1.1.2.4. Shore, Private and Charter Boat Targeted Fishing Trips in the Gulf of Mexico by State, 2003

Species	TX	LA	MS	AL	FLW	Total
Grouper	-	-	-	9,921	330,511	340,432
Red Snapper	120,942	40,868	31,485	170,541	135,936	499,772
Dolphin	4,135	782	-	-	118,853	123,770
King Mackerel	173,661	5,533	3,977	70,008	350,537	603,716
Total	298,738	47,183	35,462	250,470	935,837	1,567,690

Source: MRFSS Data summarized by Stephen Holiman (NMFS SERO) and TPWD Creel Survey (Green and Campbell 2005).

Table 3.5.1.1.2.5. Headboat angler days, NMFS Headboat Survey.

	STATE			
	LOUISIANA	TEXAS	WFLORIDA/-ALABAMA	TOTAL
	Sum	Sum	Sum	Sum
	TOTAL #	TOTAL #	TOTAL #	TOTAL #
YEAR				
1987	6,362	63,363	217,049	286,774
1988	7,691	70,396	195,948	274,035
1989	2,867	63,389	208,325	274,581
1990	6,898	58,144	213,906	278,948
1991	6,373	59,969	174,312	240,654
1992	9,911	76,218	184,742	270,871
1993	11,256	80,904	207,898	300,058
1994	12,651	100,778	204,562	317,991
1995	10,498	90,464	182,410	283,372
1996	10,988	91,852	154,913	257,753
1997	9,008	82,207	149,442	240,657
1998	7,854	77,650	185,331	270,835
1999	8,026	58,235	176,117	242,378
2000	-----DATABASE PROBLEM--------			218,826
2001	-----DATABASE PROBLEM--------			215,004
2002	6,222	66,951	141,831	215,004
2003	6,636	74,432	144,211	225,279

Table 3.5.1.1.2.6 Socio-economic characteristics of recreational anglers. **Source: Holiman (2000)**

	Charter	Private/Rental	Shore
Average Age			
Alabama	42.17	42.49	47.59
Florida East	43.60	42.41	44.39
Florida West	43.85	44.03	44.18
Louisiana	44.99	44.35	41.39
Mississippi	43.70	41.51	41.74
Average Income			
Alabama	57,980	54,090	42,110
Florida East	94,590	56,250	44,100
Florida West	78,430	51,370	42,590
Louisiana	86,340	55,180	40,870
Mississippi	61,730	48,500	31,300
Average Number of Fishing Trips			
Alabama	3.64	31.99	34.92
Florida East	12.16	53.26	56.94
Florida West	10.83	47.07	50.56
Louisiana	11.73	30.50	31.78
Mississippi	15.09	43.34	69.63
Average Years of Fishing Experience			
Alabama	13.07	21.56	20.76
Florida East	18.37	22.20	21.18
Florida West	17.77	21.51	19.37
Louisiana	22.94	24.08	18.24
Mississippi	12.62	21.83	21.33
Average Years of Fishing Experience in the State			
Alabama	7.81	19.75	14.54
Florida East	10.61	18.07	15.04
Florida West	11.65	16.70	13.14
Louisiana	16.17	22.21	15.97
Mississippi	7.18	18.59	16.46
Average Total Trip Expenditures			
Alabama	479.17	53.55	150.25
Florida East	380.32	52.10	82.91
Florida West	622.29	127.44	98.88
Louisiana	326.26	39.35	57.56
Mississippi	296.91	27.04	28.27

3.5.1.1.2.2 For-hire Vessels

A federal for-hire vessel permit has been required for reef fish since 1996 and the sector currently operates under a limited access system (GMFMC 2005c). Prior to the implementation of the current moratorium, NMFS had issued 3,340 permits associated with 1,779 unique vessels. Of these vessels, 1,625 had reef fish permits (GMFMC 2005c). More current estimates are not available.

The for-hire sector is comprised of charter vessels and headboats (partyboats). Although charter vessels tend to be smaller, on average, than headboats, the key distinction between the two types of operations is that the fee charged on charter boat or trip is for the entire vessel, regardless of how many passengers are carried, whereas the fee charged for a headboat trip is paid per individual angler.

In support of the development of the current limited access system, permits data were evaluated to identify summary characteristics of the fleet (GMFMC 2005c). This evaluation revealed that approximately 79 percent of the fleet had a maximum capacity of 6 or fewer passengers, 82 percent were in the 21-50 foot length range, and 70 percent had engines ranging from 101-600 horsepower. Sixty-one vessels had passenger capacity greater than 60 passengers. Individual ownership is the dominant form of ownership type (69 percent), with less than a third of vessels corporate-owned. Florida was the homeport of 61 percent of all federally permitted for-hire vessels, followed by Texas (13 percent), Alabama (8 percent), Louisiana (8 percent), and Mississippi (4 percent).

Financial information on the for-hire vessels in the Gulf is not routinely collected. The most recent data available are from two studies conducted in 1998-1999 and summarized in Holland et al. (1999) and Sutton et al. (1999). Selected financial statistics from these studies are summarized in Table 3.5.1.1.2.7. Included in the cost estimates are bookkeeping services, advertising and promotion, fuel and oil, bait expenses, docking fees, food/drink for customers and crew, ice expenses, insurance expenses, maintenance expenses, permits and licenses, and wage/salary expense. The cost calculations do not account for capital expenses, other fixed costs, and returns to owners/operators. The 1999 figures have been adjusted to 2004 dollars using the producer price index for all commodities, with 1982-1984 as the base year.

As expected, since they carry larger passenger loads, headboats earn substantially higher revenues than charterboats. The average charterboat is estimated to generate $76,960 in annual revenues and $36,758 in annual profits, whereas the appropriate values for the

Table 3.5.1.1.2.7. Economic Characteristics of Charterboats and Headboats.

Characteristic	Charterboats	Headboats
All Vessel Classes		
Revenues ($)	76,960	404,172
Costs ($)	40,200	65,962
Profits ($)	36,758	338,209
Avg. fees per angler per trip ($)	146	61
Avg. trips per vessel	108	209
Avg. passenger	5	30
Max. passenger	8	60
Length (feet)	37	65
Horsepower	493	786
6 or less maximum passenger capacity		
Revenues	70,491	
Costs	35,540	
Profits	34,949	
Avg. fees per angler per trip ($)	152	
Avg. trips per vessel	105	
Avg. passenger	4	
Length	35	
Horsepower	475	
7 to 12 maximum passenger capacity		
Revenues	129,813	
Costs	43,311	
Profits	86,502	
Avg. fees per angler per trip ($)	128	
Avg. trips per vessel	146	
Avg. passenger	6	
Length	41	
Horsepower	546	
13 to 30 maximum passenger capacity		
Revenues	113,266	298,812
Costs	73,887	35,750
Profits	39,379	263,062
Avg. fees per angler per trip ($)	94	70
Avg. trips per vessel	115	201
Avg. passenger	9	17
Length	44	43
Horsepower	617	726
31 to 60 maximum passenger capacity		
Revenues	149,905	327,615
Costs	116,099	46,602
Profits	33,806	281,013
Avg. fees per angler per trip ($)	64	55
Avg. trips per vessel	152	208
Avg. passenger	21	27
Length	60	64
Horsepower	750	735
61 or greater maximum passenger capacity		
Revenues		570,376

Characteristic	Charterboats	Headboats
Costs		109,616
Profits		460,760
Avg. fees per angler per trip ($)		67
Avg. trips per vessel		213
Avg. passenger		40
Length		76
Horsepower		903

Notes: (1) Trips are calculated as the sum of half-day, full-day, and overnight trips after converting all classes of trips to full-day trips. **(2)** Revenues do not necessarily equal the product of average fees, trips and passengers because of the way trips are calculated and because all averages are calculated independently on a per vessel basis.
Source: Holland et al. (1999) and Sutton et al. (1999).

average headboat are $404,172 and $338,209, respectively. On average, both types of operations are profitable, with headboat operations showing a relatively large profit figure. As mentioned above, however, the calculation of costs does not take into account fixed costs, which would be expected to be much larger for headboats. For both charterboats and headboats, the number of passengers carried per trip is about half of the maximum passenger capacity. Therefore, substantial excess capacity exists in the sector.

Table 3.5.1.1.2.8 compares for-hire characteristics for the Florida west-coast sector with that of the rest of the Gulf of Mexico. Florida vessels, on average, earn less than those in the rest of the Gulf. This difference may be due partly to the difference in the size of charterboat or headboat operation. On average, Florida vessels are smaller, have smaller horsepower, have lower maximum passenger capacity, and take fewer passengers per trip. The difference, although not apparent from the information provided, may also be influenced by the increased competition created by the larger number of vessels in the state.

Table 3.5.1.1.2.8. Economic Characteristics of Charterboats and Headboats by Geographical Area

Characteristic	Charterboats		Headboats	
	Florida	Rest of Gulf	Florida	Rest of Gulf
All Vessel Classes				
Revenues ($)	68,233	106,118	318,512	630,046
Costs ($)	37,984	62,624	69,410	87,621
Profits ($)	30,249	43,494	249,103	542,425
Avg. fees per angler per trip ($)	149	133	59	70
Avg. trips per vessel	104	110	205	209
Avg. passenger	4	8	25	41
Max. passenger	6	14	56	71
Length (feet)	35	41	60	74
Horsepower	465	615	795	732
6 or less maximum passenger capacity				
Revenues	68,620	69,748		
Costs	37,962	34,417		
Profits	30,656	35,330		
Avg. fees per angler per trip ($)	151	159		

Characteristic	Charterboats		Headboats	
Avg. trips per vessel	104	86		
Avg. passenger	4	4		
Length	35	35		
Horsepower	467	553		
7 to 12 maximum passenger capacity				
Revenues	67,760	186,793		
Costs	30,116	70,944		
Profits	37,643	115,848		
Avg. fees per angler per trip ($)	105	158		
Avg. trips per vessel	137	149		
Avg. passenger	5	8		
Length	31	48		
Horsepower	303	706		
13 to 30 maximum passenger capacity				
Revenues	55,124	141,134	352,515	84,000
Costs	43,407	94,458	30,296	57,568
Profits	11,716	46,676	322,219	26,432
Avg. fees per angler per trip ($)	108	90	73	56
Avg. trips per vessel	81	128	214	151
Avg. passenger	6	11	18	10
Length	39	47	40	52
Horsepower	492	687	757	600
31 to 60 maximum passenger capacity				
Revenues		176,629	227,996	556,080
Costs		145,124	58,459	37,296
Profits		31,505	169,535	518,784
Avg. fees per angler per trip ($)		61	50	69
Avg. trips per vessel		178	182	219
Avg. passenger		23	24	36
Length		59	61	70
Horsepower		738	704	875
61 or greater maximum passenger capacity				
Revenues			490,448	840,524
Costs			124,790	145,460
Profits			365,657	695,064
Avg. fees per angler per trip ($)			67	75
Avg. trips per vessel			248	213
Avg. passenger			32	53
Length			73	83
Horsepower			1,083	624

Notes: (1)Trips are calculated as the sum of half-day, full-day, and overnight trips after converting all classes of trips to full-day trips. (2) Revenues do not necessarily equal the product of average fees, trips and passengers because of the way trips are calculated and because all averages are calculated independently on a per vessel basis.
Source of basic data: Databases from Holland et al. (1999) and Sutton et al. (1999).

3.5.1.2 Economic Environment of the Gulf Shrimp Fishery

A general description of the fishery is found in Section 3.2. However, this section presents additional detailed information considered to be important to a thorough understanding of the economic aspects of the fishery, and thus to the analysis of the management alternatives being considered in this amendment. The descriptive information presented in the sections below are with regard to conditions as they existed in 2005, since this is the most recent year for which complete data are available to generate the necessary information.

As with any commercial fishery, the Gulf of Mexico commercial shrimp fishery has three primary sectors: the harvesting sector (i.e. vessels), dealers/wholesalers, and processors.[4] The harvesting sector is the focus of the following description and analysis given that it is the sector most directly affected by management measures. However, that sector has multiple components as well. For example, and as reflected in the current management structure, a subset of vessels focuses some or most of its harvesting activities on royal red shrimp. Although royal red shrimp landings are a relatively minor component of the overall fishery, they are important to a small subset of vessels within the commercial fishery. In addition, though the shrimp fishery is dominated by the use of otter trawls, butterfly and skimmer nets are also important. In particular, skimmer nets have become increasingly important in Louisiana's inshore fishery, and their use is spreading in other inshore areas of the northern and eastern Gulf.[5] Finally, though most shrimp in the Gulf are harvested for consumptive purposes, a commercial bait shrimp fishery does exist. Texas likely accounts for the highest percentage of these landings. However, vessel and trip level data on bait shrimp landings are not currently collected in Texas and thus it is not possible to ascertain or account for their importance to individual vessels in the shrimp fishery. Bait shrimp landings also occur in Alabama and Mississippi. However, due to regulations in those states, vessels may only possess a food or a bait shrimp license at any given point in time and thus those landings are not considered in the following analyses. Conversely, vessels in Texas may harvest shrimp for both food and bait purposes if they possess the proper licenses, which need not be possessed only on an "either/or" basis in that state. Vessels in Louisiana and on Florida's Gulf coast may also harvest shrimp for either food or bait purposes, though no specific licenses are required to do so as in Texas. Bait shrimp landings from west Florida and Louisiana are accounted for in the following analyses.

Multiple databases exist by which to gauge participation and conditions in the Gulf shrimp fishery. Historically, NMFS' Gulf Shrimp Landings File (SLF) has been the primary source of landings data. The Vessel Operating Units File (VOUF) has been another source of information regarding the participation of vessels in the fishery. The weaknesses of these two data sources were previously outlined in Amendment 11 (GMFMC 2001). In general, the SLF provides an incomplete picture of vessel participation due to the practice of consolidating trips in such a manner that the landing vessel's identity is sometimes suppressed.[6] The VOUF's primary

[4] Some companies operate as both dealer/wholesalers and processors.

[5] Skimmer nets are illegal in Texas.

[6] See Kazmierczak et al. (2003) for the potential analytical repercussions of this practice.

weakness is its reliance on the dockside observation of vessels and their gear for purposes of determining current participation in the fishery, though it is also hampered by the fact that it only tracks Coast Guard documented vessels (i.e. state registered boats are not taken into account). These weaknesses partly precipitated the desire for a federal permit, so as to better identify and characterize the universe of participants in the EEZ component of the fishery. However, since the permit is only required for vessels operating in federal waters, permit data cannot be used to assess participation throughout all waters of the Gulf of Mexico. The ability to assess such participation has been recently improved by the implementation of trip ticket programs in Louisiana and Alabama, and the required reporting of vessel identification numbers in Florida's trip ticket program. Data from the Louisiana and Alabama programs began to be directly incorporated into the SLF in 2002. Finally, possession of a permit does not necessitate actual participation in the fishery (i.e. some vessel permits may be "latent" or inactive as a result of an owner's temporary loss of a vessel, a decision to use the vessel in another fishery, or speculation). Therefore, a composite of all these data sources has been used to generate information regarding participation in the entire fishery, though the focus will be on federal Gulf shrimp permit holders and their activities.

3.5.1.3 The Gulf Shrimp Fishery

In 2005, at least 5,322 vessels (including Coast Guard documented vessels and state registered boats) were active in the commercial Gulf shrimp fishery.[7] This figure represents a decrease of 2,161 vessels, or approximately 28.9 percent, since 2002. Of these 5,322 vessels, 3,516 are not expected to qualify for federal Gulf shrimp permits under the moratorium established by GMFMC (2005b). The other 1,806 active vessels are expected to qualify for moratorium permits. Thus, of the 2,666 vessels expected to qualify for moratorium permits, 860 vessels were not active (i.e. had no Gulf food shrimp landings) in 2005. These figures compare to 2,264 active qualifying vessels and 458 inactive qualifying vessels in 2002, which indicates a decrease of 458 vessels (approximately 20.2 percent) in the number of active, qualifying vessels between 2002 and 2005.

Total food shrimp landings and revenues were 134.56 million pounds (tails) and $347.34 million, respectively. Those landings and revenues can be broken down further into the following general categories: landings and revenues to qualifying vessels, to non-qualifying vessels, to large as opposed to small vessels,[8] and to unknown vessels. It is important to remember that "known" vessels includes all qualifying vessels (active and inactive) and all active, non-qualifying vessels. This breakdown and related statistics are presented in Tables 3.5.1.1.1 and 3.5.1.1.2. Table 3.5.1.1.3 presents statistics for known, active vessels only and thus removes the effect of inactive, qualifying vessels on average food shrimp landings and revenues per vessel. By comparing the information in Tables 3.5.1.1.1 and 3.5.1.1.3, it can be seen that removal of inactive qualifying vessels from the analysis of identifiable vessels increases average shrimp landings and revenues per vessel, particularly for large vessels.

---

[7] For present purposes, "active" is defined as having any identifiable landings in the Gulf food shrimp fishery.
[8] Large vessels are those greater than or equal to 60 feet in length, while small vessels are less than 60 feet.

Small vessels are more numerous than large vessels within the fishery as a whole and within the universe of non-qualifying vessels. However, as would be expected, large vessels dominate the universe of qualifying vessels. Large vessels also account for a much higher percentage of landings and revenues than their smaller counterparts within the fishery as a whole (i.e. they account for 78.6 percent of revenues to known vessels in the fishery), and even more so within the universe of qualifying vessels (93.6 percent). Conversely, because small vessels are dominate within the non-qualifying universe (i.e. they outnumber large vessels nearly 28 to 1), they account for a much higher percentage of landings and revenues (approximately 85.4 percent) within that particular group. In comparing information in Tables 3.5.1.1.2 and 3.5.1.1.4, it can again be seen that the removal of inactive vessels from the analysis of qualifying vessels increases average landings and revenues significantly for both large and small vessels.

With respect to comparisons between the total universe and qualifying universe, average landings and revenues are very similar for large vessels. This finding is expected since it would be very difficult for large vessels to economically survive without operating in the EEZ, and thus most would need a federal permit. This expectation is reflected by the relatively small level of food shrimp landings by large, non-qualifying vessels. Conversely, small qualifying vessels attain much higher levels of food shrimp landings and revenues on average relative to all small vessels. This finding reflects the fact that small qualifying vessels, which are more active than their non-qualifying small vessel counterparts (i.e. they spend more time operating in the Gulf food shrimp fishery), represent a much smaller percentage of the small vessel universe relative to the proportion that large qualifying vessels represent within the large vessel universe. Put alternatively, proportionally more large vessels than small vessels operate on a full-time basis and large vessels are more dependent than small vessels on the EEZ component of the fishery.

A few more observations about the non-qualifying vessels are worth noting before specifically analyzing the activities of qualifying vessels. For example, a much wider range of Gulf shrimp landings and revenues exists within that group than what would be expected, given the federal permit requirement in EEZ waters. Landings ranged from 1 to over 134,000 pounds and revenues from $3 to nearly $479,000 in 2005. Breaking down the gross revenues for these vessels into reasonable groupings, of the 3,516 non-qualifying vessels, the vast majority (2,145) grossed less than $10,000 in food shrimp revenues in 2005. Another 1,028 vessels had gross revenues between $10,000 and $50,000 and 249 vessels had gross revenues between $50,000 and $100,000. These revenue levels are to be expected for vessels that do not operate in EEZ waters and would thus not need to have a federal permit. However, 58 non-qualifying vessels had revenues between $100,000 and $150,000, 15 vessels had revenues between $150,000 and $200,000, and another 21 vessels exceeded $200,000. It is doubtful that these vessels, particularly those generating more than $150,000 in shrimp revenues, could achieve such levels of revenue generation without venturing into federal waters. In order to continue present operations, these 36 vessels would have to acquire a transferable federal permit under the permit moratorium. This figure is less than what was projected in GMFMC (2005b) 13 analysis, which is undoubtedly due to the exit of vessels from the fishery in recent years; exit which is undoubtedly the result of deteriorating economic conditions.

3.5.1.4 The Gulf Shrimp EEZ Fishery

The Gulf shrimp EEZ fishery can be examined from at least two different perspectives: either in terms of the entire universe of qualifying vessels or only those that are presently active in the fishery. The analytically appropriate choice depends on the nature of the management alternatives under consideration. That is, some alternatives could directly or indirectly affect all qualifying vessels, regardless of whether they are currently active in the fishery, while others would only affect active, qualifying vessels.

A detailed statistical description of the universe of qualifying vessels and the sub-component of active qualifying vessels is presented in Tables 3.5.1.4.1 through 3.5.1.4.18. The descriptive statistics examine the distribution of these vessels' revenues across different fisheries/species and thereby provide insight into these vessels' dependency on each fishery. For current purposes, the considered fisheries/species are grouped as follows: Gulf food shrimp, Gulf bait shrimp, South Atlantic shrimp (all components), Gulf non-shrimp, and East Coast non-shrimp. Dependency on the Gulf food shrimp fishery is considered most important for current purposes, as that component of the fishery is the focal point of management. Physical characteristics are also examined. The data on the distribution of vessels' revenues and their physical characteristics are broken down further according to vessel size category (i.e. "large" versus "small" vessels). The purpose of examining the data by vessel size is to gain a better understanding of fishery participants, their activities and behavior, and the roles they respectively play in the fishery as a whole.

With respect to statistics regarding the distribution of revenues for the qualifying universe of vessels (Table 3.5.1.4.1), the fact that the standard deviations are consistently close to or larger than the mean values indicates a high degree of heterogeneity within this group. That is, the amount of revenue earned in total and within each fishery differs considerably between vessels. Many qualifying vessels, though certainly not all, have a relatively high degree of dependency on the Gulf food shrimp fishery. Inactive vessels are not are not at all dependent on landings from the fishery, which is why the average percentage of revenue from the fishery is lower (66.4 percent) than what might be expected. If inactive vessels are removed from the analysis, the percentage increases to 87 percent. Between 2002 and 2005, the sources of these vessels' commercial fishing revenues have remained relatively the same. As in 2002, approximately 5-6 percent of the qualifying vessels' revenues come from Gulf bait shrimp, South Atlantic shrimp, and Gulf non-shrimp fisheries. However, the most notable change is the significant increase in revenues from non-shrimp fisheries on the U.S. east coast, which now represent more than 8 percent of these vessels' total revenues compared to only .2 percent in 2002. Current data suggests that the majority of this increase is due to the exit of vessels from the Gulf shrimp fishery into the mid-Atlantic/New England scallop fishery, which has been one of the more lucrative commercial fisheries in recent years.

Relative to landings and revenues, the fleet of qualifying vessels is much more homogeneous with respect to physical characteristics (Tables 3.5.1.4.2 and 3.5.1.4.3), though some differences do exist. The average qualifying vessel is approximately 22 years old and 66 feet in length, with a gross tonnage, horsepower, hold capacity, and fuel capacity of 103 tons, 480, 34,000 pounds, and 11,440 gallons respectively. This vessel typically has 3 crew and uses between two and four 50 foot otter trawl nets. More than two-thirds of these vessels have steel hulls and approximately half have on-board freezing capacity.

The characteristics of active qualifying vessels in the Gulf food shrimp fishery differ from that of the entire universe of qualifying vessels. Most notably, active vessels in the fishery are far more dependent on Gulf food shrimp landings and revenues. Practically all (98 percent on average) of the active qualifying vessels' revenues come from Gulf food shrimp landings (Table 3.5.1.4.4). Also, active vessels are comparatively larger in terms of length, tonnage, and fuel capacity and more powerful in terms of horsepower (Table 3.5.1.4.5). Relatively more of the active vessels have steel hulls and on-board freezing capacity (Table 3.5.1.4.6). These findings are suggestive of the types of vessels that have been able to continue operating in the fishery in spite of recent and current adverse economic conditions.

In addition to whether or not qualifying vessels are active in the fishery, another primary source of heterogeneity is vessel size. As would be expected, small qualifying vessels generate lower levels of landings and revenues on average relative to their larger counterparts (Tables 3.5.1.4.7 and 3.5.1.4.13). Most interesting is the difference between large and small qualifying vessels with respect to their dependency on the Gulf food shrimp fishery. The percentage of revenues arising from food shrimp landings is 73 percent for large qualifying vessels, but only 49 percent for small qualifying vessels. Thus, on average, large qualifying vessels are more dependent on the Gulf food shrimp fishery than their smaller counterparts. Put alternatively, small vessels are more diverse and flexible than large vessels with respect to their operations, in general and across fisheries. This finding is consistent with results reported in Funk (1998). For large qualifying vessels, the primary source of other commercial fishing revenue is non-shrimp revenues from east coast fisheries, particularly the scallop fishery. For small qualifying vessels, approximately 21 percent of their total revenues comes from the Gulf bait shrimp fishery and Gulf non-shrimp fisheries.

However, it is also the case that dependency on Gulf food shrimp landings is much more variable within the small vessel sector than the large vessel sector. That is, many small vessels are quite dependent on food shrimp landings, while many others illustrate little if any dependency. To understand this difference, it is necessary to look at the distribution of active versus inactive (i.e. "latent") vessels in the Gulf food shrimp fishery. As previously noted ,the data indicate that, of the 2,666 qualifying vessels, 860 did not have any verifiable Gulf shrimp landings in 2005 while 1,806 vessels did. Large and small vessels comprised approximately 79 percent and 21 percent of the active qualifying vessels, respectively. However, for inactive qualifying vessels, small vessels represent a relatively higher percentage of that group (41 percent) while large vessels represent a relatively smaller percentage (59 percent). In general, a vessel could be considered inactive for a variety of reasons, including permit speculation, participation in other fisheries during the selected time period, or the vessel being sunk or otherwise inoperable. It is also possible that a vessel's landings were not identified because of the previously noted data recording and management issues. This fact is important to bear in mind because it is much more likely that a small vessel's landings would have been missed than a large vessel's landings, due to the consolidation of landings and suppression of vessel identifiers in the SLF, particularly if the former was in fact a state registered boat, and even more so if that boat were operating out of Texas and Mississippi, where trip ticket programs covering the food shrimp fishery are not in operation.

An examination of the geographic distribution of inactive qualifying vessel owners sheds some light onto this issue. Specifically, 32 percent of the inactive vessels' owners are from Texas, 30.6 percent are from Florida (including the east coast), 14.9 percent are from Louisiana, 9.5 percent are from Alabama, 7 percent are from Mississippi and the remaining 6 percent are from non-Gulf states. It is quite likely that some of the alleged "latent" qualifying vessels in Texas and Mississippi may in fact be active, but their landings cannot be specifically identified given current data collection practices. For the other areas, the likely explanation is a combination of permit speculation and the flexible operations of those vessels, particularly those that are small. However, this question can only be answered with certainty upon changes in current data collection practices (e.g. not consolidating landings of small vessels and suppressing their vessel identifiers in the SLF) and/or the implementation of trip ticket programs for the food shrimp fishery in Texas and Mississippi.

Regardless, according to available information, comparing statistics between all qualifying vessels as opposed to active qualifying vessels only by size category generates the following results. For large vessels, dependency on Gulf food shrimp revenues increases from the previously noted 73 percent to nearly 99 percent when only active vessels are considered (Table 3.5.1.4.10). Consistent with the above discussion, the change in dependency is even more dramatic for small vessels, which increases from the previously noted 49 percent to nearly 95 percent when only active vessels are considered (Table 3.5.1.4.16). Thus, when only considering active vessels in the Gulf food shrimp fishery, small vessels are almost equally dependent as their larger counterparts on revenues from the Gulf food shrimp fishery.

Also, on average, small qualifying vessels are also "smaller" in regards to almost all of their physical attributes relative to large qualifying vessels (Tables 3.5.1.4.8, 3.5.1.4.9, 3.5.1.4.14, and 3.5.1.4.15). For example, they use smaller crews, fewer and significantly smaller nets, have less engine horsepower, and significantly lower fuel and hold capacities. Small qualifying vessels are also older on average, indicating the trend towards the building and acquisition of larger vessels in the fishery during the past decade or so. Large qualifying vessels also tend to be steel-hulled. Fiberglass hulls are most prominent among small qualifying vessels, though steel and wood hulls are also common. Nearly two-thirds of the large qualifying vessels have on-board freezing capabilities while few small qualifying vessels have such equipment. Small vessels still rely on ice for refrigeration and storage, though more than one-third of large vessels also depend on ice. Some of the qualifying vessels are so small that they rely on live wells for storage.

According to information in Tables 3.5.1.4.8 and 3.5.1.4.9 to that in Tables 3.5.1.4.10 and 3.5.1.4.11, the physical characteristics of large qualifying vessels and active large qualifying vessels differ little. However, in comparing information regarding small qualifying vessels in Tables 3.5.1.4.14 and 3.5.1.4.9 with active small qualifying vessels in Tables 3.5.1.4.17 and 3.5.1.4.18, some differences exist. Specifically, the active vessels have larger fuel capacities, slightly greater hold capacity, horsepower and tonnage. A significantly higher percentage of the active vessels also have steel hulls, while fiberglass hulls are much less prevalent. Again, these findings are suggestive of the types of vessels that have been able to continue operating in the Gulf food shrimp fishery in spite of recent and current economic conditions.

Table 3.5.1.4.1.1 Distribution of Food Shrimp Landings and Revenues for Unknown and Known Vessels (Including Inactive Qualifiers) by Known Vessel Size Category, 2005.

	Landings (millions of pounds, tails)	Revenues (millions)	Number of vessels	Mean landings per vessel	Mean revenue per vessel
Unknown	7.07	$15.04	N/A	N/A	N/A
Known	127.49	$332.30	6,182	20,623	$53,754
Large	87.62	$261.24	2,034	43,078	$128,437
Small	39.87	$71.06	4,138	9,635	$17,173
Total	134.56	$347.34	N/A	N/A	N/A

Table 3.5.1.4.1.2 Distribution of Food Shrimp Landings and Revenues for Qualifying (Including Inactive Qualifiers) and Non-Qualifying Vessels by Vessel Size Category, 2005.

	Landings (millions of pounds, tails)	Revenues (millions)	Number of vessels	Mean landings per vessel	Mean revenue per vessel
Qualifying	93.41	$269.25	2,666	37,509	$100,994
Large	84.10	$252.02	1,934	43,485	$130,310
Small	9.31	$17.23	732	12,719	$23,538
Non-Qualifying	34.08	$63.05	3,516	9,690	$17,932
Large	3.52	$9.22	123	28,618	$74,959
Small	30.56	$53.83	3,393	9,007	$15,865
Total Known	127.49	$332.30	6,182	20,623	$53,754

Table 3.5.1.4.1.3 Distribution of Food Shrimp Landings and Revenues for Known Active Vessels by Vessel Size Category, 2005.

	Landings (millions of pounds, tails)	Revenues (millions)	Number of vessels	Mean landings per vessel	Mean revenue per vessel
Known	127.49	$332.30	5,322	23,955	$62,439
Large	87.62	$261.24	1,553	56,420	$168,216
Small	39.87	$71.06	3,769	10,578	$18,854

Table 3.5.1.4.1.4 Distribution of Food Shrimp Landings and Revenues for Qualifying Active Vessels by Vessel Size Category, 2005.

	Landings (millions of pounds, tails)	Revenues (millions)	Number of vessels	Mean landings per vessel	Mean revenue per vessel
Qualifying	93.41	$269.25	1,806	51,722	$149,086
Large	84.10	$252.02	1,430	58,811	$176,238
Small	9.31	$17.23	376	24,760	$45,824

Table 3.5.1.4.2.1 Distribution of Revenues and Selected Statistics for All Qualifying (Including Inactive) Vessels, 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp
Number of vessels	2,666	2,666	2,666	2,666	2,666	2,666	2,666	2,666	2,666
Minimum	0	$0	$0	$0	$0	$0	$0	$0	0
Maximum	306,389	$757,104	$129,600	$498,711	$1,889,660	$410,589	$757,104	$1,889,660	100
Total	93,409,641	$269,256,689	$2,306,245	$8,209,486	$25,233,396	$4,493,347	$279,772,420	$309,499,163	N/A
Mean	35,037	$100,997	$865	$3,079	$9,465	$1,685	$104,941	$116,091	66.4
Standard Dev	42,713	$126,593	$8,188	$24,857	$91,226	$17,487	$126,493	$149,995	46.8

Table 3.5.1.4.2.2 Physical Characteristics and Selected Statistics for All Qualifying (Including Inactive) Vessels.[9]

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	1,955	1,934	1,933	2,663	2,666	2,666	2,664	2,464	1,421
Minimum	1	1	8	3	11	8	10	5	0.25
Maximum	7	4	87	106	131	3,412	80,000	770	240
Total	6,405.1	6,700.8	96,940.3	57,949.0	174,989.5	1,277,733.0	30,484,267.0	253,898.0	24,293.1
Mean	3.3	3.5	50.2	21.8	65.6	479.3	11,443.0	103.0	17.1
Standard Dev	0.8	0.9	18.3	11.8	16.3	257.4	10,142.1	49.2	15.6

Table 3.5.1.4.2.3 Distribution of Additional Physical Characteristics for All Qualifying (Including Inactive) Vessels.

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	68.8	Freezer	49.2	Otter Trawl	99.2
Fiberglass	15.2	Ice	49.2	Skimmer Net	0.3
Wood	14.9	Live Well	1.6	Other	0.5
Other	1.1				

[9] The 2004 Vessel Operating Units File (VOUF) was the source of data for hull type, crew size, number of nets, and net size. The Gulf Shrimp Permits database is the source of data for all other characteristics. Characteristics data was not available for every qualifying vessel for a variety of reasons. For example, a vessel may not have been found in the VOUF (which only tracks active Coast Guard documented vessels), the data may not have been provided by the permit owner, or the data is not applicable to particular vessels, as is the case with state registered boats and tonnage.

Table 3.5.1.4.2.4 Distribution of Revenues and Selected Statistics for Active Qualifying Vessels, 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp
Number of vessels	1,806	1,806	1,806	1,806	1,806	1,806	1,806	1,806	1,806
Minimum	38	$103	$0	$0	$0	$0	$103	$103	.2
Maximum	306,389	$757,104	$11,370	$405,198	$570,725	$190,643	$757,104	$757,104	100
Total	93,409,641	$269,256,689	$14,625	$1,906,863	$2,392,107	$1,284,446	$271,178,177	$274,854,730	N/A
Mean	51,722	$149,090	$8	$1,056	$1,325	$711	$150,154	$152,190	98.0
Standard Dev	42,781	$128,403	$271	$15,045	$21,263	$7,084	$128,572	$129,082	11.3

Table 3.5.1.4.2.5 Physical Characteristics and Selected Statistics for Active Qualifying Vessels.

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	1,598	1,597	1,597	1,806	1,806	1,806	1,804	1,728	970
Minimum	1	1	8	3	18	8	55	6	0.5
Maximum	7	4	87	106	130.6	3,412	80,000	770	240
Total	5,291.7	5,602.8	82,117.7	37,214.0	124,032.0	920,537.0	23,369,162.0	187,999.0	17,122.7
Mean	3.3	3.5	51.4	20.6	68.7	509.7	12,954.1	108.8	17.7
Standard Dev	0.8	0.9	17.7	11.7	14.2	277.3	10,331.8	47.7	15.9

Table 3.5.1.4.2.6 Distribution of Additional Physical Characteristics for Active Qualifying Vessels.

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	77.2	Freezer	55.0	Otter Trawl	99.3
Wood	11.5	Ice	44.9	Skimmer Net	0.4
Fiberglass	10.6	Live Well	.1	Other	0.3
Other	.7				

Table 3.5.1.4.2.7 Distribution of Revenues and Selected Statistics for Large Qualifying (Including Inactive) Vessels, 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp
Number of Vessels	1,934	1,934	1,934	1,934	1,934	1,934	1,934	1,934	1,934
Minimum	0	$0	$0	$0	$0	$0	$0	$0	0
Maximum	306,389	$757,104	$0	$498,711	$1,889,660	$410,589	$757,104	$1,889,660	100
Total	84,095,709	$252,028,154	$0	$7,893,302	$25,214,107	$2,073,756	$259,921,456	$287,209,319	N/A
Mean	43,483	$130,314	$0	$4,081	$13,037	$1,072	$134,396	$148,505	73.0
Standard Dev	45,393	$135,457	$0	$28,936	$106,897	$16,113	$135,082	$162,535	44.1

Table 3.5.1.4.2.8 Physical Characteristics and Selected Statistics for Large Qualifying (Including Inactive) Vessels.

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	1,565	1,559	1,559	1,931	1,934	1,934	1,932	1,934	1,066
Minimum	1	1	8	3	60	8	1000	32	0.5
Maximum	7	4	87	55	131	3,412	80,000	770	240
Total	5,493.8	5,840.6	88,185.8	38,749.0	143,174.3	1,056,819.0	29,358,873.0	235,183.0	21583.7
Mean	3.5	3.7	56.6	20.1	74.0	546.4	15,196.1	121.6	20.2
Standard Dev	0.6	0.6	12.7	11.1	8.4	259.1	9,458.6	36.9	16.4

Table 3.5.1.4.2.9   Distribution of Additional Physical Characteristics for Large Qualifying (Including Inactive) Vessels.

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	82.9	Freezer	65.1	Otter Trawl	99.7
Wood	9.9	Ice	34.9	Other	0.3
Fiberglass	7.0				
Other	0.2				

Table 3.5.1.4.2.10 Distribution of Revenues and Selected Statistics for Large Qualifying Active Vessels, 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp
Number of Vessels	1,430	1,430	1,430	1,430	1,430	1,430	1,430	1,430	1,430
Minimum	177	$574	$0	$0	$0	$0	$574	$574	.2
Maximum	306,389	$757,104	$0	$405,198	$570,725	$190,643	$757,104	$757,104	100
Total	84,095,709	$252,028,154	$0	$1,906,863	$2,392,107	$536,348	$253,935,017	$256,863,472	N/A
Mean	58,808	$176,243	$0	$1,333	$1,673	$375	$177,577	$179,625	98.7
Standard Dev	43,421	$129,304	$0	$16,898	$23,885	$5,560	$129,247	$129,790	9.7

Table 3.5.1.4.2.11 Physical Characteristics and Selected Statistics for Large Qualifying Active Vessels.

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	1,330	1,330	1,330	1,430	1,430	1,430	1,428	1,430	771
Minimum	1	1	8	3	60	8	1000	40	0.5
Maximum	7	4	87	55	131	3412	80000	770	240
Total	4,674.4	5,005.6	75,815.0	27,446.0	106,491.6	799,295.0	22,632,394.0	176,592.0	15,425.4
Mean	3.5	3.8	57.0	19.2	74.5	558.9	15,849.0	123.5	20.0
Standard Dev	0.6	0.6	12.4	10.8	8.5	280.6	9,688.3	38.1	16.6

Table 3.5.1.4.2.12 Distribution of Additional Physical Characteristics for Large Qualifying Active Vessels.

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	86.0	Freezer	67.8	Otter Trawl	99.7
Wood	7.0	Ice	32.2	Other	0.3
Fiberglass	6.9				
Other	0.1				

Table 3.5.1.4.2.13 Distribution of Revenues and Selected Statistics for Small Qualifying (Including Inactive) Vessels, 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp
Number of vessels	732	732	732	732	732	732	732	732	732
Minimum	0	$0	$0	$0	$0	$0	$0	$0	0
Maximum	196,942	$300,383	$129,600	$97,668	$12,883	$312,616	$300,383	$312,616	100
Total	9,313,932	$17,228,535	$2,306,245	$316,184	$19,289	$2,419,591	$19,850,964	$22,289,845	N/A
Mean	12,724	$23,536	$3,151	$432	$26	$3,305	$27,119	$30,451	49.0
Standard Dev	22,697	$40,293	$15,402	$5,366	$512	$20,608	$41,485	$45,188	49.1

Table 3.5.1.4.2.14 Physical Characteristics and Selected Statistics for Small Qualifying (Including Inactive) Vessels.

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	390	375	374	732	732	732	732	530	355
Minimum	1	1	8	3	11	10	10	5	0.25
Maximum	6	4	80	106	59	1,271	15,000	330	50
Total	911.3	860.2	8,754.5	19,200.0	31,815.2	220,914.0	1,125,394.0	18,715.0	2709.4
Mean	2.3	2.3	23.4	26.2	43.5	301.8	1,537.4	35.3	7.6
Standard Dev	0.6	0.8	13.2	12.7	10.2	143.3	1,707.4	21.0	6.7

Table 3.5.1.4.2.15 Distribution of Additional Physical Characteristics for Small Qualifying (Including Inactive) Vessels.

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Fiberglass	36.9	Ice	86.9	Otter Trawl	98.0
Steel	31.6	Freezer	7.1	Skimmer Net	1.0
Wood	28.0	Live Well	6.0	Other	1.0
Other	3.5				

Table 3.5.1.4.2.16 Distribution of Revenues and Selected Statistics for Small Qualifying Active Vessels, 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp
Number of vessels	376	376	376	376	376	376	376	376	376
Minimum	38	$103	$0	$0	$0	$0	$103	$103	1.1
Maximum	196,942	$300,383	$11,370	$0	$0	$181,937	$300,383	$300,942	100
Total	9,313,932	$17,228,535	$14,625	$0	$0	$748,099	$17,243,160	$17,991,259	N/A
Mean	24,771	$45,821	$39	$0	$0	$1,990	$45,859	$47,849	95.5
Standard Dev	26,552	$46,272	$594	$0	$0	$11,030	$46,238	$47,144	15.9

Table 3.5.1.4.2.17 Physical Characteristics and Selected Statistics for Small Qualifying Active Vessels.

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	268	267	267	376	376	376	376	298	199
Minimum	1	1	8	3	18	55	55	6	0.5
Maximum	4	4	80	106	59	1,271	10,000	130	50
Total	617.3	597.2	6,302.7	9,768.0	17,540.4	121,242.0	736,768.0	11,407.0	1,697.4
Mean	2.3	2.2	23.6	26.0	46.7	322.5	1,959.5	38.3	8.5
Standard Dev	0.5	0.7	13.7	13.5	8.8	159.8	1,715.4	15.7	7.1

Table 3.5.1.4.2.18 Distribution of Additional Physical Characteristics for Small Qualifying Active Vessels.

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	43.9	Ice	93.4	Otter Trawl	97.6
Wood	28.2	Freezer	6.4	Skimmer Net	1.9
Fiberglass	24.7	Live Well	.3	Other	.5
Other	3.2				

Table 3.5.1.4.3.1 Changes in Nominal Shrimp Prices, 2000 through May 2006.

Size	2000	2001	2002	2003	2004	2005 Pre-Katrina	2005 Post-Katrina	May2006	Change 2000 to 2006	Percent change 2000 to 2006
Under 15	$9.06	$8.39	$6.96	$5.91	$6.34	$6.56	$6.46	$5.95	-$3.11	-34.3%
15-20	$7.10	$6.51	$5.45	$4.95	$5.26	$4.75	$4.22	$4.10	-$3.00	-42.2%
21-25	$5.72	$5.24	$4.23	$3.99	$4.32	$3.98	$3.52	$3.40	-$2.32	-40.5%
26-30	$5.08	$4.76	$3.51	$3.52	$3.34	$3.18	$3.12	$3.18	-$1.90	-37.4%
31-40	$4.47	$3.74	$2.91	$2.82	$2.59	$2.67	$2.61	$2.63	-$1.84	-41.1%
41-50	$3.92	$2.95	$2.58	$2.31	$2.14	$2.37	$2.30	$2.24	-$1.68	-42.8%
51-67	$3.44	$2.59	$2.31	$2.00	$1.84	$2.17	$2.11	$2.04	-$1.40	-40.7%
>67	$2.16	$1.95	$1.60	$1.23	$1.11	$1.58	$1.61	$1.51	-$0.65	-30.1%

Table 3.5.1.4.4.1 Selected Statistics for Gulf Food Shrimp Dealers in 2005.

	Gulf Food Shrimp Landings	Gulf Food Shrimp Sales
Number of dealers	609	608[10]
Minimum	1	$4
Maximum	7,402,272	$26,274,180
Total	134,557,315	$347,344,190
Mean	220,948	$571,290
Standard Dev	595,791	$1,756,763

[10] One dealer reported its purchases of Gulf food shrimp landings, but did not report the sales value.

3.5.1.5 Historical and Current Economic Status of the Gulf Shrimp Fishery's Harvesting Sector

As has been noted in various publications and the media coverage, the Gulf shrimp fishery has been in economic decline for approximately the past four years. Travis and Griffin (2004) discuss this decline and its causes in detail, the highlights of which follow.

According to Funk (1998), which examined fleet profitability during the 1965 through 1995 time period, the average annual rate of return (net revenue or profit as a percentage of revenue) for the fishery as a whole was 12.5 percent, which is a respectable figure for capital investors. Given the inherent variability in shrimp stock conditions from year to year and, thus, landings and revenues, it is not surprising that profitability was also quite volatile from year to year, with the industry experiencing exceptionally high profits in some years and very low or negative profits (losses) in other years. In addition to the annual variability in abundance, economic performance appeared to be largely driven by changes in fuel prices, with changes in crew share expenses playing a secondary role. Several researchers have noted that fuel costs have and continue to represent a significant portion of the industry's operating costs (Haby et al. 2003; Ward et al. 1995). Thus, fluctuations in fuel prices can significantly impact the industry's economic performance.

In addition to variability over time, Funk's (1998) analysis also indicated that economic performance varied by vessel size. In general, rates of return tend to be higher on average for smaller vessels than for larger vessels, even though revenues and aggregate profits tend to be higher for the larger vessels. This result indicates that the costs of operating larger vessels also tend to be relatively higher, both in the aggregate and on a per unit basis, than those of smaller vessels. However, Funk (1998) hypothesized that ownership status and level of participation in the fishery were two of the most important factors explaining this variation in profitability. That is, smaller vessels tend to be predominantly operated by their owners, but only participate in the shrimp fishery on a part-time basis. These factors increase the flexibility of these vessels' operations. In general, these vessels will only participate in the fishery when revenue and/or profit per unit of effort are relatively high. When low or negative profits are being earned, these vessels and their owners will allocate their time to other fisheries and endeavors. Conversely, the larger vessels are more frequently operated by hired captains, and participate in the fishery on a full-time basis. In addition to the fact that these captains must be paid, as well as the crew, these vessels have much less flexibility with respect to when they participate in the fishery. Good captains must be retained, lest they be lost to other owners, and bills for relatively high "fixed" costs, such as insurance, mortgage payments, etc., must still be paid regardless of whether the vessel fishes or not. Furthermore, many of these larger vessels are part of a vertically integrated operation (i.e. they are owned by processing firms). In such instances, the goal of the owner is likely to maximize profits for the entire operation as opposed to the individual vessel. A stable supply of shrimp is critical to the profitable operation of processing plants. All of these factors will cause these larger vessels to continue operating in the shrimp fishery, even when profits are low or negative. Therefore, on average and over time, a lower rate of return should be expected for larger vessels relative to smaller vessels in this fishery. Funk's (1998) results confirm this expectation. Nonetheless, overall, this industry was historically profitable during this time period.

According to a subsequent analysis whose primary purpose was to analyze the impacts of the recent changes in TED regulations (NMFS 2002b), the large vessel component of the fishery was profitable to highly profitable between 1998 and 2000. Nominal shrimp prices were relatively stable, fuel prices were relatively low by historical standards, and abundance tended to be higher than historical averages. Undoubtedly, strong conditions at the macroeconomic level created relatively high levels of consumer demand for shrimp, which in turn engendered strong economic performance in the shrimp industry.

However, economic conditions took an abrupt turn in the latter half of 2001. Current evidence indicates that as imports surged, macroeconomic conditions deteriorated, and when the post-September 11, 2001 era began, the industry was hit by sharply declining prices and higher insurance premiums.[11] At least for the large vessel sector, profits turned into losses by the end of 2001. The deteriorating trend appears to have continued through 2002 and 2003, exacerbated by increases in fuel prices that began in the latter part of 2002 and continued through 2003. According to average price data reported by the Bureau of Labor Statistics (BLS), from 2002 to 2003, fuel prices increased between 21 percent and 29 percent, depending on the selected fuel price index.[12] Regardless of which index is used, fuel prices increased significantly which, in turn, significantly increased shrimp vessels' operating costs.

By 2002, as indicated in the economic analysis of the 2003 Texas Closure policy (Travis and Griffin 2003) and the supplemental economic analysis of Amendment 10 to the Shrimp Fishery Management Plan (NMFS 2003a), economic conditions deteriorated to the point where all sectors of the Gulf shrimp fishery, regardless of vessel size, state, or gear, were facing negative profits (losses) on average by the end of 2002. According to the Texas Closure analysis, for the fishery as a whole in 2002, the average rate of return (profits or losses as a percentage of revenue) was expected to be approximately -41 percent, with lower loss rates being experienced for the small vessel sector (-30 percent) relative to the large vessel sector (-45 percent). Regardless of whether the Texas Closure policy was continued or not, projections for 2003 indicated that these economic losses would persist under existing conditions at the time.

These analyses clearly indicated that rapidly declining prices were the primary source of the recent deterioration in the industry's economic condition. In the aggregate, the average nominal price of shrimp in the Gulf decreased by approximately 28 percent between 2000 and 2002. Revenues decreased even more as a result of relatively lower shrimp abundance and, therefore, landings in 2001 and 2002 relative to 2000. The magnitude of the price decline varied by shrimp size category, with the under 15 count ("jumbo") and 68 and over count ("small") size categories seeing the smallest declines (approximately 23 percent) and the 31-40 and 41-50 count ("large" and "medium") size categories seeing the largest declines (approximately 35 percent). Due to inflation, these price declines were even larger in real terms.

[11] Increases in vessel insurance premiums were documented at that time in a Commercial Fisheries News article, a reprint of which can be found at http://www.fishresearch.org/Articles/2002/10/insurance.asp.

[12] According to information posted to http://data.bls.gov on February 17, 2004, the Consumer Price Index's average price data for fuel oil, Series APU00007251, indicated that fuel prices increased by 21% between 2002 and 2003. However, the PPI's data on average prices for #2 diesel fuel, Series WPU057303, indicated that fuel prices increased by 29% during this time.

According to Haby et al. (2003), increases in shrimp imports have been the primary cause of the recent decline in U.S. shrimp prices. A complete discussion of the factors contributing to the increase in imports can be found in Haby et al. (2003). In general, recent surges in imports have been caused by increases in the production of foreign, farm-raised shrimp. More specifically, increased competition from shrimp imports has been due to three primary factors: 1) changes in product form due to relatively lower wages in the exporting countries, 2) shifts in production to larger count sizes, and 3) tariff and exchange rate conditions which have been favorable to shrimp imports into the U.S. With respect to the first factor, lower wage rates have allowed major shrimp exporters (e.g. Thailand) to increase production of more convenient and higher value product forms, such as hand-peeled raw and cooked shrimp. With respect to the second factor, changes in farming technology and species have allowed production of foreign product to shift towards larger, more valuable sizes. As a result of these factors, imports are more directly competing with the product traditionally harvested by the domestic industry, thereby reducing the latter's historical comparative advantage with respect to these product forms and sizes. Finally, with respect to the third factor, the lack of duties on shrimp imports into the U.S., the presence of relatively significant duties on shrimp imports into the European Union (E.U.), and the recent strength of the U.S. dollar relative to foreign currencies have created favorable conditions for countries exporting products to the U.S.

As Haby et al.(2003) note, the increase in imports caused the domestic industry's share of the U.S. shrimp market to decrease from 44.6 percent to 14.8 percent between 1980 and 2001. While the growth in imports was relatively steady throughout most of this time period (for e.g., 4 percent to 5 percent in the late 1990's), shrimp imports surged by 16 percent in 2001. Since 2001, which is the last year accounted for in their analysis, shrimp imports have continued to rise. Although the increase in 2002 was a modest 7.2 percent, relative to the increase in 2001, a significant increase of 19.1 percent occurred in 2003 according to the most recently available data.[13] These increases led to further erosion in the domestic industry's market share and additional price declines.

In order to further investigate changes to the industry's economic status, a new economic analysis was conducted (Travis and Griffin 2004). This updated analysis revealed that, on average, vessels were not even able to cover their variable costs in 2002. Preliminary information at the time indicated that domestic shrimp prices had continued to decline in 2003,[14] which would lead to the expectation that the vessels' inability to cover their variable costs would continue in 2003 and probably beyond. If vessels cannot cover their variable costs, they will be forced to cease operations (i.e. exit the fishery), at least until conditions change.

Projections of fleet size, as measured by full-time equivalent vessels (FTEVs), and nominal effort were updated and extended farther into the future (20 years, or through 2021) to determine how long it would take for the fishery to reach an equilibrium state, assuming no changes in external factors (e.g. imports, regulations, etc.). In general, equilibrium occurs once economic

[13] Shrimp import data can be found at http://www.st.nmfs.gov/st1/trade/trade_prdct_cntry.html

[14] Available data at that time indicated that the decline in nominal prices from 2000 to 2003 was 36% across all size categories. Depending on the size category, the declines ranged from 27% to 40%.

losses are no longer being incurred (i.e. economic profits are zero) and fleet size is stable (i.e. fleet size has reached its minimum level).

According to the updated projections, the average rate of return in the fishery for 2002 was projected to have been approximately -33 percent, slightly better than initial projections, and the difference between the rates of return in the small vessel sector and large vessel sector also narrowed to a small degree (-27 percent and -36 percent, respectively). Economic losses were forecasted to continue throughout the fishery on average until 2012, *ceteris paribus*. As would be expected, these losses cause vessels to continue exiting from the fishery during this time. The size of the large vessel sector and level of associated fishing activity decline continuously, in terms of FTEVs and nominal effort, through 2012 and were expected to have decreased by 39 percent and 34 percent, respectively, relative to 2002 levels. However, only the large vessel sector reached equilibrium by 2012. Although the number of FTEVs and nominal effort are expected to decrease in the small vessel sector by approximately 29 percent by 2012, the small vessel sector continued to decrease in size and effort throughout the entire twenty-year simulation. The logic behind this differential result between the large and small vessel sectors is fairly straightforward. Specifically, as large vessels, which predominately operate in offshore waters, exit the fishery, their departure leads to an improvement in the economic performance of the large vessels that remain in the fishery, primarily as a result of increases in CPUE in offshore waters. However, given the migration pattern of shrimp from inshore to offshore waters, the departure of large vessels does not generally increase CPUE in inshore waters where the smaller vessels tend to operate. Conversely, the departure of small vessels improves the economic performance of both small and large vessels by removing competition in inshore waters and by allowing more shrimp to escape into offshore waters (i.e., CPUE should increase in both inshore and offshore waters). Although the economic performance of large vessels was projected to improve more quickly than that of small vessels, *ceteris paribus*, it must be emphasized that, under 2002 conditions, economic recovery even in the large vessel sector is not expected for several years.

It is important to note that these projections assumed that external factors such as imports, fuel prices, and other costs remain unchanged from their 2002 status. That is, information regarding increases in fuel prices, insurance premiums, and imports, and further declines in shrimp prices since 2002 was not incorporated into the model and analysis since final data were not yet available at that time. Since these changes would be expected to further erode the harvesting sector's economic performance, the projections of economic losses, decreases in fleet size and effort, and the period of time before the large vessel sector stabilizes are likely underestimated. Thus, unless other factors change in a manner that would contravene these adverse impacts, these projections of fleet size and effort reductions should be considered conservative. Such contravening factors would include those which could be reasonably expected to increase prices, such as improvements in product quality and successful marketing programs that promote domestic, wild food shrimp, both of which would be expected to increase the demand for domestically produced shrimp. In theory, tariffs and other import restrictions (e.g. more stringent standards on the presence of antibiotics in farmed shrimp) could also lead to price increases.

Since the time of this analysis, many changes have continued to occur that would likely affect the economic status of the Gulf shrimp harvesting sector. Most of these changes would be expected to adversely affect the industry's economic status. For example, fuel prices have risen significantly since 2002. Probably the best proxy to use for fuel prices paid by commercial shrimpers (or commercial fishermen in general) is the diesel fuel price paid by farmers, statistics for which are generated by the USDA. This price is more appropriate than the diesel fuel price "paid on the street," which is typically generated by the BLS, because it removes fuel excise taxes, which neither commercial fishermen nor farmers pay. The diesel fuel price per gallon paid by farmers changed as follows between 2002 and 2005: $.96, $1.24, $1.31, and $1.97.[15] Although annual data is not yet available for 2006, the USDA reported that the diesel fuel price paid by farmers had increased to $2.28 per gallon as of April, 2006.[16] This represents a price increase of nearly 138 percent between 2002 and April 2006, with the largest increases occurring in 2003, 2005, and early 2006.

To provide some context, it is helpful to think of how these fuel price increases translate into increases in a typical vessel's fuel expenses. With respect to the cost of filling up a shrimp vessel, the average fuel capacity of an active, qualifying vessel is approximately 13,000 gallons (see Table 3.5.1.4.5). Thus, between 2002 and April 2006, the cost of filling up an "average" active, qualifying shrimp vessel has risen from approximately $12,500 to nearly $30,000. However, these costs differ considerably between large and small active, qualifying vessels. For large vessels with an average fuel capacity of approximately 16,000 gallons (Table 3.5.1.4.11), the fuel price increases cause the cost of filling up the vessel to increase from slightly more than $15,000 to more than $36,000. For small vessels, which only have an average fuel capacity of approximately 2,000 gallons (Table 3.5.1.4.17), the cost of filling up a vessel has increased from about $2,000 to nearly $4,600. In any case, again, the cost of filling up a shrimp vessel with fuel has increased nearly 138 percent between 2002 and April 2006.

With respect to domestic shrimp prices, Table 3.5.1.3.1 presents information on changes in prices per pound by size count from 2000 through 2006. These prices are tail or heads-off prices, not heads-on prices, and smaller counts indicate larger shrimp. The information in this table suggests that the largest price declines were in 2001, 2002, and 2003, which is consistent with information in the previously discussed analyses. Domestic shrimp prices generally stabilized and in fact recovered to some extent in 2004 and 2005 prior to Hurricanes Katrina and Rita. However, those gains have largely been eliminated in the post-hurricane months of 2005 and early 2006, as prices are once more in decline. Although the recent price declines have occurred in the post-hurricane time frame, it should not be concluded that they are directly due to the hurricanes. Rather, as a result of declining participation and therefore effort in the fishery, which is partly due to the hurricanes, but also due to the adverse economic condition of the fishery, the average size of harvested shrimp has increased and landings have increased in the larger shrimp size categories (i.e. 15-20 and 21-25 count), which in turn has caused prices to decrease for those size categories. Second, and likely most important, the price gains that occurred in 2004 and the pre-hurricane months of 2005 were undoubtedly due to the impact of duties imposed on imported shrimp and the relative stabilization in the volume of imports coming into the U.S. In 2004, shrimp imports increased by 12.7 percent over their 2003 level. While still significant, it was less than the increase in 2003 and much of it was in the early part of the year. In 2005, shrimp imports increased by only 2.2 percent over their 2004 level.

[15] See http://www.nass.usda.gov/pa/annsum05/pricespaid.pdf
[16] See http://www.nass.usda.gov/ks/prices/2006/pricemay.pdf

However, shrimp imports have once more been surging into the U.S. market in the past several months, and this is more than likely the primary cause of general (i.e. across all size counts) price decreases for domestic shrimp during that time. Specifically, from January through June 2006, shrimp imports are approximately 15.2 percent higher than they were during those same months in 2005.[17]

In sum, depending on the size, Gulf shrimp prices declined between 30 percent and 43 percent from 2000 to May 2006, with most of the declines occurring between 2001 and 2003. Between 2003 and May 2006, prices stabilized or increased in 2004 and 2005 before hurricanes Katrina and Rita. However, prices have declined since that time. Between 2003 and May 2006, prices increased between 2 percent and 22 percent for the smallest shrimp, basically remained stable for the "jumbo" size shrimp (under 15 count), but have decreased between 3 percent and 17 percent for most size categories. The declines have been greatest for the "large" shrimp (15-20 and 21-25 count), which have also become the predominant size counts in the domestic landings and thus what the offshore fleet has become most dependent on to generate revenues.

With respect to catch rates (catch per unit of effort or CPUE, as measured by pounds of shrimp tails landed per day fished, where a day fished equals 24 hours of trawl time), the most reliable data to use in this case is information pertaining to the offshore component of the fishery. Between 1990 and 2002, catch rates in the offshore fishery varied from 418 pounds per day fished to 593 pounds per day fished, and averaged 487 pounds per day fished. From 2003 to 2005, pounds per day fished increased to 615, 621, and 833 respectively. These increases in offshore CPUE are directly caused by the concomitant declines in offshore effort (by more than 49 percent) since 2002. The value of 833 pounds per day fished in 2005 represents an increase of 71 percent over the 1990-2002 average, and is second only to the value of 856 pounds per day fished that was seen back in 1960 (the first year for which this data was tracked).

Thus, since the time period considered in Travis and Griffin's analysis (i.e. 2002), fuel prices have risen significantly, shrimp prices have declined, but catch rates have increased. The first two changes would be expected to worsen the economic performance of the Gulf shrimp harvesting sector. Increased fuel prices cause fuel expenses to increase and lower shrimp prices cause revenues to fall, both of which will lead to lower profits or higher losses. Conversely, increases in catch rates will increase revenue per unit of effort (or, alternatively, decrease cost per pound), which should improve the offshore fleet's economic performance. However, it is highly likely that the combined effects of the fuel price increase and shrimp price decrease outweigh the effect of the higher catch rates. Therefore, it is also highly likely that the offshore fleet's economic performance was worse in 2005 than in 2002. This conclusion is supported by the fact that the actual decline in effort between 2002 and 2005 was greater than Travis and Griffin's projections (i.e. vessels are exiting the fishery more quickly than forecasted). As such, it is reasonable to conclude that, not only will effort and fleet size continue to decline for the foreseeable future, but the equilibrium level of effort and fleet size will be lower than originally forecasted and thus the reductions in effort and fleet size at the new equilibrium will be larger than predicted. Whether the new equilibrium will be attained sooner, later, or at the same time as initially projected is currently unknown.

[17] See http://www.st.nmfs.gov/st1/market_news/doc45.txt

3.5.1.6 Gulf Shrimp Dealer/Wholesaler Sector

In addition to the harvesting sector, dealers/wholesalers play an important role in the Gulf shrimp industry. Unfortunately, no studies have been done to specifically examine their current economic performance. However, given the documented declines in the harvesting sector and the processing sector, and also given the fact that many dealers are also harvesters or processors, it is logical to conclude that this sector is also experiencing adverse economic conditions for the same reasons.

This sector is generally characterized in Table 3.5.1.4.1. In 2005, 609 dealers were identified in the SLF data. This figure compares to 626 dealers in 2002 and 745 dealers in 2004. Therefore, the number of dealers in 2005 is less than in 2002 and considerably less than in 2004, which is generally consistent with the hypothesis that this sector, like the harvesting sector, experienced a significant economic decline in 2005. However, all of these figures are considerably higher than in previous, recent years. For example, between 1999 and 2001, the number of dealers ranged 310 to 320. Such a dramatic increase is inconsistent with the hypothesis that this sector has also been experiencing adverse economic conditions. However, the answer to this apparent mystery lies primarily in certain harvesters' responses to the poor economic conditions.[18] Specifically, in their attempts to reduce costs and obtain higher prices for their product, it appears that many harvesters decided to remove one of the so-called "middlemen" by obtaining dealer licenses themselves in order to sell directly to the public. An in-depth examination of the data appears to support this conclusion.

The statistics in Table 3.5.1.4.1 suggest that considerable heterogeneity exists within this sector with respect to individual dealers' volume and sales. The data indicate that, of the 608 dealers reporting sales figures, 70 percent (426) reported food shrimp sales of less than \$100,000. Of these, over 71 percent (304) reported sales of less than \$10,000. It is highly likely that the vast majority of these dealers are in fact harvesters who decided to obtain a dealer license and sell their own product rather than sell through a traditional dealer/wholesaler. If these "dealers" are factored out, these figures indicate that only 183 dealers sold more than \$100,000 of food shrimp. Given that the number of dealers with sales over \$100,000 was 228 in 2002, this figure is closer to what would be expected given numbers from previous years and prevailing economic conditions. These firms are likely the traditional dealers that have dockside businesses/facilities. Of these 183 dealers, 102 had food shrimp sales volumes between \$100,000 and \$1.0 million, while the remaining 83 had sales exceeding \$1.0 million. Many of these 83 dealers are also processing firms. Two firms had sales exceeding \$10.0 million.

Finally, with respect to the significant decrease in the number of dealers between 2004 and 2005, it appears that this decline is almost entirely attributable to the decline in the number of harvesters between those two years. In 2004, there were 193 dealers that sold more than \$100,000 of food shrimp. Thus, the number of traditional dealers decreased by approximately 10 firms in 2005, suggesting that the decline in this sector primarily occurred in 2003 and 2004. On the other hand, the number of dealers with sales of less than \$100,000 was 550 and the number with less than \$10,000 was 396 in 2004. Compared to the 2005 figures, the significant decrease

[18] Improved identification of dealers also plays a role, though it appears not a significant one.

in “dealers” that occurred in 2005 was in the group with sales between $10,000 and $100,000, which in turn likely represents harvesters with dealer licenses that exited the fishery.

3.5.1.7 Gulf Shrimp Processing Sector

With respect to the processing sector, descriptive statistics regarding employment, overall volume and sales, and food shrimp volume and sales for 2005 are presented in Table 3.5.1.5.1. As with the harvesting and dealer sectors, there is considerable heterogeneity within the processing sector regarding employment, volume, and sales. In 2005, the data indicate that 18 processors had less than $1.0 million in food shrimp production, 14 had between $1.0 and $5.0 million, 10 had between $5.0 and $10.0 million, 9 had between $10.0 and $20.0 million, and the remaining 10 exceeded $20.0 million. Back in 2002, the data indicated that 21 processors had less than $1.0 million in food shrimp production, 22 had between $1.0 and $5.0 million, 9 had between $5.0 and $10.0 million, 11 had between $10.0 and $20.0 million, and the remaining 11 exceeded $20.0 million. Along with the statistics in Table 3.5.1.5.1, this information indicates that the number of firms has decreased from 74 to 60 between 2002 and 2005, reflecting additional consolidation in the Gulf shrimp processing sector. The data also indicates that the surviving firms have expanded their production (i.e. average production per firm has increased), which has helped to maintain the value of their production in the fact of declining prices (i.e. processed value per firm has remained relatively stable). Also, in general, the firms that have exited the industry in the last few years are the smaller processors (i.e. those with less than $5 million of processed shrimp value).

The data also indicates that a majority of these firms are highly dependent on the processing of food shrimp. Unfortunately, it is not been historically possible to determine with certainty how much of the shrimp being processed is domestic as opposed to imported by using the NMFS processor data. However, by cross-referencing multiple data sources, Keithly et al. (2005) attempted to approximate this figure.[19] According to their findings, use of imports by domestic processors increased steadily through the 1980's and for example, in 1986, accounted for about one-third of production. Between 1992 and 1994, which was apparently the peak period, domestic and imported product accounted for nearly equal proportions of total processed shrimp products in the Southeast region. Even though, as noted previously, imports have continued to increase since then, Southeast shrimp processing activities have not increased proportionately as a result.

Keithly et al. (2005) hypothesized that this outcome is a direct result of a significant and steady decrease in the deflated price of processed shrimp from over $7.00/pound in the early 1980's to less than $4.00/pound in recent years. This decline has also precipitated a decline in processors’ marketing margins (i.e. per unit profitability). As a result of the declining margins, some processors have adjusted by increasing output in order to compensate; but many have been unable to make such an adjustment, and thus have been forced to exit the industry. This is illustrated by the fact that the number of Gulf shrimp processors fell from 124 to 72 between

[19] The one weakness with their approach is the assumption that all domestic production is utilized by the processing sector. While this assumption would be plausible under stable economic conditions, it is less reasonable in dire economic times when harvesters shift from traditional sales channels and instead sell directly to the public.

1980 and 2001. Thus, the situation illustrates the classic case of an industry in economic decline, wherein the number of firms falls, and those who remain become larger in size (as measured by output). That is, the industry has become more concentrated. Moreover, Keithly et al. (2005) concluded that, if production of farm-raised shrimp continues to increase and a substantial portion of that production enters the U.S. market, the price of processed shrimp will continue to decline; margins will continue to narrow; and consolidation will continue to occur as additional firms exit and remaining firms attempt to compensate by increasing their output.

A more recent study by Keithly et al. (2006) supports many of the conclusions and hypotheses offered in Keithly, et al. (2005), and also helps to explain the changes that have occurred in this sector between 2002 and 2004, as noted above. In the recent study, Keithly et al. (2006) conducted a survey of shrimp processors in order to better estimate their marketing margins and their dependency on domestic as opposed to imported product. The survey information was combined with data from the NMFS processor database for analysis. A critical finding of this study is that shrimp processors' marketing margins have continued to decrease in recent years because the price of processed shrimp has been declining at a faster rate than the price of raw product. The decrease in the price of processed shrimp has been caused by increased imports of value-added product that directly compete with the domestic processors' product. The price decline has caused marketing margins to decrease, which in turn has forced firms to either exit the industry or increase their production. In general, smaller processors have exited while medium to larger sized processors have expanded, probably due to differences in their respective access to financial capital (i.e. smaller firms likely have less access to financial capital than their larger counterparts).

In addition, the study found that, in recent years, domestic processors have used a very limited amount of imported, raw product and instead are heavily dependent on domestically harvested product, contrary to popular belief. As such, the health of the processing sector is heavily dependent on domestic harvesting production. Keithly et al. (2006) note that the remaining firms' ability to maintain operations is dependent on their ability to expand, assuming processed shrimp prices continue to decline, which would be the case if imports of value-added product continue to increase. Therefore, if domestic harvesting production decreases, processors will be constrained in their ability to expand production, and additional consolidation of the industry will be likely. The decrease in Gulf shrimp landings in 2005 may have exacerbated the decline in the economic health of the Gulf shrimp processing sector. On the other hand, landings data indicate that domestic landings have rebounded significantly in 2006, which would help stabilize the processing sector. Though 2006 processor data is not yet available, various reports also indicate that the processing sector was significantly impacted by Hurricane Katrina, either directly as a result of wind/storm surge damage or indirectly as a result of population shifts/displacement which in turn created labor shortages. Processors located in Biloxi, D'iberville, and Ocean Springs, Mississippi as well as in New Orleans and Violet, Louisiana were particularly hard hit (IAI, 2006).

Table 3.5.1.7.1 Employment, Production and Value in the Gulf Shrimp Processing Sector, 2005.

	Number of Employees	Total Pounds	Total Product Value	Shrimp Pounds	Value of Shrimp	Shrimp As Percent of Total Product Value
Number of Processors	60	60	60	60	60	60
Minimum	2	766	$5,362	125	$756	0.3
Maximum	353	32,420,000	$82,795,705	32,420,000	$64,471,208	100
Total	3381	219,428,486	$600,199,583	202,240,611	$548,060,139	N/A
Mean	56	3,657,141	$10,003,326	3,370,677	$9,134,336	88.6
Standard Dev	76	5,688,090	$13,950,347	5,387,083	$12,245,836	26.7

3.5.2 Social Environment

As described in the social impact statement, there is little data to adequately describe the affected environment for communities dependent on the shrimp or red snapper fisheries. However, a combination of secondary data including landings data, federal permits data, and census data can be analyzed as a starting point to identify some of the communities that may be affected by changes in federal fishing regulations. Data from the 1990 and 2000 Census was used for the descriptions in this document so that it is possible to see changes in the communities in those ten years.

Under NEPA, EO 12898 requires fisheries managers to address environmental justice in minority and low-income populations regarding the actions proposed. Although demographic information from the U.S. Census has categories for race and income, we can not assume that the percentage of minorities or low-income shown in the Census data is the same as the percentage of minorities or low-income who are involved in the fishing industry. There is not enough research on individual communities in these fisheries to know the status of race or income among people who rely on the fishing industry. Therefore it is not possible to know if the actions in this amendment would have any disproportionately high and adverse effects on minority or low-income populations. However, because this amendment requires reductions in effort in the shrimp and red snapper fishery throughout the Gulf of Mexico, it is assumed that there will not be an environmental justice issue for minorities or low-income people who participate in these fisheries.

Fishing communities were ranked according to the dealer reported number of pounds, using 2004 red snapper data and 2005 shrimp data, to get an idea of how dependent communities are on the red snapper and shrimp fisheries. Permits data was also taken into consideration. These analyses do not fully take into account how communities have been impacted by the hurricanes season of 2005.

Even before hurricane Katrina fishermen in the shrimp industry were already having a difficult time making a living in the shrimp fishery due to the high cost of fuel and the low price paid at the docks for shrimp, and the overcapitalization of the shrimp fishery. Many shrimp fishermen had dropped the insurance on their boats and reduced the number of crew on their boats to increase profits. Big shrimp boats were being repossessed at an increasing rate, and fishermen were exiting the shrimp fishery.

The hurricanes of 2005 brought massive disruptions to the fishing industry across the northern Gulf of Mexico. Docks, marinas, fuel sources, and icehouses were heavily damaged or destroyed. Some fishermen with operable boats have moved, at least temporarily, to other locations to fish, and may unload in an area that is different than where they unloaded before the hurricanes. A year after the storm several communities were still struggling to get back on their feet and recover their shrimp fishing industry. In 2004, Louisiana, Mississippi, and Alabama accounted for almost half of the shrimp harvested in the nation. In Louisiana, 66 percent of the shrimp fishermen live in areas affected by hurricane Katrina. 83 percent of Louisiana's seafood processors and all eight of seafood canning factories were also located in these areas. Two of the largest shrimp processors in Louisiana, Bumble Bee Cannery in Violet, Louisiana and Piazza Seafoods in New Orleans, were left inoperable. Bumble Bee is not planning to reopen (Impact Assessment, Inc. 2007).

Boats and fishing infrastructure were lost to the hurricane and fishing dependent communities were totally disrupted. In the case of lower Plaquemines Parrish and St. Bernard Parrish, most of the fishing infrastructure was completely destroyed. The Empire/Venice area of Plaquemines Parish was one of the top areas for landings of shrimp in the Gulf of Mexico prior to the storm. In October 2005, 2/3s of the shrimp fleet was out of commission (Impact Assessment, Inc. 2007).

Communities are still rebuilding their fishing dependent businesses and fishermen are trying to repair or replace damaged or destroyed boats. Many shrimp fishermen along the northern coast of the GOM are living in FEMA trailers or with friends and relatives in other locations. As of August 2006, some were still waiting to obtain a FEMA trailer so they can move back to their communities. Some shrimpers will never return to their communities and will rebuild their lives elsewhere.

Recent fieldwork in lower Plaquemines Parish revealed that there are many boats still in need of salvaging. Some are stranded along roadways and in marshes as owners wait to see if they can get help from the government to remove their boats and return them to the water. One fisherman said he has a 40-foot shrimp boat that appears to have received minor damage but is stranded in the marsh. He had received an estimate of $40,000 to remove his boat from the marsh and get it back into the water, less than a half of mile away. Others who lost their shrimp boats do not have insurance to replace them. A shrimp dock in Buras, Louisiana reopened in May 2006 and the owner said he had half of the number of shrimp boats landing shrimp in July 2006 as he had at the same time in 2005 (Ingles, personal communication 2006).

Grand Isle, Louisiana had two shrimp docks with ice machines and fuel before the storm. Both of these docks were left in ruins after the storm passed. One shrimp dock reopened in November 2005, the other opened in April 2006. In July 2006, the number of shrimpers unloading shrimp in Grand Isle was less than it was a year ago (Ingles, personal communication 2006).

In 2005, the Louisiana Department of Fish and Wildlife estimated that at one year out, there would be an economic loss of over $538,000,000 to the shrimp industry. Even as infrastructure is rebuilt and some shrimp fishermen go back to shrimping, there are still many challenges ahead. Currently, there are still not enough processors in business to process all of the shrimp that is coming in, causing bottle necks in the processing. Louisiana had a reported loss of 35-40 percent of the labor pool they had before the hurricane in jobs dependent on the fishing industry. Many workers relocated to other areas after the hurricane and have not returned. In Plaquemines Parish, the number of commercial fishing licenses was down 38 percent in 2006 from the number of licenses in 2004-2005. The number of commercial fishing licenses St. Bernard Parish was down 43 percent for the same time frame (Impact Assessment, Inc. 2007).

Many of the shrimp boats in Bayou la Batre, Mississippi were lost or stranded in the marsh due to hurricane Katrina; 60 percent of the commercial shrimp boats in Bayou la Batre were destroyed (Impact Assessment, Inc. 2007). Even before the storm, many of the boats in Bayou la Batre were tied up at the docks and had been repossessed.

The shrimp industry in Mississippi also suffered great losses from hurricane Katrina. Many boats were damaged or destroyed and most of the infrastructure for the shrimp industry in Gulfport and Biloxi was destroyed. At the start of the shrimp season in May 2006, 15 percent of the shrimp fleet that had been in place pre-Katrina went out to fish. Aerial surveys done in June 2006 of shrimp boats along the Mississippi coast revealed 306 boats, which were down from the 603 observed in June 2005 (Impact Assessment, Inc. 2007).

The Gulf of Mexico shrimp industry faces many challenges ahead. Some of the challenges are created due to the low prices paid at the docks for shrimp due to the competition from the price paid for imported shrimp and the high cost of fuel. Other challenges were created by hurricane Katrina. Many fishermen are still displaced, and do not have homes to return to in their communities. There is still a need for funding to help rebuild the infrastructure that supported the shrimp industry prior to the storm. Shrimp boats are still in need of repair and salvaging. There are not enough processors, commercial marinas, icehouses, and fuel docks to service the shrimp fishery in the Gulf of Mexico as it rebuilds. Some of the land that was occupied by infrastructure that supported the shrimp industry before hurricane Katrina is being bought up and converted to other uses such as space for condominiums and casinos.

Although we are continuing to study the impacts of the hurricanes, we do not have a full understanding of how the fishing industry in the Gulf of Mexico has changed at this time. It is still unknown how many shrimp boats were lost, and how many fishermen are out of the fishery now and may not return. Fishing infrastructure is being rebuilt, boats are being salvaged and repaired, fishermen are fishing again, and communities are picking up the pieces. The shrimp fishery may have already been downsized to the level needed to protect juvenile red snapper and make shrimping more profitable for the shrimpers. In order to understand the possible impacts of new regulations on communities that are dependent on the shrimp and red snapper fisheries, a few sample communities were chosen for profiling in this document.

A problem with the exclusive use of secondary data is that there is not enough information to know the social impacts of changes in regulations on any one community. Landings data may be inconclusive in that a boat that is homeported in one location may not necessarily unload its catch at that location. If we look at the permits data, the homeport of a vessel may be in a different community than where the owner and/or operator live. An analysis of the mailing addresses of licenses holders may not identify which community a vessel is docked in or unloaded in because the owner may reside in another community.

However, we do know how many boats unload in each community and the distribution of the permit holders. We also know how many pounds and the value of the seafood that is unloaded with processors and dealers in a given community. We can then see which communities would be the most adversely affected by changes to the regulations.

As the price of water front property continues to rise, it is becoming more common in many communities for fishermen and others working in fishing dependent businesses to live inland, away from the water. This compounds the problem of trying to identify fishing communities as a certain location place bound location where people dependent on marine resources live and work. In some areas, fishermen who used to live in one community may now be dispersed in several outlying communities with more affordable housing.

The census data offers its own set of problems when trying to identify the number of people who are dependent on fishing resources in a given community. First, the census is only conducted every ten years. In the span of ten years much can change in a coastal community due to the increasing pressure to develop waterfront property. Second, people who work seasonally in fishing dependent areas may or may not be counted in a particular community that is dependent on fishing, depending if they are residing in that community at the time of the census. A third problem is that in the census fishing is lumped together with farming and forestry occupations under the occupation category and with agriculture, forestry, and hunting under the industry category. Therefore, it is impossible to discern how many people are actually dependent on fishing from the other occupations fishing is lumped with. Further, people who rely on other supplemental work outside of fishing related occupations may report their occupation under another category.

The census data does provide us with a better understanding of the community by giving information such as the educational level of community members, percentage of people who are living below the poverty line, and the percentage of the population who are employed. The census data also includes a breakdown of the types of industry in the community and percentages of people employed in each. This information can be indicative of other opportunities that may exist in the community for fishermen or people employed in fishing dependent businesses who may be forced out of industry due to changes in regulations.

Changes in federal fishing regulations that limit the amount of a species that can be caught, or limit the seasons when a particular species can be caught, the number of fishing trips in a given time frame, and place restrictions on gear used, have the potential to impact communities that depend on these fisheries. At this time, it is not possible to fully analyze the impacts that further restrictions on the red snapper fishery will have on individual communities that are dependent on this fishery.

As illustrated above, much more time and money need to be invested in conducting community research if we are to really begin to understand the dynamics of fishing dependency within individual communities and be able to competently describe the social impacts of any changes in federal fishing regulations. As more community profiles are developed in the future, it may be possible to better describe specific social impacts of fishing regulations on some communities. Until that time, secondary data will be used as a starting point to understand potential social impacts. The rankings for communities listed below are in the top of the rankings for communities that are the most likely to be affected by changes in regulations as based on secondary data.

Table 3.5.2.1 Number of Primary Permit Owners, Active Permits, Inactive Permits, and Percent of Permits Inactive by Community, 2005.

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
PORT ISABEL	TX	141	111	30	21.3
BROWNSVILLE	TX	139	105	34	24.5
PALACIOS	TX	91	68	23	25.3
PORT ARTHUR	TX	86	55	31	36.0
BILOXI	MS	73	60	13	17.8
CUT OFF	LA	73	57	16	21.9
BAYOU LA BATRE	AL	65	33	32	49.2
FREEPORT	TX	64	46	18	28.1
PORT LAVACA	TX	60	53	7	11.7
FORT MYERS BCH	FL	57	49	8	14.0
CHAUVIN	LA	54	42	12	22.2
ARANSAS PASS	TX	45	28	17	37.8
NEW ORLEANS	LA	45	34	11	24.4
ABBEVILLE	LA	44	35	9	20.5
HOUMA	LA	39	31	8	20.5
OCEAN SPRINGS	MS	38	30	8	21.1
IRVINGTON	AL	36	25	11	30.6
HOUSTON	TX	33	25	8	24.2
PENSACOLA	FL	32	20	12	37.5
PANAMA CITY	FL	31	17	14	45.2
GRAND ISLE	LA	26	24	2	7.7
LAFAYETTE	LA	25	22	3	12.0
NEDERLAND	TX	25	22	3	12.0
GALLIANO	LA	24	21	3	12.5
CODEN	AL	23	13	10	43.5
D'IBERVILLE	MS	23	17	6	26.1
HARVEY	LA	23	21	2	8.7
HUDSON	FL	23	0	23	100.0
TAMPA	FL	23	18	5	21.7
DULAC	LA	22	18	4	18.2
GALVESTON	TX	22	12	10	45.5
KEY WEST	FL	22	17	5	22.7
PASS CHRISTIAN	MS	22	15	7	31.8
CAMERON	LA	21	16	5	23.8
FORT MYERS	FL	18	13	5	27.8
MOBILE	AL	18	11	7	38.9
SPRING HILL	FL	18	0	18	100.0
BEAUMONT	TX	17	12	5	29.4
ERATH	LA	16	15	1	6.3
GROVES	TX	16	10	6	37.5

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
GULFPORT	MS	16	8	8	50.0
JACKSONVILLE	FL	16	2	14	87.5
DICKINSON	TX	15	11	4	26.7
LAFITTE	LA	14	11	3	21.4
LEAGUE CITY	TX	14	12	2	14.3
BON SECOUR	AL	13	8	5	38.5
MARRERO	LA	13	10	3	23.1
MONTEGUT	LA	13	8	5	38.5
THEODORE	AL	13	10	3	23.1
APALACHICOLA	FL	12	11	1	8.3
AVONDALE	LA	12	10	2	16.7
BACLIFF	TX	12	7	5	41.7
BURAS	LA	12	9	3	25.0
PASCAGOULA	MS	12	10	2	16.7
ROCKPORT	TX	12	6	6	50.0
FAIRHOPE	AL	11	9	2	18.2
GRAND BAY	AL	11	8	3	27.3
GRETNA	LA	11	11	0	0.0
NEW PORT RICHEY	FL	11	7	4	36.4
PEARLAND	TX	11	10	1	9.1
TARPON SPRINGS	FL	11	6	5	45.5
CARRABELLE	FL	10	8	2	20.0
FERNANDINA BCH	FL	10	2	8	80.0
GOLDEN MEADOW	LA	10	10	0	0.0
LAROSE	LA	10	9	1	10.0
BARATARIA	LA	9	7	2	22.2
BAY ST. LOUIS	MS	9	5	4	44.4
FOLEY	AL	9	7	2	22.2
LONG BEACH	MS	9	7	2	22.2
PORT NECHES	TX	9	6	3	33.3
PORT O'CONNOR	TX	9	1	8	88.9
PORT RICHEY	FL	9	3	6	66.7
BELLE CHASSE	LA	8	8	0	0.0
BOOTHVILLE	LA	8	8	0	0.0
BROOKSVILLE	FL	8	0	8	100.0
CRYSTAL RIVER	FL	8	2	6	75.0
MIAMI	FL	8	0	8	100.0
ST. PETERSBURG	FL	8	2	6	75.0
SUGAR LAND	TX	8	7	1	12.5
SULPHUR	LA	8	4	4	50.0
VENICE	LA	8	7	1	12.5
YOUNGSVILLE	LA	8	7	1	12.5
BATON ROUGE	LA	7	7	0	0.0
LOCKPORT	LA	7	4	3	42.9
NEWPORT NEWS	VA	7	1	6	85.7
NICEVILLE	FL	7	5	2	28.6
ORANGE	TX	7	4	3	42.9
ATLANTIC BEACH	FL	6	1	5	83.3
BOURG	LA	6	5	1	16.7
CARROLLTON	TX	6	5	1	16.7
DUNNELLON	FL	6	1	5	83.3
EASTPOINT	FL	6	3	3	50.0

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
HERNANDO BEACH	FL	6	0	6	100.0
KAPLAN	LA	6	5	1	16.7
LAGUNA VISTA	TX	6	4	2	33.3
LOS FRESNOS	TX	6	6	0	0.0
METAIRIE	LA	6	2	4	66.7
MORGAN CITY	LA	6	6	0	0.0
OLMITO	TX	6	6	0	0.0
ORIENTAL	NC	6	2	4	66.7
SOUTHPORT	FL	6	2	4	66.7
WAVELAND	MS	6	5	1	16.7
WESTWEGO	LA	6	6	0	0.0
DAUPHIN ISLAND	AL	5	3	2	40.0
EMPIRE	LA	5	5	0	0.0
FRIENDSWOOD	TX	5	3	2	40.0
GULF SHORES	AL	5	2	3	60.0
LAKE CHARLES	LA	5	3	2	40.0
MATAGORDA	TX	5	4	1	20.0
NEW IBERIA	LA	5	5	0	0.0
PANACEA	FL	5	0	5	100.0
ROBERTSDALE	AL	5	5	0	0.0
SEADRIFT	TX	5	0	5	100.0
SLIDELL	LA	5	2	3	60.0
SNEADS FERRY	NC	5	0	5	100.0
AUSTIN	TX	4	2	2	50.0
BOKEELIA	FL	4	0	4	100.0
BRADENTON	FL	4	0	4	100.0
BRUNSWICK	GA	4	1	3	75.0
CORPUS CHRISTI	TX	4	2	2	50.0
CRYSTAL BEACH	TX	4	3	1	25.0
INGLIS	FL	4	2	2	50.0
LAKE ARTHUR	LA	4	4	0	0.0
LAKE JACKSON	TX	4	3	1	25.0
ODESSA	FL	4	0	4	100.0
PASADENA	TX	4	4	0	0.0
SHALLOTTE	NC	4	0	4	100.0
SUPPLY	NC	4	2	2	50.0
VICTORIA	TX	4	4	0	0.0
AMELIA	LA	3	3	0	0.0
ANAHUAC	TX	3	0	3	100.0
BRAZORIA	TX	3	1	2	66.7
BREAUX BRIDGE	LA	3	1	2	66.7
CHALMETTE	LA	3	1	2	66.7
CLUTE	TX	3	3	0	0.0
CORTEZ	FL	3	1	2	66.7
CRAWFORDVILLE	FL	3	3	0	0.0
FORT WORTH	TX	3	2	1	33.3
GARLAND	TX	3	3	0	0.0
GAUTIER	MS	3	2	1	33.3
GLOUCESTER	MA	3	0	3	100.0
HITCHCOCK	TX	3	2	1	33.3
HOMOSASSA	FL	3	0	3	100.0
KEMAH	TX	3	3	0	0.0

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
LITHIA	FL	3	3	0	0.0
LOWLAND	NC	3	1	2	66.7
LYNN HAVEN	FL	3	3	0	0.0
MAYPORT	FL	3	0	3	100.0
MERRITT ISLAND	FL	3	0	3	100.0
NEW BERN	NC	3	0	3	100.0
NORTH PORT	FL	3	2	1	33.3
PUNTA GORDA	FL	3	1	2	66.7
RICHMOND	TX	3	3	0	0.0
RIVERVIEW	FL	3	2	1	33.3
SEABROOK	TX	3	2	1	33.3
ST. BERNARD	LA	3	2	1	33.3
ST. JAMES CITY	FL	3	1	2	66.7
THIBODAUX	LA	3	3	0	0.0
ALVIN	TX	2	1	1	50.0
AMA	LA	2	2	0	0.0
AURORA	NC	2	0	2	100.0
BELHAVEN	NC	2	2	0	0.0
BRIDGE CITY	TX	2	2	0	0.0
CANTONMENT	FL	2	0	2	100.0
CAPE CANAVERAL	FL	2	2	0	0.0
CEDAR LANE	TX	2	1	1	50.0
CHANNELVIEW	TX	2	0	2	100.0
CLEVELAND	TX	2	0	2	100.0
COCOA BEACH	FL	2	0	2	100.0
CRESCENT	GA	2	0	2	100.0
ESTERO	FL	2	1	1	50.0
FULTON	TX	2	1	1	50.0
FULTONDALE	AL	2	2	0	0.0
GIBSON	LA	2	2	0	0.0
GRANTSBORO	NC	2	1	1	50.0
HOLIDAY	FL	2	1	1	50.0
HORSESHOE BEACH	FL	2	0	2	100.0
HUMBLE	TX	2	2	0	0.0
INVERNESS	FL	2	0	2	100.0
KILN	MS	2	1	1	50.0
KINDER	LA	2	2	0	0.0
LEHIGH ACRES	FL	2	1	1	50.0
LIBERTY	TX	2	0	2	100.0
MADEIRA BEACH	FL	2	0	2	100.0
MATLACHA	FL	2	1	1	50.0
MCCLELLANVILLE	SC	2	0	2	100.0
MIDWAY	GA	2	0	2	100.0
MISSOURI CITY	TX	2	2	0	0.0
MOUNT PLEASANT	SC	2	0	2	100.0
NEW SMYRNA BEACH	FL	2	0	2	100.0
PLAQUEMINE	LA	2	2	0	0.0
PORT ARANSAS	TX	2	1	1	50.0
RICHMOND HILL	GA	2	1	1	50.0
SABINE PASS	TX	2	1	1	50.0
SAN LEON	TX	2	1	1	50.0

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
SAUCIER	MS	2	0	2	100.0
SOPCHOPPY	FL	2	1	1	50.0
VANCLEAVE	MS	2	1	1	50.0
YANKEETOWN	FL	2	1	1	50.0
YULEE	FL	2	0	2	100.0
ADDIS	LA	1	1	0	0.0
ALISO VIEJO	CA	1	1	0	0.0
ANAHEIM	CA	1	1	0	0.0
ARCADIA	FL	1	0	1	100.0
ARLINGTON	TX	1	1	0	0.0
BALDWIN	LA	1	1	0	0.0
BAY CITY	TX	1	0	1	100.0
BAYTOWN	TX	1	0	1	100.0
BERWICK	LA	1	0	1	100.0
BONITA SPRINGS	FL	1	1	0	0.0
BRANDON	FL	1	1	0	0.0
BROOKFIELD	IL	1	1	0	0.0
BRUCE	FL	1	0	1	100.0
CAPE MAY	NJ	1	0	1	100.0
CHANTILLY	VA	1	1	0	0.0
CHARENTON	LA	1	1	0	0.0
CHARLOTTE	NC	1	1	0	0.0
CHICAGO	IL	1	0	1	100.0
CITRONELLE	AL	1	1	0	0.0
CLAXTON	GA	1	1	0	0.0
CLERMONT	FL	1	1	0	0.0
COCONUT CREEK	FL	1	0	1	100.0
COUSHATTA	LA	1	0	1	100.0
CREOLE	LA	1	1	0	0.0
DALLAS	TX	1	0	1	100.0
DAPHNE	AL	1	0	1	100.0
DELCAMBRE	LA	1	0	1	100.0
DENTON	TX	1	1	0	0.0
DIAMOND HEAD	MS	1	0	1	100.0
DONALDSONVILLE	LA	1	1	0	0.0
DUNEDIN	FL	1	1	0	0.0
EAST KINGSTON	NH	1	0	1	100.0
EDMOND	OK	1	1	0	0.0
ELBERTA	AL	1	0	1	100.0
ENGLEWOOD	FL	1	0	1	100.0
EUTIS	FL	1	0	1	100.0
FOLSOM	LA	1	0	1	100.0
FORT LAUDERDALE	FL	1	1	0	0.0
FORT WALTON BCH	FL	1	0	1	100.0
FORT WHITE	FL	1	0	1	100.0
FRANKLIN	LA	1	1	0	0.0
FREDRICKSBURG	TX	1	1	0	0.0
GOLIAD	TX	1	0	1	100.0
GRAMERCY	LA	1	1	0	0.0
GRAND CHENIER	LA	1	1	0	0.0
GRAND PRAIRIE	TX	1	1	0	0.0
GRAY	LA	1	1	0	0.0

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
GUEYDAN	LA	1	1	0	0.0
HAYESVILLE	NC	1	1	0	0.0
HIGH ISLAND	TX	1	1	0	0.0
HOBUCKEN	NC	1	0	1	100.0
HORTENSE	GA	1	0	1	100.0
INDIANOLA	MS	1	1	0	0.0
INGLESIDE	TX	1	0	1	100.0
IOWA	LA	1	1	0	0.0
IRVING	TX	1	1	0	0.0
JAYESS	MS	1	1	0	0.0
JEANERETTE	LA	1	0	1	100.0
KATY	TX	1	0	1	100.0
KENNER	LA	1	0	1	100.0
LA MARQUE	TX	1	0	1	100.0
LAUDERHILL	FL	1	0	1	100.0
LECANTO	FL	1	0	1	100.0
LONG BEACH	CA	1	1	0	0.0
LOXLEY	AL	1	1	0	0.0
LULING	LA	1	0	1	100.0
LUTZ	FL	1	0	1	100.0
LYONS	GA	1	0	1	100.0
METAIRE	LA	1	1	0	0.0
MIMS	FL	1	0	1	100.0
MONTICELLO	MS	1	1	0	0.0
MORRISTON	FL	1	0	1	100.0
MOSS POINT	MS	1	0	1	100.0
NACOGDOCHES	TX	1	1	0	0.0
NAPLES	FL	1	0	1	100.0
NEPTUNE BEACH	FL	1	0	1	100.0
NORTH MIAMI	FL	1	0	1	100.0
NORTH RICHLAND	TX	1	1	0	0.0
OCALA	FL	1	0	1	100.0
OLD OCEAN	TX	1	0	1	100.0
OPELOUSAS	LA	1	1	0	0.0
ORANGE BEACH	AL	1	1	0	0.0
ORLANDO	FL	1	0	1	100.0
PATTERSON	LA	1	1	0	0.0
PETAL	MS	1	0	1	100.0
PICAYUNE	MS	1	0	1	100.0
PIERRE PART	LA	1	1	0	0.0
PLANT CITY	FL	1	1	0	0.0
PORT BOLIVAR	TX	1	1	0	0.0
PORT CHARLOTTE	FL	1	0	1	100.0
PORT ORANGE	FL	1	0	1	100.0
PORTLAND	TX	1	0	1	100.0
QUITMAN	MS	1	1	0	0.0
ROCKWALL	TX	1	1	0	0.0
ROSHARON	TX	1	0	1	100.0
ROUND ROCK	TX	1	1	0	0.0
RUTH	MS	1	1	0	0.0
SAN BENITO	TX	1	1	0	0.0
SAN DEIGO	CA	1	1	0	0.0

CITY	STATE	Number of Permit Owners	Number of Active Permits	Inactive Permits	Percent of Permits Inactive
SARALAND	AL	1	0	1	100.0
SILVER SPRING	FL	1	0	1	100.0
SILVERHILL	AL	1	1	0	0.0
SOUR LAKE	TX	1	0	1	100.0
SOUTH PADRE	TX	1	0	1	100.0
SOUTHBEND	WA	1	1	0	0.0
SPANISH FORT	AL	1	1	0	0.0
ST. AUGUSTINE	FL	1	0	1	100.0
STEINHATCHEE	FL	1	0	1	100.0
SUWANNEE	FL	1	0	1	100.0
SWEENY	TX	1	1	0	0.0
TERRYTOWN	LA	1	1	0	0.0
TEXAS CITY	TX	1	1	0	0.0
TORRANCE	CA	1	1	0	0.0
TOWNSEND	GA	1	0	1	100.0
VALRICO	FL	1	1	0	0.0
VENICE	FL	1	0	1	100.0
VINTON	LA	1	1	0	0.0
VIOLET	LA	1	1	0	0.0
WADMALAW ISLAND	SC	1	0	1	100.0
WADSWORTH	TX	1	0	1	100.0
WANCHESE	NC	1	1	0	0.0
WEBSTER	TX	1	1	0	0.0
WELSH	LA	1	1	0	0.0
WEST COLUMBIA	TX	1	1	0	0.0
WEWAHITCHKA	FL	1	1	0	0.0
WILMINGTON	DE	1	1	0	0.0
WINNIE	TX	1	1	0	0.0

Table 3.5.2.2 Number of Vessels Supplying Shrimp to Selected Communities, 2005.

City	State	Number of Vessels
DULAC	LA	612
GRAND ISLE	LA	543
LAFITTE	LA	528
GOLDEN MEADOW	LA	517
CHAUVIN	LA	431
EMPIRE	LA	326
VENICE	LA	274
BAYOU LA BATRE	AL	235
PORT ARTHUR	TX	220
MONTEGUT	LA	198
ABBEVILLE	LA	195
BOOTHVILLE	LA	184
DELCAMBRE	LA	174
PORT SULPHUR	LA	164
LOCKPORT	LA	163
BROWNSVILLE	TX	159
BILOXI	MS	155
CROWN POINT	LA	140
PALACIOS	TX	140
THERIOT	LA	136
PORT BOLIVAR	TX	129
CUT OFF	LA	123
FREEPORT	TX	108
FT MYERS BEACH	FL	107
CAMERON	LA	105
KEY WEST	FL	99
NEW ORLEANS	LA	99
PORT ISABEL	TX	95
ARANSAS PASS	TX	92
BELLE CHASSE	LA	90

Table 3.5.2.3 Number of Qualifying Vessels Supplying Shrimp to Selected Communities, 2005.

City	State	Number of Qualifying Vessels
PORT ARTHUR	TX	197
DULAC	LA	182
BAYOU LA BATRE	AL	174
BROWNSVILLE	TX	149
GRAND ISLE	LA	144
PALACIOS	TX	135
ABBEVILLE	LA	129
GOLDEN MEADOW	LA	121
FREEPORT	TX	104
PORT BOLIVAR	TX	103
FT MYERS BEACH	FL	101
PORT ISABEL	TX	94
BILOXI	MS	91
KEY WEST	FL	90
ARANSAS PASS	TX	79
CHAUVIN	LA	75
DELCAMBRE	LA	72
BOOTHVILLE	LA	69
CUT OFF	LA	66
GALVESTON	TX	63
VENICE	LA	61
EMPIRE	LA	51
SABINE PASS	TX	46
CAMERON	LA	41
LOCKPORT	LA	39
LAFITTE	LA	36
BON SECOUR	AL	33
TAMPA	FL	30
MORGAN CITY	LA	27
APALACHICOLA	FL	26
BELLE CHASSE	LA	25
PORT ST JOE	FL	23

Table 3.5.2.4 Gulf Food Shrimp Landings, Sales, and Number of Dealers by Select Communities, Ranked by Sales in 2005[20]

City	State	Gulf Food Shrimp Landings	Gulf Food Shrimp Sales	Number of Dealers
PORT ARTHUR	TX	10,356,766	$33,931,933	6
PALACIOS	TX	8,778,959	$28,280,168	13
BROWNSVILLE	TX	7,402,272	$26,274,180	UNK
DULAC	LA	10,557,448	$23,398,055	14
BAYOU LA BATRE	AL	7,231,942	$21,993,433	11
ABBEVILLE	LA	7,343,199	$19,603,253	11
PORT ISABEL	TX	4,359,018	$15,935,891	9
GOLDEN MEADOW	LA	5,788,934	$12,925,081	14
BILOXI	MS	4,238,124	$12,255,039	6
CHAUVIN	LA	6,955,645	$12,141,876	26
FT MYERS BEACH	FL	3,355,467	$11,208,159	4
PORT BOLIVAR	TX	3,631,662	$10,832,920	5
GRAND ISLE	LA	5,726,732	$10,217,558	8
LAFITTE	LA	4,794,645	$9,542,357	11
CUT OFF	LA	2,514,991	$6,706,646	13
FREEPORT	TX	2,044,158	$6,284,408	3
BON SECOUR	AL	1,661,125	$6,235,378	7
VENICE	LA	3,318,664	$6,146,924	3
EMPIRE	LA	2,763,166	$4,701,122	11
GALVESTON	TX	1,513,876	$4,696,202	4
BOOTHVILLE	LA	1,984,358	$4,242,576	3
ARANSAS PASS	TX	1,331,701	$4,074,451	8
KEY WEST	FL	1,731,059	$3,947,430	3
TAMPA	FL	1,194,154	$3,759,880	3
PORT ST JOE	FL	***	***	1
DELCAMBRE	LA	1,908,189	$3,243,822	10
THERIOT	LA	2,180,607	$3,212,594	6
MONTEGUT	LA	1,716,148	$3,140,727	8
MORGAN CITY	LA	940,064	$2,235,909	13
LOCKPORT	LA	1,052,305	$2,195,130	3

[20]For communities where the number of dealers is less than three, landings and sales are suppressed to protect firms' confidential data. For Brownsville, even though several shrimp dealers purchase shrimp in the community, all dealer data is reported under a single code and thus the exact number of dealers is unknown. Only communities with more than $300,000 in landings were selected for presentation.

City	State	Gulf Food Shrimp Landings	Gulf Food Shrimp Sales	Number of Dealers
APALACHICOLA	FL	940,776	$2,102,312	5
CROWN POINT	LA	***	***	2
TARPON SPRINGS	FL	663,518	$1,845,417	3
BELLE CHASSE	LA	938,989	$1,778,136	5
SABINE PASS	TX	***	***	2
HOUMA	LA	943,886	$1,451,230	12
DICKINSON	TX	633,205	$1,382,023	3
CAMERON	LA	885,122	$1,351,238	25
SEABROOK	TX	***	***	2
IRVINGTON	AL	356,980	$1,019,190	3
SAN LEON	TX	509,252	$959,347	6
CODEN	AL	249,916	$872,384	6
PORT SULPHUR	LA	***	***	2
HACKBERRY	LA	674,106	$818,213	5
PORT LAVACA	TX	375,165	$792,047	4
THEODORE	AL	325,192	$698,473	4
CRYSTAL BEACH	TX	208,944	$577,115	3
YSCLOSKEY	LA	319,695	$494,129	3
INGLIS	FL	***	***	1
NEW ORLEANS	LA	217,014	$463,542	8
KEMAH	TX	***	***	1
PASCAGOULA	MS	178,463	$418,792	3
GULFPORT	MS	***	***	2
PASS CHRISTIAN	MS	***	***	2
FULTON	TX	157,128	$357,825	7
BAYTOWN	TX	***	***	2
OAK ISLAND	TX	183,608	$335,179	3
ST BERNARD	LA	183,714	$315,947	6
GRAND BAY	AL	***	***	1

Table 3.5.2.5 Ranking of Communities in 2005 Based on Strength of Relationship to the Gulf Shrimp Fishery with Special Emphasis on the EEZ Fishery.

Rank	City	State
1	PORT ARTHUR	TX
2	BROWNSVILLE	TX
3	BAYOU LA BATRE	AL
4	DULAC	LA
5	PALACIOS	TX
6	BILOXI	MS
7	PORT ISABEL	TX
8	CHAUVIN	LA
9	ABBEVILLE	LA
10	FT MYERS BEACH	FL
11	GRAND ISLE	LA
12	GOLDEN MEADOW	LA
13	FREEPORT	TX
14	CUT OFF	LA
15	DELCAMBRE	LA
16	ARANSAS PASS	TX
17	LAFITTE	LA
18	TAMPA	FL
19	KEY WEST	FL
20	PORT BOLIVAR	TX
21	VENICE	LA
22	EMPIRE	LA
23	NEW ORLEANS	LA
24	BOOTHVILLE	LA
25	GALVESTON	TX
26	BON SECOUR	AL
27	HOUMA	LA
28	PORT LAVACA	TX
29	CAMERON	LA
30	APALACHICOLA	FL
31	LOCKPORT	LA
32	MONTEGUT	LA
33	IRVINGTON	AL
34	PORT ST JOE	FL
35	THERIOT	LA

Table 3.5.2.6 Communities Determined to be Vulnerable Based on Socioeconomic Attributes, as Modified by Information Regarding Impacts of the 2005 Hurricanes.

Group 1	Group 2
Palacios	Abbeville
Dulac	Golden Meadow
Bayou La Batre	Freeport
Port Isabel	Lafitte
Empire	Aransas Pass
Boothville	Chauvin
Coden	Apalachicola
Venice	Montegut
Cameron	Brownsville
Port Arthur	Port Lavaca
Grand Isle	Houma
	Galveston
	Delcambre

Table 3.5.2.7 Processed Pounds, Value, and Employment of Gulf Shrimp Processors by Community in 2005, Ranked by Processed Shrimp Value.[21]

City	State	Number of Shrimp Processors	Total Processed Pounds	Total Processed Value	Processed Shrimp Pounds	Processed Shrimp Value	Employment	Shrimp as Percent of Processed Value
DELCAMBRE	LA	4	21,115,149	$66,330,738	21,115,149	$66,330,738	170	100.0
LAKELAND	FL	1	***	***	***	***	***	77.9
BAYOU LA BATRE	AL	8	21,336,661	$62,527,413	16,495,961	$55,227,198	231	88.3
BILOXI	MS	7	19,708,834	$42,225,235	19,482,121	$42,108,637	296	99.7
BROWNSVILLE	TX	2	***	***	***	***	***	100.0
DULAC	LA	5	15,011,516	$38,837,889	15,004,076	$38,822,265	155	100.0
PORT ISABEL	TX	1	***	***	***	***	***	100.0
TAMPA	FL	1	***	***	***	***	***	81.8
NEW ORLEANS	LA	1	***	***	***	***	***	100.0
PORT ARTHUR	TX	1	***	***	***	***	***	100.0
SAN BENITO	TX	1	***	***	***	***	***	100.0
DOVER	FL	1	***	***	***	***	***	78.0
BON SECOUR	AL	2	***	***	***	***	***	79.9
D'IBERVILLE	MS	1	***	***	***	***	***	100.0
PALACIOS	TX	1	***	***	***	***	***	100.0
BEAUMONT	TX	1	***	***	***	***	***	100.0
PORT SAINT JOE	FL	1	***	***	***	***	***	100.0
ST PETERSBURG	FL	1	***	***	***	***	***	49.2
APALACHICOLA	FL	3	1,645,000	$6,779,225	1,645,000	$6,779,225	12	100.0
MOBILE	AL	1	***	***	***	***	***	100.0
CHAUVIN	LA	5	1,398,309	$4,620,674	1,398,309	$4,620,674	65	100.0
VIOLET	LA	1	***	***	***	***	***	100.0
GOLDEN MEADOW	LA	2	***	***	***	***	***	100.0

[21] For communities where the number of processors is less than three, information regarding processed pounds, value, and employment are suppressed to protect firms' confidential data. However, dependency on the value of processed shrimp is reported for all communities with shrimp processors.

KEMAH	TX	1	***	***	***	***	***	29.1
HARAHAN	LA	1	***	***	***	***	***	100.0
OCEAN SPRINGS	MS	1	***	***	***	***	***	99.9
THERIOT	LA	1	***	***	***	***	***	100.0
PASCAGOULA	MS	1	***	***	***	***	***	100.0
CARRABELLE	FL	1	***	***	***	***	***	100.0
HOUMA	LA	1	***	***	***	***	***	0.3
SEADRIFT	TX	1	***	***	***	***	***	13.5

Communities Dependent on the Red Snapper Fishery

Many of the commercial fishermen who fish for red snapper also fish for other reef fish. Some fishermen fish throughout the Gulf and unload in various locations, making it difficult to identify communities that would be most affected by new regulations on the red snapper fishery. For the recreational fishery, there are many communities spread throughout the Gulf, from Florida to Texas that serve as a launching point for recreational and charter fishermen who target red snapper. At this time, the communities that are most involved with the recreational red snapper fishery have not been identified.

After the hurricanes of 2005, some fishermen who participate in charter and private recreational fisheries began to launch from different communities than they previously had used while the community they normally fished from is rebuilt. For the purpose of this amendment, three communities that are dependent on the commercial red snapper fishery were chosen as representative communities that could be impacted by new regulations. After analyzing secondary data relating to the red snapper fishery in the Gulf of Mexico, three communities were chosen to be highlighted. These include Panama City, Florida; Port Isabel, Texas; and Galveston, Texas.

Panama City, Florida

Panama City is located on St. Andrews Bay just inland from the Gulf in the central Panhandle region. The city is typically accessed by U.S. Highway 98 and State Highway 22. Local and visiting fishing vessels access the Gulf through the channel at St. Andrew Bay, roughly two miles from the waterfront.

There are numerous commercial and recreational fishing businesses in Panama City. At least 100 commercial and charter vessels moor at various harbors. Several wholesale fish houses handle a wide variety of finfish and shellfish, and there are numerous bait and tackle shops, ship stores, boat builders and dealers, fishing piers, and marinas where charter fishing is offered. There were nine active processors in 2000, employing a total of 55 persons on average that year. In short, there is considerable infrastructure for both commercial and recreational fishing (Impact Assessment, Inc. 2005a).

In 2004, Panama City ranked first in pounds and revenue for red snapper landed in the Gulf of Mexico. According to the 2000 Census, 0.5 percent of the people living in Port Isabel were listed in the agriculture, forestry, fishing and hunting category under industry, and 0.4 percent in the farming, fishing, and forestry category under occupations. The census data may not adequately reflect all of the people involved in the fishing industry in Panama City.

Panama City Demographics

Factor	1990	2000
Total population	34,378	36,417
Gender Ratio M/F (Number)	16,094/18,284	17,683/18,734
Age (Percent of total population)		
Under 18 years of age	24.5	23.0
18 to 64 years of age	58.5	61.1
65 years and over	17.0	15.9
Ethnicity or Race (Number)		
White	25,954	26,819
Black or African American	7,500	7,813
American Indian and Alaskan Native	215	231
Asian	583	564
Native Hawaiian and other Pacific Islander	--	28
Some other race	126	274
Two or more races	--	688
Hispanic or Latino (any race)	460	1,060
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	12.1	6.7
Percent high school graduate or higher	70.3	79.2
Percent with a Bachelor's degree or higher	16.7	18.9
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	5.3	7.2
Percent who speak English less than very well	1.9	2.0
Household income (Median $)	26,629	31,572
Poverty Status (Percent of population with income below poverty line)	19.6	17.2
Percent female headed household	23.0	15.4
Home Ownership (Number)		
Owner occupied	8,193	8,565
Renter occupied	5,860	6,254
Value Owner-occupied Housing (Median $)	49,800	75,800
Monthly Contract Rent (Median $)	279	526
Employment Status (Population 16 yrs and over)		
Percent in the labor force	58.6	56.4
Percent of civilian labor force unemployed	8.0	5.8
Occupation (Percent in workforce)**		
Management, professional, and related occupations	--	32.2
Service occupations	--	20.8
Sales and office occupations	--	27.7
Farming, fishing, and forestry occupations	1.5	0.4
Construction, extraction, and maintenance occupations	--	8.6
Production, transportation, and material moving occupations	--	10.4
Industry (Percent in workforce)**		
Agriculture, forestry, fishing and hunting	1.5	0.5†
Manufacturing	7.7	7.0
Percent government workers	20.4	18.6
Commuting to Work (Workers 16 yrs and over)		

Percent in carpools	12.5	13.7
Percent using public transportation	0.2	0.7
Mean travel time to work (minutes)	--	18.6
Percent worked outside of county of residence	1.8	3.3

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons between those census years.
†Year 2000 figures include mining in this group; 1990 figures do not. Mining includes the offshore oil industry workforce.

Port Isabel, Texas

Port Isabel is adjacent to the Laguna Madre on the easternmost tip of Cameron County. The Gulf of Mexico is easily reached from Port Isabel via the Brazos-Santiago Pass, some three miles to the east. According to Impact Assessment, Inc., the contemporary economy of Port Isabel is based in tourism, commercial fisheries, and petroleum industry support services. The surrounding estuarine and nearshore marine waters are popular destinations for recreational anglers. The shrimp industry became a viable form of industry in the 1950s. In 1960 alone, Port Isabel captains and crew harvested over seven million pounds of shrimp. Numerous Port Isabel businesses support recreational and commercial fishing activities. Commercial fishing vessels have access to various docking facilities, two seafood-trucking operations, seafood processors, wholesalers, and boat yards. Two fishing piers, eight marinas, a public boat ramp, six bait and tackle shops, and 18 charter/head boats and sight-seeing boats sustain Port Isabel's recreational fishing industry (Impact assessment, Inc. 2005b).

In 2004, Port Isabel ranked second in pounds and revenue for red snapper landed in the Gulf of Mexico. In June 2005, Port Isabel has four Class 1 permits registered by homeport and three Class 1 permits registered by mailing address. There are no Class 2 permits registered by homeport or mailing address. According to the 2000 Census, 6.1 percent of the people living in Port Isabel were listed in the agriculture, forestry, fishing and hunting category under industry, and 3.8 percent in the farming, fishing, and forestry category under occupations. The census data may not adequately reflect all of the people involved in the fishing industry in Port Isabel due to the petroleum industry, which some people may work with intermittently with fishing, and they may list working in the oil industry as their primary job.

Port Isabel, Texas Demographics (U.S. Census Bureau 2000)

Factor	**1990**	**2000**
Total population	4,467	4,865
Gender Ratio M/F (Number)	2,136/2,331	2,358/2,507
Age (Percent of total population)		
Under 18 years of age	33.2	30.4
18 to 64 years of age	56.5	57.4
65 years and over	10.3	12.2
Ethnicity or Race (Number)		
White	3,938	3,876
Black or African American	25	50

American Indian and Alaskan Native	6	16
Asian	10	12
Native Hawaiian and other Pacific Islander	N/A	5
Some other race	488	756
Two or more races	N/A	150
Hispanic or Latino (any race)	3,337	3,619
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	29.8	24.3
Percent high school graduate or higher	49.1	59.1
Percent with a Bachelor's degree or higher	7.3	12.3
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	73.7	71.3
Percent who speak English less than very well	39.2	28.9
Household income (Median $)	15,275	25,323
Poverty Status (Percent of population with income below poverty line)	39.0	27.3
Percent female headed household	14.6	16.6
Home Ownership (Number)		
Owner occupied	808	984
Renter occupied	555	665
Value Owner-occupied Housing (Median $)	48,300	58,900
Monthly Contract Rent (Median $)	229	405
Employment Status (Population 16 yrs and over)		
Percent in the labor force	62.9	57.2
Percent of civilian labor force unemployed	5.5	4.4
Occupation (Percent in workforce)**		
Management, professional, and related occupations	N/A	17.7
Service occupations	N/A	29.6
Sales and office occupations	N/A	27.6
Farming, fishing, and forestry occupations	4.7	3.8
Construction, extraction, and maintenance occupations	N/A	9.8
Production, transportation, and material moving occupations	N/A	11.5
Industry (Percent in workforce)**		
Agriculture, forestry, fishing and hunting	4.7	6.1
Mining (includes the offshore oil/gas industry workforce)	0.0	0.0
Manufacturing	3.6	3.5
Percent government workers	16.1	13.5
Commuting to Work (Workers 16 yrs and over)		

Mean travel time to work (minutes)	N/A	16.8
Percent worked outside of county of residence	0.1	4.3

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons between those census years.

Galveston, Texas

The city of Galveston is located 50 miles south of Houston. The Port of Galveston and The University of Texas Medical Branch are primary employers in the area. Tourism is an important aspect of the local economy. Commercial fisheries are prosecuted both offshore and nearshore as well as in the estuarine waters. Tourism is also an important part of the economy. There are numerous dockside hotels and other businesses that are frequented by boaters and recreational anglers. There are also several charter boats operating in the area (Impact Assessment, Inc. 2005b).

In 2004, Galveston was fourth in number of pounds landed and revenue as reported by dealer codes. Currently (June 2005), there are eleven Class 1 red snapper permits and six Class 2 permits listed by homeport. There are five Class 1 permits and four Class 2 permits listed by mailing address. According to the 2000 Census, only 0.3 percent of the people living in Galveston were listed in the agriculture, forestry, fishing and hunting category under industry, and 0.3 percent in the farming, fishing, and forestry category under occupations. The numbers dropped in both categories since the 1990 census. As with the other communities, the exact numbers of people involved in fishing is unknown since each category includes other occupations lumped with fishing.

Galveston Demographics (U.S. Census Bureau 2000)

Factor	**1990**	**2000**
Total population	59,070	57,247
Gender Ratio M/F (Number)	28,539/ 30,531	27,649/ 29,598
Age (Percent of total population)		
Under 18 years of age	24.7	23.4
18 to 64 years of age	61.9	62.9
65 years and over	13.4	13.7
Ethnicity or Race (Number)		
White	36,315	33,582
Black or African American	17,161	14,592
American Indian and Alaskan Native	144	243
Asian	1,387	1,839
Native Hawaiian and other Pacific Islander	N/A	42
Some other race	4,063	5,571
Two or more races	N/A	1,378
Hispanic or Latino (any race)	12,649	14,753
Educational Attainment (Population 25 and over)		

Percent with less than 9th grade	13.7	10.3
Percent high school graduate or higher	70.0	74.4
Percent with a Bachelor's degree or higher	21.1	23.7
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	19.8	26.5
And Percent who speak English less than very well	7.6	11.2
Household income (Median $)	20,825	28,895
Poverty Status (Percent of population with income below poverty line)	24.2	22.3
Percent female headed household	16.3	16.9
Home Ownership (Number)		
Owner occupied	10,136	10,399
Renter occupied	14,021	13,443
Value Owner-occupied Housing (Median $)	57,200	73,800
Monthly Contract Rent (Median $)	309	531
Employment Status (Population 16 yrs and over)		
Percent in the labor force	62.7	59.7
Percent of civilian labor force unemployed	9.0	10.1
Occupation (Percent in workforce)**		
Management, professional, and related occupations	N/A	35.2
Service occupations	N/A	24.2
Sales and office occupations	N/A	24.0
Farming, fishing, and forestry occupations	1.8	0.3
Construction, extraction, and maintenance occupations	N/A	8.3
Production, transportation, and material moving occupations	N/A	8.0
Industry (Percent in workforce)**		
Agriculture, forestry, fishing and hunting	1.5	0.3
Mining (includes the offshore oil/gas industry workforce)	1.0	0.5
Manufacturing	5.7	4.1
Percent government workers	32.1	31.5
Commuting to Work (Workers 16 yrs and over)		
Mean travel time to work (minutes)	N/A	19.1
Percent worked outside of county of residence	5.5	9.5

**Differences in the types of data the U.S. Census Bureau used to generate Occupation and Industry percentages in 1990 and 2000 preclude valid comparisons between those census years.

Communities Dependent on the Shrimp Fishery

An analysis of the shrimp landings data as well as a review of the number of shrimp permits helps to suggest communities that will be impacted by fishing management measures that reduce effort. The top five communities with the most number of federal shrimp permits in 2005 were Port Isabel, Brownsville, Palacios, and Port Arthur, Texas; and Biloxi, Mississippi. Port Arthur, Palacios, and Brownsville, Texas; Dulac, Louisiana; and Bayou la Batre, Alabama were the top five communities in shrimp landings ranked by sales in 2005.

As mentioned above, there is still much uncertainty in the shrimp fishery as some communities that were heavily damaged by the hurricanes of 2005, such as Biloxi, Mississippi; Bayou la Batre, Alabama; and Venice, Louisiana, rebuild their fishing infrastructure. Some of the shrimpers unloaded in different ports than where they unloaded before the hurricanes, shifting landings numbers. For the purpose of showing a few communities that may be impacted by new regulations on the shrimp fishery, Brownsville, Port Isabel, and Port Arthur, Texas; and Grand Isle, Louisiana are shown. There is not enough specific information on communities that are dependent on the shrimp fishery to fully describe any potential impacts. In 2005, Port Isabel, Texas has the most federal shrimp permits of any of the gulf communities and ranked seventh in landings by amount of sales. The demographics for Port, Isabel are listed above under communities dependent on the red snapper fishery.

Brownsville, Texas

Brownsville, Texas is located 25 miles west of the Gulf of Mexico. Agriculture, petrochemicals, and shrimp harvesting and processing are a major part of the economy. The Port of Brownsville opened in 1936 and Brownsville became one of the major shrimp exporters. Brownsville's population grew by 41 percent from 1990 to 2000. In 2000, farming, fishing, and forestry occupations were reported by 1.0 percent of the population. There are numerous fishing-related businesses in Brownsville including a large shrimp trawl fleet and associated docks, processors, and related businesses. Brownsville ranked third in sales of shrimp in 2005, and fourth in the number of federal permits.

Brownsville, Texas Demographics (U.S. Census Bureau 2000)

Factor	**1990**	**2000**
Total population	98,962	139,722
Gender Ratio M/F (Number)	46,714/ 52,248	65,783/ 73,939
Age (Percent of total population)		
Under 18 years of age	36.5%	34.6%
18 to 64 years of age	54.8%	55.9%
65 years and over	8.7%	9.5%
Ethnicity or Race (Number)		
White	83,895	114,083
Black or African American	193	575

American Indian and Alaskan Native	140	580
Asian	301	752
Native Hawaiian and other Pacific Islander	N/A	46
Some other race	14,433	20,486
Two or more races	N/A	3,200
Hispanic or Latino (any race)	89,206	127,535
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	40.2%	31.8%
Percent high school graduate or higher	45.5%	51.7%
Percent with a Bachelor's degree or higher	12.2%	13.4%
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	87.3%	87.2%
And Percent who speak English less than very well	47.2%	42.0%
Household income (Median $)	$15,890	$24,468
Poverty Status (Percent of population with income below poverty line)	43.8%	36.0%
Percent female headed household	20.2%	20.9%
Home Ownership (Number)		
Owner occupied	14,681	23,361
Renter occupied	11,641	14,813
Value Owner-occupied Housing (Median $)	$39,000	$53,000
Monthly Contract Rent (Median $)	$236	$405
Employment Status (Population 16 yrs and over)		
Percent in the labor force	55.9%	52.4%
Percent of civilian labor force unemployed	15.3%	13.0%
Occupation (Percent in workforce)**		
Management, professional, and related occupations	N/A	27.6%
Service occupations	N/A	18.5%
Sales and office occupations	N/A	26.7%
Farming, fishing, and forestry occupations	2.3%	1.0%
Construction, extraction, and maintenance occupations	N/A	9.4%
Production, transportation, and material moving occupations	N/A	16.9%
Industry (Percent in workforce)**		
Agriculture, forestry, fishing and hunting	2.3%	1.3 %
Mining (includes the offshore oil/gas industry workforce)	0.0%	0.2%
Manufacturing	14.1%	12.2%
Percent government workers	21.6%	19.5%

Grand Isle, Louisiana

Grand Isle is located at the end of Highway 1 and is the only inhabited barrier island in the state. It is an important area for both recreational and commercial fisheries. Tourism and offshore oil are also an important part of the economy. In 2000, grand Isle had a population of 1,541, an increase over the 1990 population of 1,455. The number of people who report their occupation under the farming, fishing, and forestry occupations for 2000 increased to 8.8 percent from the 5.4 percent reported in 1990. The number of people who listed themselves in the agriculture, forestry, fishing and hunting industry increased from 5.4 percent in 1990 to 8.3 percent in 2000. Shrimping is the main commercial fishing industry. Boats range from small skimmer and butterfly net boats to large trawlers. Recreational fishing is important to the economy with many fishing tournaments located here (Impact Assessment, Inc 2005c).

In 2005, Grand Isle ranked 13th in shrimp sales in the Gulf and 21st in the number of federal permits.

Grand Isle Demographics

Factor	**1990**	**2000**
Total population	1,455	1,541
Gender Ratio M/F (Number)	738/717	788/753
Age (Percent of total population)		
Under 18 years of age	28.4	23.7
18 to 64 years of age	49.4	63.1
65 years and over	7.8	13.2
Ethnicity or Race (Number)		
White	1,447	1,480
Black or African American	2	3
American Indian and Alaskan Native	6	35
Asian	0	3
Native Hawaiian and other Pacific Islander	N/A	0
Some other race	0	6
Two or more races	N/A	14
Hispanic or Latino (any race)	11	23
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	23.9	17.0
Percent high school graduate or higher	57.0	68.3
Percent with a Bachelor's degree or higher	5.6	13.3
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	28.2	18.4
And Percent who speak English less than very well	10.9	3.2
Household income (Median $)	19,454	33,548

Poverty Status (Percent of population with income below poverty line)	25.8	13.2
Percent female headed household	9.7	8.4
Home Ownership (Number)		
Owner occupied	391	498
Renter occupied	137	124
Value Owner-occupied Housing (Median $)	42,100	69,500
Monthly Contract Rent (Median $)	249	316
Employment Status (Population 16 yrs and over)		
Percent in the labor force	55.1	57.8
Percent of civilian labor force unemployed	3.9	4.7
Occupation (Percent in workforce)**		
Management, professional, and related occupations	N/A	22.0
Service occupations	N/A	16.9
Sales and office occupations	N/A	22.5
Farming, fishing, and forestry occupations	5.4	8.8
Construction, extraction, and maintenance occupations	N/A	13.9
Production, transportation, and material moving occupations	N/A	15.9
Industry (Percent in workforce)**		
Agriculture, forestry, fishing and hunting	5.4	8.3
Mining (includes the offshore oil/gas industry workforce)	8.5	6.9
Manufacturing	17.6	8.9
Percent government workers	13.8	14.2

Port Arthur, Texas

Port Arthur is located on the western side of Sabine Lake, approximately 90 miles east of Houston, and about 14 miles north of the Gulf of Mexico. It is a popular place for recreational fishing all year round. There is also a productive commercial fishing fleet based here. It is also an important area for the oil industry. There is extensive infrastructure for the fishing industry including boat builders and brokers, marinas, processors, and retail and wholesale seafood dealers. In 2000, 1.1 percent of the population listed their occupation under the farming, fishing, and forestry category. A drop from the 2.0 percent listed in the category in 1990. There was also a drop in the number of people in the agriculture, forestry, fishing and hunting category of industry from 1990 which showed 2.1 percent of the population, to 2000 which showed 1.3 percent of the population under that category.

In 2005, Port Arthur ranked first in the amount of shrimp sales and fourth in the number of federal shrimp permits.

Port Arthur Demographics

Factor	**1990**	**2000**
Total population	58,724	57,755
Gender Ratio M/F (Number)	27,697/ 31,027	27,525/ 30,230
Age (Percent of total population)		
Under 18 years of age	28.2%	28.7%
18 to 64 years of age	54.8%	55.8%
65 years and over	17.0%	15.5%
Ethnicity or Race (Number)		
White	28,955	22,528
Black or African American	24,778	25,240
American Indian and Alaskan Native	147	260
Asian	2,825	3,404
Native Hawaiian and other Pacific Islander	N/A	9
Some other race	2,019	5,127
Two or more races	N/A	1,187
Hispanic or Latino (any race)	4,829	10,081
Educational Attainment (Population 25 and over)		
Percent with less than 9th grade	16.6%	14.4%
Percent high school graduate or higher	65.5%	69.7%
Percent with a Bachelor's degree or higher	10.0%	9.3%
Language Spoken at Home (Population 5 years and over)		
Percent who speak a language other than English at home	15.6%	23.2%
And Percent who speak English less than very well	7.2%	12.7%
Household income (Median $)	$18,548	$26,455
Poverty Status (Percent of population with income below poverty line)	28.1%	25.2%
Percent female headed household	17.2%	19.7%
Home Ownership (Number)		
Owner occupied	14,515	13,578
Renter occupied	7,811	8,261
Value Owner-occupied Housing (Median $)	$30,400	$35,900
Monthly Contract Rent (Median $)	$226	$405
Employment Status (Population 16 yrs and over)		
Percent in the labor force	54.3%	52.8%
Percent of civilian labor force unemployed	6.9%	7.0%
Occupation (Percent in workforce)**		
Management, professional, and related occupations	N/A	20.8%
Service occupations	N/A	23.2%
Sales and office occupations	N/A	23.8%

Farming, fishing, and forestry occupations	2.0%	1.1%
Construction, extraction, and maintenance occupations	N/A	12.2%
Production, transportation, and material moving occupations	N/A	18.8%
Industry (Percent in workforce)**		
Agriculture, forestry, fishing and hunting	2.1%	1.3%
Mining (includes the offshore oil/gas industry workforce)	0.7%	1.6%
Manufacturing	17.6%	13.1%
Percent government workers	13.4%	17.0%

3.6 Administrative Environment

3.6.1 Federal Fishery Management

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

Responsibility for federal fishery management decision-making is divided between the 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 M-SFCMA and with other applicable laws summarized in Section 10. In most cases, the Secretary has delegated this authority to NMFS.

The Council is responsible for fishery resources in federal waters of the GOM. These waters extend to 200 nautical miles offshore from the nine-mile seaward boundary of the states of Florida and Texas, and the three-mile seaward boundary of the states of Alabama, Mississippi, and Louisiana. The length of the GOM coastline is approximately 1,631 miles. Florida has the longest coastline of 770 miles along its Gulf coast, followed by Louisiana (397 miles), Texas (361 miles), Alabama (53 miles), and Mississippi (44 miles).

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

Regulations contained within FMPs are enforced through actions of the NOAA’s Office of Law Enforcement, the USCG, 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 (GSMFC) Law Enforcement Committee have developed a 5-year “GOM Cooperative Law Enforcement Strategic Plan - 2006-2011.”

3.6.2 State Fishery Management

The purpose of state representation at the council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five Gulf States exercises legislative and regulatory authority over their 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 states primary regulatory agency for marine resources is provided in Amendment 22 (GMFMC 2004a).

4.0 BYCATCH PRACTICABILITY ANALYSES

Introduction

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

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

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

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

The directed red snapper fishery has been regulated to limit harvest in order that the stock can recover from an overfished condition. These regulations have included catch quotas, minimum size limits, seasonal closures, and trip limits for the commercial fishery, as well as an IFQ program. For the recreational directed fishery, catch quotas, minimum size limits, bag limits, and seasonal closures have been implemented. These measures are generally effective in limiting fishing mortality, the size of fish targeted, the number of targeted fishing trips, and/or the time fishermen spend pursuing a species. However, these management tools have the unavoidable adverse effect of creating regulatory discards, which makes reducing bycatch, particularly in the recreational fishery, challenging. While the discard mortality rate of the commercial fishery is much higher than that of the recreational fishery, the total number of red snapper released by the recreational fishery during the baseline years, 2001-2003, was substantially higher than that of the commercial fishery. Discard mortality can limit the amount by which TACs reduce fishing mortality. Consequently, each TAC alternative previously implemented and currently under consideration, effectively defines an associated bycatch reduction target. The Council is considering these bycatch reduction targets in analyzing the practicability of taking additional action to further minimize bycatch and bycatch mortality in the directed red snapper fisheries.

Reducing red snapper bycatch in the shrimp trawl fishery is also a challenging goal. Recent information suggests that BRDs used by the shrimp trawl fleet are not as effective as previously thought. Additionally, the amount of effort expended trawling appears to be much larger factor in measuring and potentially reducing bycatch in this fishery. In a separated regulatory action the Council is considering a change to the certification criterion for BRDs in order to improve performance of these devices in reducing bycatch. Available data indicate shrimp effort is currently declining even more rapidly than predicted when the red snapper rebuilding plan was developed in Amendment 22 to the Reef Fish FMP. However, there is still a large degree of uncertainty as to the level of effort that would maximize benefits to the shrimp fishery, and that needed to minimize red snapper bycatch to the extent practicable. Consequently, the Council is considering in this joint amendment the practicability of taking additional action to further minimize shrimp trawl bycatch.

4.1 Penaeid Shrimp Fishery

This analysis evaluates whether existing or reasonably foreseeable regulations in the Gulf of Mexico penaeid shrimp fishery are effectively minimizing bycatch and the mortality of unavoidable bycatch to the extent practicable, consistent with National Standard 9 of the M-SFCMA. Section 3.0 provides a detailed description of this fishery and the affected environment.

Bycatch in the Fishery**:** More than 450 taxa have been identified from shrimp trawls in the Gulf of Mexico (Branstetter 1997), and the average catch is approximately 28 kg per hour (NMFS 1998). By weight, approximately 67 percent of the catch is finfish, 16 percent is commercial shrimp, and 17 percent is invertebrates. The fishery is also a substantial source of bycatch mortality on sea turtles. While a diverse fauna is taken, the catch/bycatch is dominated by just a few species. According to NMFS (1997), the 10 most abundant species, including the shrimp species, comprise between 50 percent and 75 percent of the total catch by weight. The species composition changes somewhat depending on the area and depth fished, but for the Gulf overall, Atlantic croaker and longspine porgy are the two dominant finfish species taken in trawls, comprising approximately 25 percent of the total catch by weight. Other commonly occurring species include three species of portunid crabs, mantis shrimp, spot, inshore lizardfish, searobins, and Gulf butterfish. Red snapper represent less than 0.5 percent of the total catch either by weight or number (Branstetter 1997). Although red snapper comprise a very small percentage of overall bycatch, the mortality associated with this bycatch impacts the recruitment of older (age 2 and above) to the directed fishery, and ultimately the recovery of the red snapper stock.

Measures to Address Bycatch**:** To address finfish bycatch issues, especially bycatch of red snapper, the Council initially established regulations requiring bycatch reduction devices (BRDs), specifically to reduce the bycatch of juvenile red snapper. In 1998, all shrimp trawlers operating in the EEZ, inshore of the 100-fathom contour, west of Cape San Blas, Florida were required to use BRDs. To be certified for use in the fishery, a BRD had to demonstrate a 44 percent reduction in fishing mortality for age 0 and age 1 red snapper from the baseline years of 1984-1989. Subsequently, in 2004, BRDs were required in the eastern Gulf of Mexico (east of Cape San Blas, Florida). BRDs used in this area had to demonstrate a 30 percent reduction in the total finfish biomass, and this measure was implemented to address bycatch reduction for all finfish species. Only two Gulf states (Florida and Texas) require the use of BRDs in state waters.

In a regulatory amendment approved by the Council in August 2006 and to be implemented by NMFS, the BRD criterion for the western Gulf (west of Cape San Blas, Florida), was changed from the 44 percent reduction in red snapper mortality to match the criterion of the eastern Gulf - a 30 percent reduction in total finfish biomass. The Council changed the criterion for several reasons. The original criterion placed unnecessary restrictions and logistic limitations to testing a BRD. Under the old criterion, the efficacy of the BRD was measured by directly applying a reduction in fishing mortality on red snapper attributable to the BRD. However, in reality, the BRD is evaluated for its ability to reduce catch-per-unit-effort (CPUE) of red snapper; this CPUE value must then be applied to stock size and recruitment values for a given year class to determine a reduction in F; a BRD that can demonstrate a consistent reduction in CPUE would still have a variable reduction rate in regard to F depending on annual recruitment. Consequently, a more appropriate measure of the efficiency of a BRD to reduce bycatch is to evaluate the reductions in CPUE of a species or species group.

Even though the Council has moved away from a BRD criterion that achieves a specific reduction in red snapper (F), there is a general correlation between the reduction rate of red snapper and the reduction of total finfish (Table 2.6, Figure 4.1.1). In general, a BRD that effectively reduces 30 percent of the finfish biomass also reduces the catch of juvenile red snapper so that F is reduced by about 20 to 25 percent (See Table 2.6 for comparisons of the more commonly used BRDs at this time).

The results of the 2005 stock assessment for red snapper indicated that substantial additional reductions in bycatch of red snapper were needed for both the directed fishery and the shrimp fishery. To achieve the rebuilding targets established in Amendment 22 to the Reef Fish FMP, bycatch reductions in the shrimp fishery need to be increased by as much as 70 percent to 80 percent from the 2001-2003 average, which exceeds current technological abilities through gear modifications. As noted above, red snapper comprise less than 0.5 percent of the total catch in a net by either weight or numbers; current BRD designs achieve between a 20 percent and 40 percent reduction in red snapper CPUE. Given the low overall occurrence of this species per tow, it is not expected that technological advances with gear will be forthcoming in the near future that can, by themselves, achieve levels of reduction recommended to rebuild the red snapper stock under the current plan. Of the hundreds of experimental BRD designs evaluated over the years, only a few have been able to meet the current (or previous) bycatch reduction criterion target.

To address sea turtle bycatch and associated mortality, NMFS implemented regulations requiring turtle excluder devices (TEDs) in 1987, which were phased in over 20 months. Originally, TEDs were required on a seasonal basis, and no TEDs were required if the fisherman followed restricted tow times. Subsequent rulemaking in 1992 required TEDs in all shrimp trawls from North Carolina to Texas, but phased in these requirements to the inshore fishery over a 2-year period. Over time, TED regulations have been modified to change the allowable configurations of TEDs with the intent of improving turtle exclusion. TEDs are required in both state and federal waters.

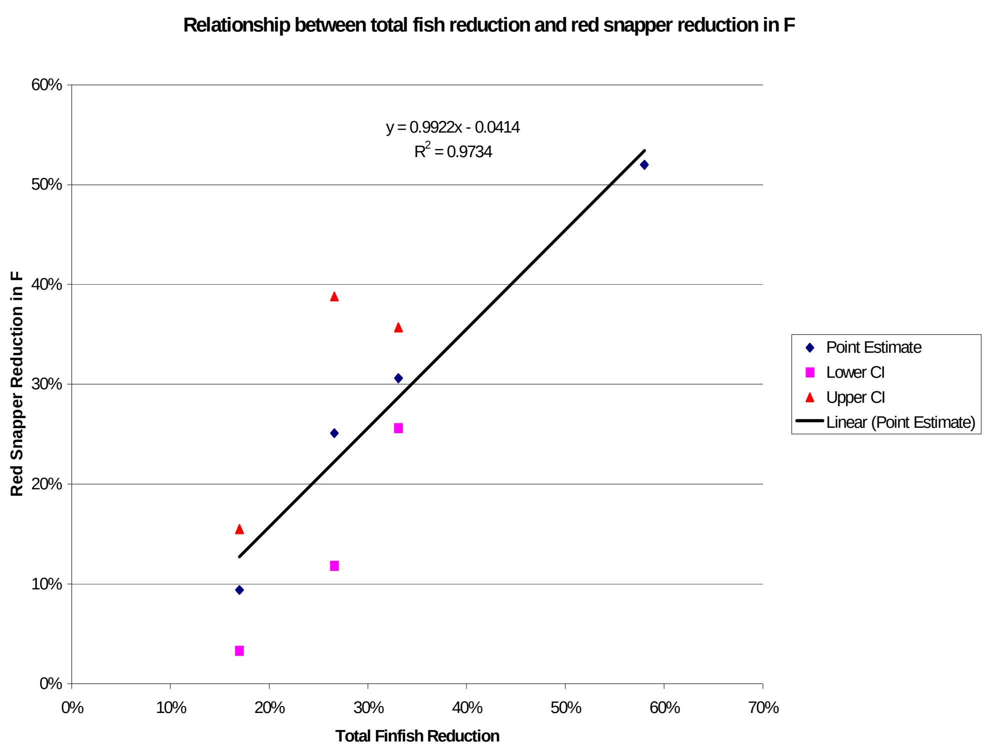
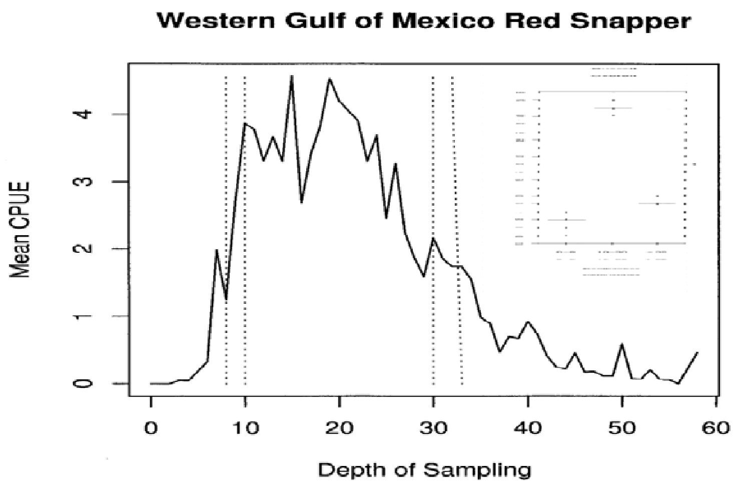


Figure 4.1.1. Relationship between total reduction in biomass of finfish and reductions in fishing mortality for red snapper attributable to bycatch reductions devices used or tested in the Gulf of Mexico shrimp fishery.

Additional/Future Measures to Address Bycatch: The 2005 red snapper stock assessment provided a broad range of linked scenarios under which the red snapper stock could recover under the current rebuilding targets. All of these options depended on reducing bycatch mortality proportionally in both the directed and shrimp fisheries. Additional reductions in red snapper mortality attributable to the shrimp fishery could be achieved through direct reductions in shrimp fishing effort; especially effort expended in areas where juvenile red snapper are commonly taken. There is a very good relationship between shrimp effort and red snapper bycatch mortality (Figure 2.6), and CPUE in the offshore areas between 10 and 30 fathoms where juvenile red snapper are most abundant (Figure 4.1.2).

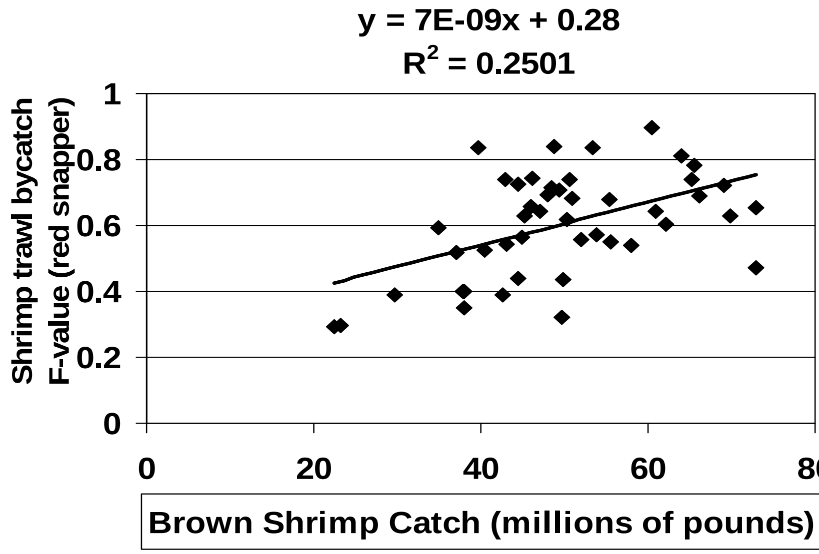
Figure 4.1.2. Distribution of juvenile red snapper across depth. (From Gallaway pers. comm.[22], information provided to SEWG)



Therefore, achieving additional mortality reductions for juvenile red snapper through effort controls in the shrimp fishery may be a more appropriate approach than using shrimp landings to establish bycatch quotas or by restricting the number of federal shrimp vessel permits. NMFS Southeast Fisheries Science Center, Galveston Laboratory, analyses demonstrated there is a weak relationship between mortality on ages 0 and 1 red snapper and shrimp landings (Figure 4.1.3). These estimates indicate that brown shrimp landings only explain 25 percent of the variation observed in juvenile red snapper mortality. Using total shrimp landings would be even more ineffective because of the multi-species nature of the fishery. Effort inside 10 fathoms, targeting white shrimp (and seabobs), would not directly affect red snapper. Very limited numbers of juvenile red snapper occur inside of the 10-fathom contour (Branstetter 1997; Gallaway et al. 1998). In addition, approximately 10 percent of all shrimp landed (brown, pink, and white shrimp) are landed in the eastern Gulf of Mexico (east of Cape San Blas, Florida), and juvenile red snapper are not common there. To that end, monitoring total shrimp landings as a proxy for bycatch levels would not provide accurate estimate of impacts to red snapper.

[22] Benny Gallaway, LGL Ecological Research Associates, 1410 Cavitt Street, Bryan, Texas 77801

Figure 4.1.3: Shrimp Trawl Bycatch F-values (Red Snapper) vs. Brown Shrimp Catch



Shrimp trawl bycatch F- values (red snapper) vs. brown shrimp catch, 1960 – 2005.

Similarly, restricting or allocating effort according to the number of active federal shrimp permits may provide a basis for future action, but only after the moratorium, established in GMFMC (2005b), is fully operational one year after its implementation in order to evaluate the moratorium's effects. As noted under the discussion for **Action 1**, the 2005 hurricane season was the busiest and costliest on record. Fuel prices reached $3 per gallon, and shrimp prices have not increased. It is likely fishing effort and landings will be down in 2007, especially from Mississippi and Louisiana vessels. This impact is discussed in more detail in Sections 2.5.1.2 and 3.2. Nevertheless, until the moratorium on federal vessel permits is fully implemented, attempting to estimate effort through the permit system as a control on red snapper mortality would be impractical.

As discussed in detail in Section 3.2.1, in the future, it may be possible to achieve more consistent and precise bycatch reduction of red snapper through the identification of specific "hot spot" areas where juvenile red snapper are known to be consistently abundant. As noted above, red snapper are more common in the 10 to 30-fathom depth zone of the western Gulf; however this is an exceptionally large area of the western Gulf and shrimp fishing occurs in many portions of this depth range. Closing this large area permanently would have substantial impacts to the viability of the brown shrimp component of the Gulf shrimp fishery.

Nevertheless, with additional research, perhaps site-specific locations within these depth strata could be identified where juvenile red snapper are extremely abundant on a consistent basis. Areas such as these could be closed permanently or perhaps seasonally. However, even with the existing extensive fishery-independent SEAMAP database and the fishery-dependent observer data for the fishery, such "hot spots" have not been effectively identified. Additional and extensive offshore sampling would be required to collect the information needed to identify such areas, if such areas actually exist; and this information would have to be correlated with shrimping activity. While such wide-scale activities are cost prohibitive, preliminary efforts are currently underway.

Whether large or small areas are seasonally or permanently closed, to effectively enforce the closures would require real time monitoring, such as through a vessel monitoring system (VMS). While VMS is an option being considered for the shrimp fishery by the Council in the future, it will be a cost to the individual vessel owners to maintain and operate the VMS; monthly service costs are normally borne by the fishermen. Given the current economic depression of the Gulf shrimp trawl fishery, this could be an excessive cost at the present time.

The Council is currently evaluating other options to reduce effort or bycatch mortality that could include limiting the number of days fished per vessel, limiting the amount of gear used, or reducing latent effort that could re-emerge in the fishery should economic conditions improve. None of these potential actions can be fully evaluated until the proposed moratorium on federal vessel permits is implemented, and fully operational (estimated at the end of 2007). It is also noted that effort reduction in the shrimp fishery, either from the ongoing declining economic conditions, hurricane devastation, or regulations, that may be needed to meet the current rebuilding goal for red snapper may reduce the effort in the shrimp fishery to the point where this fishery cannot achieve optimum yield.

For example, in 2005, landings of brown shrimp were down considerably over recent years, and white and pink shrimp landings were down slightly (Nance 2006b). Compared to recent years, brown shrimp effort was down over 50 percent in 2005, white shrimp effort for 2005 was down about 20 percent, and pink shrimp effort was down by about a third. These declines in landings and effort reflect the current economic problems facing the shrimp industry, plus the impacts of the 2005 hurricane season. However, for all three species, catch-per-unit-effort (CPUE) - in pounds landed per day fished) has increased substantially over the last three years. Brown shrimp CPUE in 2005 was 33 percent greater than in 2003 and represents a level not seen since the 1960s. White shrimp CPUE is up nearly 70 percent, and pink shrimp CPUE is up 33 percent. In part, pounds landed are higher because the average size of the shrimp being caught for all three species has increased markedly. Yield curves indicate white and pink shrimp yield is at or near the maximum, but for brown shrimp, increases in effort would produce an increase in yield.

The following bycatch practicability analysis considers these issues in determining the practicability of additional actions to further reduce bycatch in the Gulf of Mexico penaeid shrimp fisheries through effort targets/caps/controls.

Practicability Analysis

Criterion 1: Population effects for the bycatch species

As noted in Shrimp Amendment 9, the majority of finfish taken in shrimp trawls, including red snapper, are age 0 and age 1 fish, and most do not survive. Many of the common species, such as Atlantic croaker, spot, and longspine porgy are short-lived, and have a high natural mortality rate. Nevertheless, as noted in Shrimp Amendment 10, reductions in bycatch mortality would be expected to improve the stocks of these bycatch finfish if fishing mortality is simply not offset by natural mortality. The existing BRDs and TEDs do little to reduce the catch of invertebrates; however, these species (primarily crabs or other crustaceans) are hardier than most finfish, and when brought onboard the vessel they are often returned to the water alive.

The bulk of the bycatch finfish species are not managed at the state or federal level; most are not targeted by any specific recreational or commercial fishery. Thus, there are no active assessments regarding the status of this collective group of groundfishes. However, between the directed groundfish fisheries of the 1970s and early 1980s and the continuing shrimp trawl fisheries, there has been substantial juvenescence in groundfish stocks, such as Atlantic croaker and spot.

Knowledge of the total shrimp trawl bycatch for a given species is important; however, it is meaningful only when considered in conjunction with data on that species' overall stock size, its bycatch by age class, and the magnitude of its bycatch relative to other sources of directed or non-directed fishing mortality (NMFS 1995). Again, the parameters are not well understood for most species taken as bycatch in shrimp trawls.

Bycatch mortality still significantly affects recovery of the red snapper stock. The 2005 red snapper assessment concluded the stock remains overfished and is undergoing overfishing. These conclusions are consistent with those of past assessments, despite changes in methodology and status determination criteria (SEDAR 7 2005). Section 3.4.1 provides a detailed discussion of the major conclusions of the red snapper stock assessment. According to the assessment, red snapper fishing mortality rates are too high in both the directed and shrimp fisheries. While the directed fishery contributes a greater portion of fishing mortality than previously thought, shrimp trawl bycatch of red snapper remains a significant source of mortality.

NMFS and the Council previously chose a strategy based on linked fishing mortality selectivities. This requires that bycatch mortality reductions of similar magnitudes be required for both the directed fishery and the shrimp fishery. To achieve the rebuilding targets established in Amendment 22 to the Reef Fish FMP, bycatch mortality in the shrimp fishery would need to be reduced as much as 70 percent to 80 percent across all sources (directed commercial fishery, directed recreational fishery, closed season recreational bycatch discard, and shrimp trawl discard). As discussed in Section 5.1, such high bycatch reduction targets are unlikely to be met in the directed fishery sectors. This amendment considers additional alternatives that are not dependent on a linked scenario.

The Council and NMFS believe the use of TEDs has had a significant beneficial impact on the survival and recovery of sea turtle species. The use of TEDs has contributed to population increases documented for Kemp's ridley turtles. Kemp's ridleys are the smallest sea turtle species, and adults can easily pass through the current TED opening dimensions. Once the most critically endangered sea turtle, Kemp's ridley nesting levels have increased from 700–800 per year in the mid–1980's to over 6,000 nests in 2000. Since 1990, corresponding with the more widespread use of TEDs in U.S. waters, the total annual mortality of Kemp's ridley turtles has been reduced by 44–50 percent (TEWG, 2000). In 2003, the NMFS implemented to revisions to the TED regulations to also protect larger green, loggerhead, and leatherback sea turtles.

On December 2, 2002, NMFS completed a biological opinion on the effect of shrimp trawling in the southeastern United States (NMFS 2002a) under the proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). The opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination was based, in part, on the opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks.

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

For the offshore shrimp fishery, almost all shrimp are of marketable size. There is a minimal discard of shrimp in the EEZ. As an annual stock, shrimp stocks are influenced primarily by recruitment, which is controlled by environmental variability especially in the estuaries, and is not dependent on fishing mortality. The life history of these species is presented in more detail in Section 3.

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

Improved stocks of groundfish species could have a negative effect on the shrimp population based on results of the NMFS ecological modeling of bycatch reduction. These results were presented in detail in Shrimp Amendments 9 and 10 and are only summarized here. Martinez, et al. (1996) projected that the effect of requiring BRDs could be a reduction in the biomass of shrimp by 5.9 percent to 8.2 percent. These estimates are based on increased predation that could result from an increase in abundance of bottomfish predators and decreased recycling of nutrients if finfish bycatch biomass is reduced by 50 percent. Martinez, et al. (1996) made it clear, however, that the model predicted the effects on the shrimp stock biomass and not the yield from the fishery. Information to assess the relationship between the model results and catch by fishermen is not available, and any negative effects of increased predation could be "masked" by annual fluctuations in recruitment and landings.

Criterion 4: Effects on marine mammals and birds

There are minimal, if any, interactions between seabirds and shrimp trawl gear. Sea birds are a common predator behind shrimp boats, feeding on the discards or feeding on organisms that escape from the net as the gear is brought aboard. There is some conjecture that they may have developed a dependence on this source of food. Earlier versions of a trophic ecological model (Browder 1983 and Sheridan et al. 1984) indicated that if 50 percent bycatch were removed from the ocean (e.g., landed and utilized on shore) the shrimp biomass would decline by 25 percent. If birds were harvesting a significant percentage of the bycatch biomass, a similar effect could occur, but it would be smaller in magnitude because bird guano and the tissues of dead birds would be recycled and contribute to the organic nitrogen pool. Whether bycatch reduction will have an adverse impact on bird populations is unknown.

The southeastern shrimp trawl fishery is listed as a Category III fishery in regard to marine mammal interactions (August 22, 2006; 71 FR 48802). Based on whale distribution and abundance in the Gulf, the presence of whales in Gulf shrimping grounds is very unlikely (see Section 3.4.3). There have been no reported interactions between whales and shrimp vessels in the Gulf or even in the Atlantic, where certain species are more common. Shrimp trawlers move slowly (approximately 3 knots while trawling) which would give a whale or the fishing vessel time to avoid a collision. Based on the above information, the chance of the proposed action affecting species of large whales protected by the ESA is discountable. Similar to seabirds, dolphins are a common predator behind shrimp boats, feeding on the discards or feeding on organisms that escape from the net as the gear is brought aboard.

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

As noted under Criterion 6, there have been changes in fishing practices to help increase shrimp retention, such as faster towing speeds and modified retrieval procedures, which may have led to reduced efficiency of the BRDs. Although the exact reasons for this change in efficiency are not known, in practice, the BRDs do not appear to be meeting the current reduction criterion. The actions proposed in this amendment (Actions 6 through 8) may cause some shifts in fishing costs if areas are closed for substantial amounts of time. However, based on recent effort analyses, as discussed under Criterion 6, effort is already shifting to more areas inshore of the proposed time-area closures.

According to Funk (1998), who examined fleet profitability during the 1965 through 1995 time period, the average annual rate of return (profit as a percentage of revenue) for the fishery as a whole was 12.5 percent, which is a respectable figure for capital investors. According to a subsequent analysis, whose primary purpose was to evaluate the impacts of recent changes in TED regulations (NMFS 2002b), the large vessel component of the fishery was profitable to highly profitable between 1998 and 2000. Nominal shrimp prices were relatively stable and fuel prices were relatively low by historical standards, and abundance tended to be higher than historical averages. However, since that time, rising fuel costs have and continue to represent a significant portion of the industry's operating costs (Haby et al. 2003), and a lack of concurrent ex-vessel shrimp price increases has led to a substantial economic downturn, and reduced participation in the fishery. According to an analysis for the fishery as a whole in 2002, the average rate of return was expected to be approximately -41 percent, with lower loss rates being experienced for the small vessel sector (-30 percent) relative to the large vessel sector (-45 percent). Since 2002, fuel prices have increased nearly 2.5 times, while average shrimp prices have declined by as much as 40 percent.

Recent information suggests that these trends are continuing. Insurance costs have increased to the point where a majority of shrimp vessel owners have chosen not to carry insurance. Offsetting these conflicting costs/returns, shrimp catch rates (pounds landed per days fished) have increased by nearly 75 percent in the last five years. Increases in catch rates reduce the average cost per pound of harvesting shrimp.

As noted in the introductory material, these external factors have already played a major role in reducing shrimp effort. NMFS previously estimated that these declining conditions would likely continue until at least 2012. However, that analysis assumed the prevailing price and cost structure as it existed in 2002. As noted in the analysis, the projected effort reductions were likely conservative given indications that imports were continuing to increase, shrimp prices were continuing to decline, and fuel prices and insurance premiums were continuing to increase from their 2002 levels. This situation has been exacerbated by the devastating effects of the 2005 hurricane season for the Gulf coasts of Louisiana, Mississippi, western Alabama, and north Texas. As a result of the hurricanes and poor economic returns, the latter of which puts them at a competitive disadvantage in the labor market, vessel owners have also found it increasingly difficult to procure crew. Lack of labor, particularly experienced labor, has caused some vessels to cease operations, use family as crew, or operate with fewer and less experienced crew. The use of lower quality labor is likely to increase operational inefficiencies, reduce product quality, and thus possibly reduce shrimp prices and profitability even more. The 2006 effort data indicate that shrimp effort is approximately 65 percent below the 2001-2003 benchmark years used in the 2005 red snapper stock assessment. Current evidence suggests that effort will likely decrease more than initially projected. Thus, the level of effort at the new industry equilibrium will likely be significantly less than initially projected, and the declines in effort and participation are likely to continue in the short-term.

Criterion 6: Changes in fishing practices and behavior of fishermen

Although the original BRD sampling effort from 1992 through 1998 documented that the Fisheye and Jones-Davis BRDs are both capable of meeting the certification criterion, recent evaluations of the most commonly used BRD – the Fisheye – indicate it is achieving only about a 10 percent to 20 percent reduction in red snapper bycatch mortality (Foster 1995). Similarly, it appears the efficiency of the Expanded Mesh Extended Funnel BRD, currently certified for use in the eastern Gulf, has dropped. During the original tests of this BRD in the mid-1990s, it achieved between 30 percent and 35 percent reduction in total finfish. Recent tests of this BRD indicate it is achieving between a 25 percent and 30 percent reduction. For both examples, the potential of the BRDs have not changed, but it appears fishing behavior, or some other factor in the fleet has changed, which has concurrently affected the overall efficiency of the BRDs. Another factor could be the limited amount of testing data in recent years that has resulted in large confidence limits on these estimates. Additionally, actions to maximize shrimp retention, without concurrent maintenance of fish reductions, may have resulted in a reduction in the effectiveness of the BRD to reduce bycatch.

It may be possible to address effort reductions by determining the optimal amount of effort required to harvest the available shrimp crop. That optimal amount may be substantially less than the estimates for MSY, as it would be curtailed by the need to concurrently reduce the impacts to the red snapper resource. Therefore, the real shifts would be in the brown shrimp fishery, which is conducted in areas where red snapper are abundant. This brown shrimp effort could be allocated across all vessels in the fishery, in a manner akin to a trip-based IFQ system. Each vessel permit holder would be allocated a certain number of days/trips to fish within a season or landings. An incentive-based program could provide permit holders with additional days at sea during the fishing year if they can document restricted effort by their vessel in high bycatch areas. Conversely, vessels that remain in high bycatch areas would have days at sea reduced.

Currently, there appears to be a change in the spatial distribution of effort from mid-shelf to nearshore areas. Landings in 2005 indicated a substantial shift in catch of white shrimp, which occur closer to shore than brown shrimp, and out of areas where red snapper are abundant. This shift benefits red snapper, which are more commonly taken as bycatch in the mid-shelf regions. The actions proposed in this amendment (Actions 6, 7 and 8) may cause some shifts in fishing costs if areas are closed for substantial amounts of time. However, based on recent effort analyses, as discussed elsewhere in this document, effort is already shifting to more areas inshore of the proposed time-area closures. Nevertheless, the proposed closures, of limited duration, would not preclude the fishery from achieving OY in the brown shrimp fishery. The fishery would still have the opportunity to target brown shrimp both in areas inshore and offshore of the proposed time-area closures.

More direct options to restrict overall shrimp effort, through allocating effort in areas where red snapper are abundant, offers opportunities in the future, but only after the moratorium established in GMFMC (2005b) is fully operational (one year after its implementation). Only then will NMFS and the Council have a clear understanding of the vessels remaining in the fishery. For example, according to the best available landings data, of the 2,666 vessels expected to qualify for federal Gulf shrimp moratorium permits, 2,264 were found to have at least some shrimp landings from the Gulf in 2002 (GMFMC 2005b). In 2005, this figure fell to about 1,800 vessels. However, many of these 1,800 vessels were active only prior to the hurricanes. Even though catch rates were historically high in the months of October-December, the number of active, qualifying vessels fell to approximately 1,200 during the last quarter of 2005. These figures suggest that effort and participation in the fishery are continuing to decline. As of June 1, 2007, less than 2,000 moratorium permits have been issued.

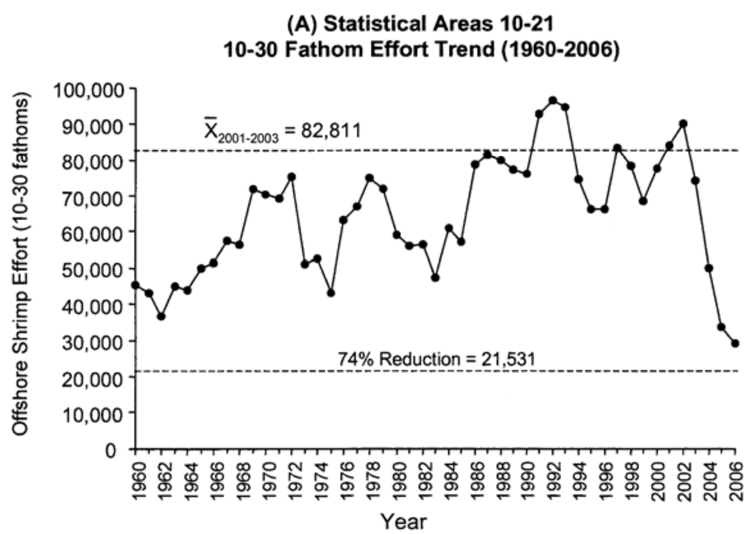
Criterion 7: Changes in research, administration, and enforcement costs and management effectiveness

While the newly adopted BRD criterion may provide opportunity for additional BRDs to be introduced in the fishery, there is expected to be minimal additional bycatch reduction benefits, at least in the short-term. The original research during the 1990s that certified the Fisheye and Jones-Davis BRDs indicated these BRDs met the existing bycatch reduction criterion of a 44 percent reduction in red snapper mortality; at the same time, these BRDs demonstrated a general reduction of about 30 percent to 40 percent in finfish biomass. Thus, a change to the criterion, as recently approved by the Council in August 2006, should not provide greater bycatch reduction than that experienced when BRDs were initially introduced to the fishery. Changing the criterion, and certifying additional BRDs that meet the overall finfish reduction will provide for a more robust method of reducing overall bycatch of finfish in the shrimp fishery. However, the levels achieved under the new criterion will be essentially the same as the levels being achieved before fishing practices changed, which changed the efficiency of the current BRDs. Future research with new BRD designs could improve the bycatch reduction efficiency of these devices, but when compared with the ongoing and projected reductions in effort, the effect of gear modifications is expected to be small.

It needs to be kept in mind, as effort in the shrimp fishery continues to fall, the benefits of BRDs with respect to bycatch reduction (red snapper and otherwise) become less and less. BRDs reduce bycatch by only a certain percentage of the total bycatch for each unit of effort in the shrimp fishery. Conversely, bycatch is reduced significantly more if a unit of effort is completely removed from the fishery.

Because of the economic situation that the shrimp industry has been experiencing since 2001 from large increases in shrimp imports and high fuel costs, effort appears to have been reduced by more than 50 percent from the 2001-2003 base years, especially in the depth zone where red snapper are most abundant (Figure 3.2.1.2). The impacts of Hurricanes Katrina and Rita on the number of vessels that will likely be fishing in the near future are unknown, but it is expected that there will be a reduced number of active vessels at least in the short term. Therefore, substantial additional bycatch reduction may have already occurred. When compared to the recommendations of the 2005 red snapper assessment for target mortality reduction levels, the shrimp fishery as it is currently operating is nearing the 74 percent target reduction level (Figure 4.1.4). However, should economic conditions improve, the fishery may re-vitalize.

Figure 4.1.4. Shrimp effort in the 10 to 30-fathom depth strata 1960-2005, illustrating the declines in effort compared to the benchmark years of 2001-2003.



When the moratorium on the issuance of new federal shrimp permits established by GMFMC (2005b) is fully implemented, it will be possible to assess the current number of vessels participating in the fishery, along with the level and spatial distribution of effort. At that time, fishery managers may consider modifying the target reduction levels established in this amendment, and take additional actions to maintain the levels of effort and participation. Such actions are not feasible at the present time until the moratorium and other actions of GMFMC (2005b) are fully established.

In regard to turtles and the use of TEDs, the original TED sizes implemented were expected to reduce shrimp trawl capture of sea turtles by 97 percent. Although the TED openings proved too small to adequately protect all species and size classes of sea turtles, recent changes in TED regulations improved the exclusion capabilities for large turtles. The currently required TEDs are at least 97 percent effective in excluding all species of sea turtles. Continued mortalities from trawl interactions are most likely from repeated interactions that stress the turtle. There are specific times where turtle abundance and increased shrimp effort co-occur; specifically in the nearshore waters in the spring (NMFS 2002b). Effort targets/caps in the EEZ are not likely to affect these periods of peak shrimping activity. Even if the proposed actions in this document result in effort shifting from the 10 to 30-fathoms depth zone into nearshore, the substantial reductions in overall shrimp effort that have occurred since 2002 will maintain mortality levels below those authorized in the 2002 biological opinion on this fishery.

The M-SFCMA requires fishery managers to address ten National Standards when developing FMPs. National Standards 1, 8, and 9 require managers to: (1) prevent overfishing, while achieving on a continuing basis optimum yield (OY) (16 U.S.C. § 1851(a)(1)), (2) consider the needs of fishing communities when setting conservation and management measures (16 U.S.C. § 1851(a)(8)), and (3) minimize to the extent practicable fishery bycatch or bycatch mortality (16 U.S.C. § 1851(a)(9)). In considering each of these mandates, management measures must to the extent practicable minimize social and economic impacts while not compromising conservation goals (50 CFR § 600.345).

The competing mandates of each of these standards make it difficult for managers to achieve the goal of each standard simultaneously when selecting management regulations. This is especially true in a situation where there are two fisheries involved; one directed at red snapper, another with a bycatch of red snapper, and both with conflicting goals. Bycatch of red snapper in the shrimp trawl fishery reduces the MSY that can be obtained from the directed red snapper fishery (SEDAR 7 2005). On the contrary, measures that cap/reduce effort in the shrimp fishery may result in this fishery not being capable of harvesting OY and negatively impacting communities that depend on shrimping. As a result, yield in the shrimp fishery may be reduced below optimum at the cost of achieving higher yields in the red snapper fishery.

To successfully rebuild red snapper to desirable levels, significant reductions in both shrimp trawl and directed red snapper fishery bycatch will be needed. When selecting management measures, managers will be confronted with the challenge of restricting directed harvest in upcoming years, which often increases bycatch and discard mortality. Managers will also be challenged to implement effective management measures for reducing shrimp trawl bycatch while attempting to minimize social and economic impacts in a fishery that has already been significantly affected by high fuel prices and competition from shrimp imports.

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

The analysis in Shrimp Amendment 9 indicated a loss of producer surplus to the shrimp fishery of approximately $116 million over an extended period of time. Part of these losses was due to the requirement of purchasing BRDs. The cost of purchasing a Fisheye BRD, which has become the industry standard, has basically remained unchanged since Amendment 9's implementation (approximately $45-$50 per BRD). However, the majority of the expected adverse impacts were due to the loss of shrimp created by requiring BRDs in the shrimp trawl nets. At the time, the average, expected shrimp loss per tow was estimated to be approximately 3 percent. However, as a result of the previously discussed changes in fishing operations, the loss in shrimp from Fisheye BRDs has been reduced to approximately 1.2 percent on average. Therefore, at the individual vessel level, the impacts from BRDs have been reduced over time as a result of changes in shrimpers' operations. Further, for the industry as a whole, the total costs from BRDs have been further reduced over time as the level of effort and participation in the fishery has declined. Therefore, the adverse economic impacts from BRDs estimated in Amendment 9 were likely overestimated and, in general, the impact of BRDs pale in comparison to the adverse impacts being created by rising imports, falling shrimp prices, increasing fuel prices and insurance premiums, and recent hurricanes. On the other hand, any additional regulations would only exacerbate the industry's already depressed economic condition and thus, in relative terms, would undoubtedly generate a significant and adverse economic impact on individual vessels and associated businesses.

Benefits of increased bycatch reduction to the directed red snapper fishery and to the public would depend on whether and to what extent the reductions affect the rate of recovery in the red snapper fishery and thus the level of allowable yields/TACs in the fishery over time. As noted under Criterion 7, it may be necessary to adjust OY for the shrimp fishery to reduce yield from the shrimp fishery based on the ability to rebuild red snapper. The reductions in effort in the shrimp fishery that have already occurred and are expected to continue and in fact probably increase in the foreseeable future are expected to yield greater benefits than any new gear modification requirements. These benefits are expected to continue to accrue to the directed red snapper fishery, and additional regulations on the already economically depressed shrimp industry may not be needed. New projections are needed to determine what the likely new equilibrium level of effort and fleet size will be and when such will be realized under present or expected future conditions.

From an economic perspective, optimum reduction in bycatch is determined by comparing marginal benefits and costs of each additional reduction. In principle, bycatch should be reduced as long as marginal benefit exceeds the marginal cost of doing so. Marginal cost includes the extra cost incurred by shrimp producers and consumers from each additional reduction in bycatch, including the present value of losses that would be incurred in the future as well as current year losses. Easiest, least-cost methods of reducing bycatch should be adopted first. Additional reductions are only achieved with increasingly restrictive regulations on shrimping activity, which suggests marginal cost increases with each additional reduction. Marginal benefit includes the extra benefit received by harvesters and consumers, including the present value of the extra current and future benefits generated with each additional reduction. Each additional reduction is expected to increase total benefits at a decreasing rate; particularly for an open access, recreational fishery (NMFS 1996).

With respect to the costs, this analysis already indicated significant reductions in effort have occurred in the shrimp fishery and these are likely to continue. Initially, such reductions are expected to come from the "marginal" vessels in the fleet. Specifically, the vessels that would exit the fishery first would be those who are the least efficient in terms of their ability to generate profits and those who are least dependent on the fishery as a source of income (i.e. part-timers). Those who remain in the fishery would generally be able to compensate for the loss of these producers by increasing their own production, either via increases in effort (if economic conditions allow) or increases in catch rates (which increase their productivity and profitability). That is, production remains relatively constant. Thus, at first, the marginal costs of effort/bycatch reduction are relatively low. However, as effort and fleet size continue to decline, remaining producers find it increasingly more difficult to increase their production either because they cannot increase their effort more than they already have (i.e. time constraints), it is unprofitable to do so under prevailing economic conditions, and/or catch rates have reached their maximum. At such a point, the marginal cost of further effort/bycatch reductions will become relatively high and production will be lost, as will the economic benefits associated with that production.

Criterion 9: Changes in the distribution of benefits and costs

There is a perception that benefits and costs are not equitably distributed between the shrimp fishery and directed red snapper fishery. The directed fishery has long expressed its frustration that little is being done to curtail bycatch in the shrimp fishery, while the directed fishery continues to be restricted in terms of TAC, fishing seasons, and bag limits. Conversely, the shrimp fishery claims it is accruing costs from using TEDs and BRDs, while any red snapper benefits accrue to others. According to the 2005 red snapper stock assessment, fishing mortality (including discards) by the recreational sector is the primary limiting factor to stock recovery for the portion of the stock in the eastern (east of the Mississippi River) Gulf. Shrimp trawl bycatch is more important in the western Gulf, but commercial fishing mortality (including discards) is significant there as well.

Section 303(e)(4)(B) of the M-SFCMA requires stock rebuilding plans "allocate both overfishing restrictions and recovery benefits fairly and equitably among sectors of the fishery." Evaluating various red snapper rebuilding plan scenarios within the context of this legal mandate requires interpreting how this provision applies to the three primary fisheries impacting red snapper mortality: the directed commercial and recreational red snapper fisheries, and the shrimp fishery.

The M-SFCMA defines the term, "fishery," to mean, "(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks (Section 3[13]). The Act does not define the term "sector." While the directed red snapper fisheries and shrimp fishery could be defined as separate fisheries because they target different species that should not be treated as a unit for conservation and management purposes, the significant influence of the shrimp fishery on the status of the red snapper stock is quite clear. As a result, the shrimp fishery could be considered a sector of the red snapper fishery for the purpose of evaluating the allocation of overfishing restrictions and recovery benefits in the context of the M-SFCMA mandate. How fishery managers address this issue has important implications on how shrimp trawl bycatch of all managed species is considered and treated in rebuilding plans developed for overfished species.

The alternative red snapper bycatch reduction targets evaluated in this amendment for the shrimp fishery would reduce the red snapper fishing mortality rate of that fishery between 50 and 74 percent from the 2001-2003 baseline. This would be accomplished by setting a target reduction in shrimp fishing effort from 50 to 74 percent within the area of highest juvenile red snapper abundance (the 10 to 30-fathom depth zone in statistical subzones 10-21). The Council's preferred 74 percent bycatch reduction target would distribute reductions in red snapper fishing mortality equally among the directed red snapper fisheries and shrimp fishery as the stock rebuilds. The less conservative red snapper bycatch reduction targets would place a relatively greater portion of the rebuilding burden on the directed red snapper fisheries.

Although the Council's preferred rebuilding scenario would hold the red snapper fishing mortality rates of the directed red snapper fisheries and the shrimp fishery constant after 2010 throughout the red snapper rebuilding timeframe, the actual red snapper catch of both fisheries could increase over time as the stock grows in response to the rebuilding measures implemented through this amendment. This means both fisheries would be allocated more red snapper as the stock recovers. The directed red snapper fishery would benefit from this allocation in the form of increased yield and, consequently, increased overall fishery value. In contrast, the shrimp fishery would not directly benefit from increased red snapper abundance because shrimp trawl bycatch of red snapper cannot be retained and has no economic value. However, effort would be allowed to increase thereby increasing the likelihood that the shrimp fishery will harvest OY.

At this time, there is no indication the time-area closures proposed in this amendment would preclude the shrimp fishery from achieving OY. Should it be necessary to implement a time-area closure to restrict fishing mortality on red snapper, fishing effort can shift either inshore or offshore of the areas of highest red snapper abundance. However, currently, with no closures, the shrimp fishery is not achieving optimum yield because of external economic factors, such as increasing fixed costs (fuel, ice, etc.) and stagnant shrimp prices, resulting in reduced levels of effort. Therefore, time-area closures may not be necessary, or may be of limited duration, as fishing mortality on juvenile red snapper is already reduced substantially. Should external economic factors continue to impact the fishery, fishing effort could decline even further and generate even smaller fishery mortality impacts on juvenile red snapper.

On the other hand, should economic conditions improve and effort increase in the shrimp fishery, especially in the mid-shelf region where juvenile red snapper are abundant, then a substantial time-area closure might have to be implemented to maintain the current 74 percent reduction target. If the closure was for an extended period of time, especially a closure concurrent to the Texas Closure, it might restrict the fishery from achieving OY by precluding the fishery from being able to target larger-sized shrimp in the mid-shelf region. Moving the fishery into shallower water would lead to catches of smaller shrimp, which result in foregone yields.

Alternatively, if better BRDs are developed in the future and result in more substantial reductions in red snapper F then it would be possible to reduce the extent of time-area closures even if effort increases. This could then allow the shrimp F target to be achieved while simultaneously allowing effort to increase to a level that allows OY to be caught.

As previously mentioned, the shrimp fishery would not directly benefit from increased red snapper abundance because shrimp trawl bycatch of red snapper cannot be retained and has no economic value. Therefore, this amendment considers alternatives that would allow the shrimp fishery to derive some benefit by relaxing the fishing effort and fishing mortality restrictions over time. Such an action might be necessary if, in the future, it became apparent that the proposed time area closures prevented the fishery from achieving optimum yield (OY) as currently defined in the Council's Shrimp FMP. To that end, the Council has considered alternatives in this amendment to adjust the reduction target over time. One of the alternatives provides specific examples of such adjustments, illustrating the Council's intent to adjust the targets over time to appropriate levels while maintaining the red snapper rebuilding schedule. However, any adjustments in the future would be based on subsequent data analyses and scientific advice to the Council, and would require the Council to adjust the target through its framework procedures.

Criterion 10: Social effects

With respect to the social impacts of current bycatch requirements, the social impact assessment (SIA) from Shrimp Amendment 9 concluded that Gulf of Mexico shrimp fishermen were experiencing a high level of work-related stress at that time due to a variety of factors, including the required use of TEDs, and that additional regulations, such as requiring the use of BRDs, would further raise fishermen's stress levels. The SIA also found that if BRD use increased shrimping efficiency and reduced fishermen's workload (because of a reduced need to cull finfish from the shrimp catch), then stress levels may decrease. Further, according to the SIA, if fishermen take advantage of public hearings and other opportunities (i.e., workshops) to become fully involved in the further development and testing of BRDs and in modifying the bycatch criteria, they should be more willing to accept and comply with bycatch regulations.

Since BRDs were first required, many events have transpired that could have only exacerbated the work-related stress of Gulf shrimp fishermen. First, under Shrimp Amendment 10, the BRD requirement was expanded to include the eastern Gulf (east of Cape San Blas), thus subjecting shrimpers along the west coast of Florida to the same types of impacts from BRDs as shrimpers in the western Gulf. In 2003, Endangered Species Act (ESA) regulations were also changed to require TEDs with larger openings. These regulations forced shrimp fishermen to purchase new TEDs.

Although these regulatory changes adversely impacted shrimp fishermen in the Gulf, other external factors have likely overwhelmed the impacts of these regulatory changes. As previously noted, shrimp prices have steadily declined for the past five years by as much as 40 percent, primarily as a result of increased imports. At the same time, operating costs have been increasing primarily as a result of increases in fuel prices and insurance premiums, though other costs have generally been rising as well. These changes have put shrimp fishermen in a price/cost squeeze that has in turn caused many fishermen to leave the fishery. Some have apparently been able to shift to other fisheries, but many have gone bankrupt and, as a result, had their vessels repossessed. In 2005, the situation was exacerbated by the devastating impacts of Hurricanes Katrina and Rita in the northern Gulf. As losses and debt have continued to mount, participation has continued to decrease, and associated onshore businesses have been forced to curtail or cease operations; entire communities have suffered as a result. Those communities most dependent on their association with the shrimp fishery have been impacted the most. Without doubt, the stress of being a Gulf shrimp fisherman today is greater than it was when BRDs were first implemented eight years ago.

Even before Hurricanes Katrina and Rita in 2005, fishermen in the shrimp industry were already having a difficult time making a living due to the high cost of fuel and the low price paid at the docks for shrimp. Many shrimp fishermen had dropped the insurance on their boats and reduced the number of crew on their boats to increase profits. Big shrimp boats were being repossessed at an increasing rate, and fishermen were exiting the shrimp fishery.

Docks, fuel sources, icehouses, and marinas were heavily damaged or destroyed by hurricanes in 2005. Eleven months after the storms several communities are still struggling to get back on their feet and recover their shrimp fishing industry. Louisiana, Mississippi, and Alabama account for almost half of the shrimp harvested in the nation. In Louisiana, 66 percent of the shrimp fishermen live in areas affected by Hurricane Katrina. A total of 83 percent of Louisiana's seafood processors and all eight seafood canning factories were also located in these areas. Two of the largest shrimp processors in Louisiana, Bumble Bee Cannery in Violet, Louisiana and Piazza Seafoods in New Orleans, were left inoperable. Bumble Bee is not planning to reopen (Impact Assessment, Inc. 2007).

Boats and fishing infrastructure were lost to the hurricane and fishing dependent communities were totally disrupted. In the case of lower Plaquemines Parrish and St. Bernard Parrish in Louisiana, most of the fishing infrastructure was completely destroyed. The Empire/Venice area of Plaquemines Parish was one of the top areas for landings of shrimp in the Gulf of Mexico prior to the storm. In October 2005, two thirds of the shrimp fleet was out of commission (Impact Assessment, Inc. 2007).

Communities are still rebuilding their fishing dependent businesses and fishermen are trying to repair or replace damaged or destroyed boats. Many shrimp fishermen along the northern coast of the Gulf are living in FEMA trailers or with friends and relatives in other locations. Others are still waiting to obtain a FEMA trailer so they can move back to their communities. Some shrimpers will never return to their communities and will rebuild their lives elsewhere.

Recent fieldwork in lower Plaquemines Parish revealed that there are many boats still in need of salvaging. Some are stranded along roadways and in marshes as owners wait to see if they can get help from the government to remove their boats and return them to the water. One fisherman said he has a 40-foot shrimp boat that appears to have received minor damage but is stranded in the marsh. He has received an estimate of $40,000 to remove his boat from the marsh and get it back into the water, less than a half of mile away. Others lost their shrimp boats and do not have insurance to replace them. A shrimp dock in Buras, Louisiana reopened in May 2006 and the owner said he has half of the number of shrimp boats landing shrimp now (July 2006) as he had this time in 2005 (Ingles, personal communication[26]).

Grand Isle, Louisiana had two shrimp docks with icehouses and fuel before the storm. Both of these docks were left in ruins after the storm passed. One shrimp dock reopened in November 2005, the other opened in April 2006. The number of shrimpers unloading shrimp in Grand Isle is less than it was a year ago (Ingles, personal communication[26]).

In 2005, the Louisiana Department of Fish and Wildlife estimated that in one year after the 2005 hurricanes, there would be an economic loss of over $538,000,000 to the shrimp industry. Even as infrastructure is rebuilt and some shrimp fishermen go back to shrimping, there are still many challenges ahead. Currently, there are still not enough processors in business to process all of the shrimp that is coming in, causing bottle necks in the processing. Louisiana had a reported loss of 35-40 percent of the labor pool they had before the hurricane in jobs dependent on the fishing industry. Many workers relocated to other areas after the hurricane and have not returned (Impact Assessment, Inc. 2007).

In Plaquemines Parish, the number of commercial fishing licenses was down 38 percent in 2006 from the number of licenses in 2004-2005. The number of commercial fishing licenses St. Bernard Parish was down 43 percent for the same time frame.

Many of the shrimp boats in Bayou la Batre, Alabama were lost or stranded in the marsh due to hurricane Katrina. Sixty percent of the commercial shrimp boats in Bayou La Batre were destroyed (Impact Assessment, Inc. 2007). Even before the storm, many of the boats in Bayou la Batre were tied up at the docks and had been repossessed.

The shrimp industry in Mississippi also suffered great losses from hurricane Katrina. Many boats were damaged or destroyed and most of the infrastructure for the shrimp industry in Gulfport and Biloxi was destroyed. At the start of the shrimp season in May 2006, 15 percent of the shrimp fleet that had been in place pre-Katrina went fishing. Aerial surveys done in June 2006 of shrimp boats along the Mississippi coast revealed 306 boats, which was down from the 603 observed in June 2005 (Impact Assessment, Inc.2007).

The Gulf of Mexico shrimp industry faces many challenges. Some of the challenges are created due to the low prices paid at the docks for shrimp due to the competition from the price paid for imported shrimp and the high cost of fuel. Other challenges were created by hurricane Katrina. Many fishermen are still displaced, and do not have homes to return to in their communities. There is still a need for funding to help rebuild the infrastructure that supported the shrimp industry prior to the storm. Shrimp boats are still in need of repair and salvaging. There are not enough processors, commercial marinas, icehouses, and fuel docks to service the shrimp fishery in the Gulf of Mexico as it rebuilds. Some of the land that was occupied by infrastructure that supported the shrimp industry before hurricane Katrina is being bought up and converted to other uses such as space for condominiums and casinos. It is still unknown how many shrimp boats were lost, and how many shrimpers are out of the fishery now and may not return. The shrimp fishery may have already been downsized to the level needed to protect juvenile red snapper and make shrimping more profitable for the shrimpers.

CONCLUSION

This bycatch practicability analysis presents information showing that both NMFS and the Council recognize the bycatch of red snapper, other finfish, and sea turtles is an issue in the shrimp trawl fishery, and that, in the past, they have acted to address bycatch to the extent practicable through technological gear developments, including TEDs and BRDs. Prior to the implementation of BRDs, the finfish bycatch to shrimp ratio was approximately 4:1 (Branstetter 1997). With the use of BRDs, this ratio has been reduced to less than 3:1. With the recent changes in TED regulations improving the exclusion capabilities for large turtles, TEDs are presently at least 97 percent effective in excluding all species of sea turtles.

Shrimp trawl bycatch is known to have an adverse effect to rebuilding the red snapper stock. The Council's original intent, in establishing BRD requirements for the western Gulf of Mexico was to reduce bycatch mortality by 44 percent from a benchmark time period (GMFMC 1997). Recent studies indicate that the actual reduction from the existing technologies is somewhere around 20 percent (SEDAR 7 2005). The 2005 red snapper stock assessment, while adjusting the impacts of various sources of mortality, and assuming a greater natural mortality on juvenile red snapper, recommends that bycatch mortality still needs to be reduced between 70 percent and 80 percent under a linked scenario where mortality reductions must be achieved proportionally across both the shrimp fishery and directed recreational and commercial fisheries (SEDAR 7 2005). This target far exceeds the capabilities of known technologies, especially considering red snapper comprise less than 0.5 percent of the bycatch in shrimp trawls by numbers or weight. Given the current management measures in place are not reducing bycatch, especially of red snapper, to the extent practicable, the Council has proposed additional alternatives to manage effort in the shrimp fishery to control fishing mortality on red snapper.

Additional methods to reduce bycatch mortality would include shrimp effort restrictions, especially in areas where juvenile red snapper are abundant. Available information indicates juvenile red snapper are more common in the 10 to 30-fathom depths of the western Gulf. With additional information and research, it may be possible to identify specific "hot spot" areas where high concentrations of juvenile red snapper are persistent across years. These areas could be closed seasonally or permanently. However, until these more precise locales can be documented as having a high and consistent interaction between red snapper and the shrimp fishery, the Council is choosing to establish broader time-area closures to achieve its rebuilding strategy.

External economic factors, discussed in detail later in this document, have already played a major role in reducing shrimp effort. The combination of rising fuel costs, stagnant shrimp prices, and strong price competition from imported shrimp products has severely impacted the viability of the domestic fleet. NMFS estimates these declining conditions are likely to continue until at least 2012. This situation was exacerbated by the devastating effects of the 2005 hurricane season for the Gulf coasts of Alabama, Mississippi, Louisiana, and north Texas. NMFS currently estimates shrimp effort is down by as much as 65 percent compared to the 2001-2003 benchmark years used in the 2005 red snapper stock assessment.

The 2005 red snapper stock assessment provided a broad range of linked scenarios under which the red snapper stock could recover under the current rebuilding targets. All of these options depended on reducing bycatch mortality proportionally in both the directed and shrimp fisheries. As discussed elsewhere, over the next five years, rebuilding trajectories for red snapper are relatively insensitive to decreases in shrimp bycatch mortality rates due to recent strong year classes, but over the long term, the red snapper stock cannot be rebuilt without reductions in shrimp trawl bycatch mortality. However, the probability of ending overfishing and achieving adequate rebuilding progress is contingent on whether reductions in fishing mortality across all sources are met. As discussed in Section 5.1, bycatch reduction targets are unlikely to be met in some sectors of the fishery. For this reason, the Council is considering in this amendment "delinked" rebuilding strategies, which do not require proportional reduction in fishing mortality to rebuild the red snapper stock and end overfishing. Under a "de-linked" scenario (see Action 1, Section 2), shrimp trawl bycatch mortality could be stabilized at the current low level (approximately 60 percent) or at a higher level (74 percent) through a control on shrimp effort in areas where juvenile red snapper are abundant (the 10 to 30 fathom depth zone or statistical subzones 10-21).

These types of changes to the overall targets are difficult to estimate at the present time. Until the moratorium on federal shrimp permits is fully implemented on October 26, 2007 (50 CFR δ 622.4(s)), it will be difficult to determine who is and who is not active in the domestic Gulf shrimp fishery. At this time, NMFS will be better able to assess the current number of vessels participating in the fishery. Therefore, there is substantial uncertainty about current and optimum effort levels with respect to maximum economic yield (MEY), OY, and how much additional bycatch reduction is practicable, within the targets of MEY and OY. Once the size of the fleet under the moratorium is known, fishery managers may consider modifying the target reduction levels, and take additional actions to maintain the levels of effort and participation. Such actions are not feasible until the moratorium is fully implemented.

4.2 Red Snapper Fishery

Background/Overview

Red snapper are caught throughout the Gulf of Mexico from the west coast of Florida to Mexico. Commercial landings are primarily from the western Gulf (79.9 percent by weight), whereas most recreational landings (77.5 percent by weight) are from the eastern Gulf (SEDAR 7 2005). Red snapper are commonly caught in both fisheries over natural hardbottom, near oil and gas platforms, and in association with artificial reefs. The primary gears used in the commercial fishery are bandit rigs (84 percent), hook-and-line (15 percent), and longlines (1 percent) (Poffenberger and McCarthy 2004). Longlines are prohibited inshore of approximately the 50 fathom boundary in the western Gulf of Mexico (west of Cape San Blas, Florida) and the 20 fathom boundary in the eastern Gulf of Mexico. Hook-and-line and spear guns are the primary gears used to harvest red snapper in the recreational fishery.

Commercial regulations for red snapper include an IFQ program and a 15-inch minimum size limit. Prior to 2007, the commercial red snapper fishery was also regulated by trip limits (either 200 or 2000 pounds) and seasonal closures. The purpose of the IFQ program is to reduce overcapacity in the commercial red snapper fishery and reduce or eliminate problems associated with derby fishing, including red snapper discards. The 15-inch minimum size limit is considered the major cause of bycatch in the commercial fishery through the release of undersized fish.

Recreational fishing regulations for red snapper include a quota, a limited access program for for-hire vessels harvesting reef fish, a 4-red snapper bag limit, and a 16-inch minimum size limit. Similar to the commercial fishery, bycatch of red snapper is primarily due to minimum size limit restrictions and a 6-month seasonal closure (November 1 – April 21) during which red snapper harvest is prohibited.

The 2005 red snapper stock assessment concluded fishing mortality rates in both the directed fishery and shrimp trawl fishery were excessive. In the western Gulf, red snapper bycatch mortality (F = 0.57 in 2003) is dominated by the shrimp trawl fishery, which incidentally catches age 0-2 year old red snapper while trawling for shrimp. Commercial handline fishing (includes bandit rigs) accounts for a lesser, but still significant portion of fishing mortality in the western Gulf (F = 0.34 in 2003). In the eastern Gulf, the recreational fishery accounts for the greatest source of fishing mortality (F = 0.79 in 2003). In both regions, closed season bycatch accounts for a smaller component of overall fishing mortality (east: F = 0.11; west: F = 0.06). However, closed season fishing mortality has increased during the last decade with the imposition of longer closed seasons.

Sources of Red Snapper Release Mortality

Several studies have identified various sources of red snapper release mortality. Sources include depth of capture, hooking location, surface interval, water temperature/season, and predation. Depth of capture greatly affects survival, with red snapper caught at greater depths having a reduced probability of survival (see discussion in SEDAR 7 2005). Rummer and Bennett (2005) found the number and severity of internal injuries to red snapper increased with retrieval depth. Injuries were largely associated with expansion of the gas bladder and included damage to the liver, heart, digestive tract, swimbladder, and external organs. Burns et al. (2004) examined the feeding behavior of red snapper and found red snapper quickly chew and swallow their prey. As a result, there is less time to set a hook while fishing, resulting in greater probability of hooking related injuries. Burns et al. (2004) concluded hook-related trauma accounted for a greater portion of release mortality than depth, despite catching red snapper at depths ranging from 90 to 140 feet. Surface interval has also been found to reduce release mortality; Burns et al. (2002) found survival of red snapper increased the faster red snapper were returned to the water. Diamond et al. (2004) found mortality of released red snapper decreased with lower water temperatures; release mortality was highest during summer and declined during fall as water temperatures dropped. Lastly, several studies have documented predation on released fish. Dolphins and pelicans are the two most commonly observed predators and are known to pursue released fish, as well as fish before they are landed (SEDAR 7 2005). Several studies, which assessed release mortality through surface observations, accounted for predation when estimating release mortality (Patterson et al. 2001; Burns et al. 2004; Wilson et al. 2004). The SEDAR data workshop panel recommended not including an additional component of mortality due to predation for this reason (SEDAR 7 2005).

Red Snapper Release Mortality Rates

The 1999 red snapper stock assessment (Schirripa and Legault 1999) assumed release mortality rates of 33 percent for the commercial fishery and 20 percent for the recreational fishery. These release mortality rates were reviewed by the Council's Reef Fish Stock Assessment Panel and determined to be the best available estimates at the time. These estimates were based on numerous research studies (Parker 1985; Render and Wilson 1993; Gitschlag and Renaud 1994; Patterson 1999; Burns et al. 2002; Dorf 2000; Shipp, personalcommunication[23]), which are summarized in Section 4.4.2.2 of Amendment 22 to the Reef Fish FMP. In general, depth of capture, hooking location, season, and predators were determined to have the greatest effects on release mortality rates.

During development of the 2005 red snapper stock assessment, the SEDAR 7 data workshop panel reviewed available information on depth of fishing and release mortality by depth to produce fishery specific release mortality rates by region (eastern and western Gulf). Several new research studies were available for review since the 1999 stock assessment (Patterson et al. 2001; Burns et al. 2002; Dorf 2003; Poffenberger and McCarthy 2004; Wilson et al. 2004). These studies found depth of fishing greatly varied by fishery (commercial, recreational), region (eastern or western Gulf), and season (closed, open). Because red snapper release mortality is strongly correlated with depth of capture, the SEDAR 7 (2005) data workshop panel reviewed available information to determine median/mean depths of capture by fishery and region. Median and mean depths of red snapper capture by region, fishery, and season are summarized in Table 4.2.1.

[23] Robert Shipp, Department of Marine Sciences, University of South Alabama, Mobile, Alabama

Table 4.2.1. Mean/median depth of fishing and corresponding release mortality rates for red snapper by fishery, region, and season (source: SEDAR 7 2005).

Fishery	Region	Season	Depth of Capture	Release Mortality
Commercial	East	Open	180 ft (55 m)	71%
	East	Closed	180 ft (55 m)	71%
	West	Open	190 ft (58 m)	82%
	West	Closed	272 ft (83 m)	88%
Recreational	East	Open	65-131 ft (20-40 m)	15%
	East	Closed	65-131 ft (20-40 m)	15%
	West	Open	131 ft (40 m)	40%
	West	Closed	131 ft (40 m)	40%

Wilson et al. (2004) conducted a study evaluating the fate of undersized red snapper on commercial fishing vessels (principle gears: circle hooks and bandit rigs) off Louisiana. For depths between 164-196 feet (50-60 m), 85 percent were presumed to die from release mortality. In the eastern Gulf, Burns et al. (2002) captured small red snapper on commercial fishing vessels and released captured fish into cages for up to 8 days. Cages were then monitored and the probability of survival by depth was estimated. At 180 feet (55 m), a 70 percent release mortality rate was estimated. Poffenberger and McCarthy (2004) evaluated logbook discard records, which indicated a 72 percent release mortality rate for commercially caught eastern Gulf red snapper and a 78 percent release mortality rate for commercially caught western Gulf red snapper. Averaging release mortality rates from these three studies, the SEDAR 7 data workshop panel assigned the release mortality rates in Table 4.2.1 for the commercial fishery during the open season.

Prior to 2007, the commercial fishery was also regulated by seasonal closures. During these closures, commercial fishing trips targeted other species, and therefore, may have occured at different depths than during the open season. Red snapper discards during the closed season were most commonly associated with mackerels and vermilion snapper in the western Gulf, and red and gag grouper in the eastern Gulf (SEDAR 7 2005). Based on trips targeting the above-mentioned species during the red snapper closed season, median depth fished in the eastern Gulf during the closed season was the same as the median depth fished during the open season (Table 4.2.1). In the western Gulf, the median depth at capture during the closed season was substantially greater than the median depth fished during the open season (Table 4.2.1). Release mortality rates of red snapper in the eastern Gulf during the commercial closed season were predicted to be the same as release mortality rates during the open season (Table 4.2.1). In the western Gulf, commercial release mortality rates were slightly higher during the closed season than during the open season because of differences in median depth fished (190 vs. 272 feet). Wilson et al. (2004) estimated 97 percent of red snapper died from release mortality at 262-278 feet (80-85 m). The logit regression by Burns et al. (2002) predicted 91 percent of red snapper died from release mortality at 80 m. Averaging these release mortality rates with logbook data (Poffenberger and McCarthy 2004) resulted in an assumed 88 percent release mortality rate for western Gulf closed season red snapper discards (SEDAR 7 2005).

Four release mortality studies have been conducted in recent years pertaining to the recreational fishery. Dorf (2003) conducted a study of recreational headboat discards off Texas during fall 1999. Sixty percent of red snapper caught were released alive and swam down. Depth ranged from 44-312 feet (13-95 m) and the average depth fished was 131 feet (40 m). Diamond et al. (2004) also conducted a controlled caging study to assess the fate of released red snapper off Texas. Increasing temperatures and depths both caused increases in mortality. At 148 feet (45 m), release mortality was 71 percent. In the eastern Gulf, where most recreational red snapper are caught in shallow water (usually < 130 feet (~40 m)), Patterson et al. (2001) and Burns et al. (2004) estimated release mortalities ranging from 9 to 22 percent for depths of 65-130 feet (20-40 m). The SEDAR 7 (2005) data workshop panel averaged the release mortality rates across these various depths to estimate a 15 percent release mortality rate for recreationally caught red snapper in the eastern Gulf (Table 4.2.1, SEDAR 7 2005). Because the average depth fished by recreational anglers in the western Gulf was greater than the average depth fished in the eastern Gulf, a higher release mortality rate (40 percent release mortality) was assumed for red snapper released in the western Gulf.

Magnitude of Red Snapper Bycatch

Estimates of discards and dead discards were reviewed during the data workshop (SEDAR 7 2005). Recreational discards by mode (charter, private) and state (Louisiana, Mississippi, Alabama, and Florida) were estimated by the Marine Recreational Fisheries Statistics Survey (MRFSS). No discard estimates were available for headboats or from the Texas Parks and Wildlife Department (TPWD) recreational fishing survey. The SEDAR data workshop panel recommended using the MRFSS proportion of red snapper released alive relative to all red snapper caught as a way to estimate headboat and TPWD discards (SEDAR 7 2005).

In 2001, the SEFSC initiated a program to collect discard data from the Gulf of Mexico commercial reef fish fishery. Twenty percent of vessels possessing a reef fish permit are required to report discard data on forms supplementing existing vessel logbooks. Using this data, commercial red snapper discards were estimated by Poffenberger and McCarthy (2004). Commercial discard estimates were generated for various permit types (Class I = 2,000 lb trip limit; Class II = 200 lb trip limit; No red snapper endorsement), gears (bandit rig, handline, and longline), level of effort (hook hours), and season (open, closed). All red snapper discarded were in response to regulations (Poffenberger and McCarthy 2004).

Because only a short time series was available to estimate commercial discards and the SEDAR data workshop panel believed recreational discards were much higher than estimated by MRFSS, the red snapper stock assessment did not use these discard estimates. Instead, discards were assumed to be due to the minimum size limit and were estimated from the predicted length composition of the catch as described in Porch (2004). Annual estimates of discards generated from the stock assessment were relatively consistent (1-2 fold differences) with commercial logbook discard estimates by Poffenberger and McCarthy (2004), but were generally higher than recreational (MRFSS) discard estimates (2-10 fold differences) described above. Tables 4.2.2. and 4.2.3 summarize estimated discards and dead discards by fishery and region.

Table 4.2.2. Summary of red snapper open-season discards by fishery, region, and year.

	Commercial			Recreational		
Year	east	west	gulfwide	east	west	gulfwide
1983	1	2	3	829211	498010	1327221
1984	1	2	4	105733	330124	435857
1985	49896	50352	100249	988630	1686208	2674838
1986	28515	57541	86056	1114901	1219824	2334725
1987	33300	51422	84722	1407258	798592	2205850
1988	54861	62796	117657	1099754	989460	2089213
1989	36307	50587	86895	1496481	1391143	2887624
1990	77846	74448	152294	1366863	1190130	2556993
1991	38561	129299	167860	1342054	1055656	2397710
1992	27970	116735	144705	1736556	1580069	3316624
1993	28525	141883	170407	1880267	2006758	3887025
1994	36119	142225	178343	2499290	2365331	4864622
1995	27143	228791	255933	3139712	2418264	5557976
1996	38664	360168	398832	4543399	1615759	6159158
1997	48655	366270	414925	3830842	1308426	5139268
1998	52696	225071	277768	2054252	953824	3008076
1999	48783	215753	264537	2369585	460690	2830275
2000	59175	199391	258565	3439823	1101966	4541789
2001	96497	350369	446866	2699578	1649885	4349463
2002	92085	515055	607140	2444268	1501146	3945413
2003	71234	349187	420421	3121939	1115188	4237127

Table 4.2.3. Summary of red snapper dead discards by fishery, region, and year. Closed season dead discards pertain to both the commercial and recreational fishery.

	Open Season							
	Commercial HL		Commercial LL		Recreational		Closed Season	
Year	east	west	east	west	east	west	east	west
1983	1	2	0	0	124382	199204	0	0
1984	1	2	0	0	15860	132049	0	0
1985	35309	40598	117	691	148294	674483	0	0
1986	20152	46017	93	1167	167235	487930	0	0
1987	23534	40719	109	1447	211089	319437	0	0
1988	38725	50261	226	1232	164963	395784	0	0
1989	25536	40580	243	901	224472	556457	0	0
1990	54680	60617	590	430	205029	476052	0	0
1991	27175	105457	204	568	201308	422262	5583	22610
1992	19812	95592	47	130	260483	632027	17635	107530
1993	20140	116166	113	178	282040	802703	15271	95655
1994	25585	116462	59	162	374894	946133	21106	126750
1995	19150	187335	121	274	470957	967306	10606	165860
1996	27320	294877	132	461	681510	646304	10207	199590
1997	34403	299839	142	503	574626	523370	10062	228720
1998	37295	184232	119	327	308138	381530	39506	189350
1999	34548	175964	88	954	355438	184276	52802	168170
2000	41923	161944	91	1557	515973	440786	77078	202310
2001	68385	285306	128	1996	404937	659954	100810	207840
2002	65191	418806	189	3540	366640	600458	98887	211050
2003	50473	282215	103	4118	468291	446075	86705	202250

The recreational fishery accounts for a majority of open season red snapper discards. During 2001-03, the recreational fishery discarded an average of 4.17 million red snapper, whereas the commercial fishery discarded an average of 0.49 million red snapper. Sixty-five percent of recreational discards during 2001-03 occurred in the eastern Gulf, while 82 percent of commercial discards during this same time period occurred in the western Gulf.

The recreational fishery has accounted for a majority of dead discards since 1984, despite having much lower assumed release mortality rates than the commercial fishery. During 2001-03, the recreational fishery averaged 0.98 million red snapper dead discards and the commercial fishery averaged 0.34 million red snapper dead discards. The number of recreational dead discards is greatest in the western Gulf. Recreational anglers in the eastern Gulf discard many more red snapper than western Gulf recreational anglers (see Table 4.2.2), but because release mortality rates are higher in the western Gulf (40 versus 15 percent), dead discards are greater in the western Gulf. Commercial handline dead discards are greatest in the western Gulf where most landings occur. Commercial longline dead discards represent a small portion of the overall dead discards largely because longlines are restricted to deeper water (20 or 50 fathoms) and tend to catch older, larger red snapper. Prior to 1991, there were no red snapper fishery closures, and therefore, no closed season discards. Commercial closures began in 1991 and recreational closures began in 1997. The majority of closed season discards are from the western Gulf.

Target Red Snapper Dead Discards

During public scoping for this amendment, several organizations suggested the Council set bycatch targets for red snapper. Table 4.2.4 summarizes baseline (2001-03) and target levels (2008-09/10) of dead discards for the commercial fishery, recreational fishery, and closed season. Target levels of dead discards represent average projected discards for each fishery under the linked 26 percent SPR rebuilding strategy, which requires equal reductions in fishing mortality across all sources.

Table 4.2.4. Target dead discards (numbers of fish) by fishery and SPR rebuilding objective.

Rebuilding Strategy	Years	Average Discards (numbers of fish)			Percent change in numbers
		Commercial	Recreational	Closed Season	
baseline	2001-03	393483	982118	302514	0.0%
20%SPR 'linked'	2007-09	191159	372439	209800	53.9%
26%SPR 'linked'	2008-09	195205	426545	200895	51.0%
26%SPR 'linked'	2008-10	209186	443577	223668	47.8%

It should be noted that reductions in fishing mortality do not correspond to reductions in numbers of red snapper. Additionally, reductions will vary by fishery because each fishery exploits different sizes and age classes, which change in abundance under different fishing mortality rates. Because dead discards are calculated from the predicted catch-at-age matrices used in the assessment, target and baseline dead discards will change based on periodic updates and revisions to the red snapper stock assessment. Additionally, target bycatch levels cannot be monitored based on existing data collection programs, since the stock assessment model generates dead discard estimates.

Approximately a 50 percent reduction in the number of directed red snapper dead discards is needed to rebuild to 26 percent SPR under a linked rebuilding scenario. Under delinked rebuilding scenarios, which do not require equal reductions in fishing mortality across all sources, target bycatch levels will vary depending on the management strategies (i.e., level of TAC, recreational and commercial size limits, and gear restrictions) selected by the Council in Actions 1 and 4.

Other Bycatch

Species incidentally encountered by the directed red snapper fishery include sea turtles, sea birds, and reef fishes. The Gulf commercial reef fish fishery is listed as a Category III fishery under the MMPA, as there have been no documented interactions between this fishery and marine mammals (August 22, 2006; 71 FR 48802). There is also no known risk of serious injury or mortality to marine mammals resulting from the recreational fishery, which uses similar gear.

A recently completed biological opinion (NMFS 2005c) conducted for the Gulf reef fish fishery found mortalities of endangered and threatened species are uncommon from gear used in the reef fish fishery and were not likely to jeopardize the continued existence of threatened or endangered species. The biological opinion indicated recreational anglers infrequently take sea turtles, although loggerhead, leatherback, Kemp's ridley and green sea turtles are known to bite baited hooks (NMFS 2005c). During 2001-2003, it was estimated recreational anglers spent 35.7 million hook-hours fishing for reef fish, during which an estimated 111 hard-shell sea turtles were caught; 40 of which died (NMFS 2005c). During this same time period, it was estimated there were 113 longline hardshell sea turtle takes, 87 vertical line hardshell sea turtle takes, and 9 leatherback sea turtle takes (NMFS 2005c). The biological opinion also estimated eight smalltooth sawfish were caught and released by the commercial and recreational reef fish fishery during 2001-03 (NMFS 2005c). Two reasonable and prudent measures to minimize stress and increase survival of sea turtles and smalltooth sawfish were identified:

1 NMFS must ensure that any caught sea turtle or smalltooth sawfish is handled in such a way as to minimize stress to the animal and increase its survival rate.
2 NMFS must ensure that monitoring and reporting of any sea turtles or smalltooth sawfish encountered (1) detect any adverse effects resulting from the GOM reef fish fishery; (2) assess the actual level of incidental take in comparison with the anticipated incidental take documented in that opinion; (3) detect when the level of anticipated take is exceeded; and (4) collect improved data from individual encounters.

These measures were addressed by the Council in Amendment 18A to the Reef Fish FMP, which established regulations to minimize stress to endangered species incidentally caught in the reef fish fishery.

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

Other species of reef fish are also incidentally caught when targeting red snapper. In the western Gulf, vermilion snapper and some deep-water groupers are incidentally caught as bycatch when harvesting red snapper. In the eastern Gulf, various species of shallow-water grouper and vermilion snapper are the primary species caught as bycatch when targeting red snapper. Vermilion snapper are not overfished or undergoing overfishing (SEDAR 9 2006a) and bycatch is not expected to jeopardize the status of this stock. Deep-water groupers are caught both in the eastern and western Gulf primarily with longline gear (> 80 percent). The deep-water grouper fishery is managed with a 1.02 million pound quota. Since 2004, the fishery has met their quota and closed no later than July 15 each year. Deep-water grouper closures during this time period may have resulted in some additional discards of grouper by longliners targeting red snapper.

Longliners account for approximately 4 percent of the annual commercial red snapper landings. It is unknown how increases in closed season discards might affect the status of deep-water grouper stocks. An updated assessment for yellowedge grouper, the most abundant deep-water grouper species in the Gulf of Mexico is currently scheduled for 2010.

Red grouper and gag are the two most abundant shallow-water grouper species in the Gulf of Mexico and primarily occur on the west Florida shelf. Gag was recently assessed (SEDAR 10 2006) and is undergoing overfishing, but overfished status was unknown. Preliminary results from the SEDAR 12 stock assessment for red grouper indicate the stock is not overfished, and is not undergoing overfishing. In both fisheries, discards represent a large and significant portion of mortality. Similar to the deep-water grouper fishery, the shallow-water grouper fishery is regulated by a quota. During 2004 and 2005, the quota was met on November 15, 2004, and October 10, 2005. In 2006, the commercial shallow-water grouper fishery did not close. Quota closures at the end of the year have likely resulted in some additional commercial discards when the red snapper fishery is open. However, most commercial landings of red snapper occur in the western Gulf where gag and red grouper are less abundant or infrequently caught.

Practicability of current management measures in the directed red snapper fishery relative to their impact on bycatch and bycatch mortality.

The bycatch practicability analysis in Reef Fish Amendment 22 indicated directed fishery bycatch was believed to have a far less effect on red snapper stock recovery than the shrimp fishery. Although shrimp bycatch still accounts for a majority of bycatch, directed fishery bycatch is now known to have a greater effect on stock recovery than previously thought. The 2005 stock assessment used higher natural mortality rates for juvenile red snapper than previous assessments, reducing the impacts of discards attributed to the shrimp trawl fishery. As a result, more juvenile red snapper were assumed to die from natural causes if not caught as bycatch. Additionally, new information on release mortality rates (see discussion above) in the directed fishery indicated release mortality rates were substantially higher than previously estimated, increasing the number of discards attributed to the directed fishery.

Currently, the commercial fishery is managed with an IFQ program, a quota, a 15-inch minimum size limit, and gear restrictions. A quota, 16-inch minimum size limit, 4-fish bag limit, closed season, and gear restrictions are used to manage the recreational fishery. Prior to 2007, the commercial fishery was also managed with closed seasons and trip limits. The following discusses current and historic management measures with respect to their relative impacts on bycatch.

Size limits

The 15-inch commercial and 16-inch recreational minimum size limit are the greatest factors contributing to bycatch in the directed fishery. Bycatch logbook records indicate > 99 percent of all commercially caught red snapper were regulatory discards. Size limits are intended to protect immature fish and reduce fishing mortality. Both the commercial and recreational minimum size limits are above the size at 50 percent maturity. Size-at-maturity varies by region, with 75 percent of eastern Gulf female red snapper mature by 12 inches (30 cm) and 50 percent of western Gulf red snapper mature by 13-14 inches (350 mm) (Fitzhugh et al. 2004).

Several yield-per-recruit (YPR) analyses have previously been conducted to identify the size that balances the benefits of harvesting fish at larger sizes against losses due to natural mortality. Goodyear (1995) concluded YPR was maximized in the red snapper fishery between 18 and 21 inches total length, assuming 20 and 33 percent release mortality in the recreational and commercial red snapper fisheries, respectively. A subsequent YPR analysis by Schirripa and Legault (1997) indicated increasing the minimum size limit above 15 inches total length would result in no gains in yield. More recent analyses of minimum size limits indicate red snapper projected recovery rates are slightly faster if the commercial minimum size limit is reduced or eliminated, but increasingly slowed by smaller recreational minimum size limits (Figure 4.2.1; Porch 2005). In the short-term (i.e., next 10 years), decreasing the recreational and commercial minimum size limits would increase stock recovery slightly (Porch 2005). Over the long-term (i.e., > 10 years), stock recovery would be increasingly slowed if the recreational size limit is lowered (Porch 2005). However, changes in spawning potential and the rate of stock recovery are negligible for recreational size limits ranging from 13 to 15 inches TL (Figure 4.2.1). The recreational size limit is considered to be more effective than the commercial minimum size limit because of lower release mortality rates in the recreational fishery. High release mortality rates in the commercial fishery provide little, if any, protection to the stock because the released fish mostly die rather than contribute to filling the quota (Porch 2005). In contrast, the 16-inch minimum recreational size limit affords some protection to the stock, because a greater percentage of discarded fish will survive to spawn and later contribute to the quota as larger animals (Porch 2005).

An updated YPR analysis, using current fishery selectivities and release mortality rates, supports the findings of Porch (2005). SERO (2006) examined four commercial minimum size limits (12, 13, 14, and 15 inches TL) and five recreational minimum size limits (6, 13, 14, 15, and 16 inches TL). Based on the range of size limits analyzed, YPR was maximized at 16 inches TL in both the eastern and western Gulf recreational fisheries, 12-inches TL in the western Gulf commercial fishery, and 15-inches TL in the eastern Gulf commercial fishery. However, there was virtually no difference in maximum YPR (< 0.3 percent) for any of the eastern Gulf commercial size limits analyzed.

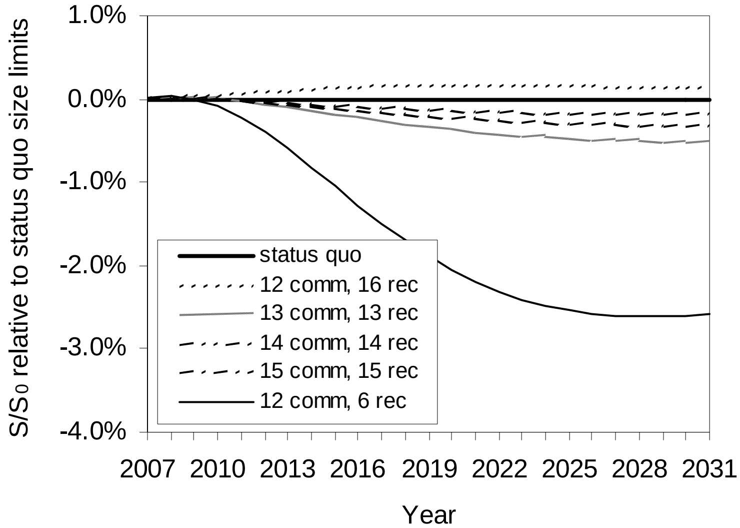


Figure 4.2.1. S/So (spawning potential) relative to the S/S0 achieved by maintaining the 15-inch commercial minimum size limit and 16-inch recreational minimum size limit (no action).

Closed Seasons

The recreational directed red snapper fishery is closed in the EEZ from November 1 to April 21 each year. Prior to 2007, the commercial directed red snapper fishery was regulated by a 4.65 MP quota that was subdivided into a spring quota (3.06 MP) and a fall quota (1.59 MP). The fishing season for the spring quota began on February 1 each year. The fishery remained open for the first 10 days of each month until the spring quota was filled. Once the spring quota was met, the fishery was closed until October 1. During fall, the fishery was open the first 10 days of each month until the fall quota was met. The fishing season could remain open for part or all of the month of December depending on when the quota was projected to be met.

The first commercial fishery closure for red snapper was in 1991. Between 1992 and 2006, the commercial fishery was open an average of 85 days per year (closed an average of 280 days per year). The first closure of the recreational red snapper directed fishery occurred in 1997. Since 2000, the red snapper fishery has been closed 171 days each year.

The 2005 stock assessment estimated fishing mortality rates associated with closed season bycatch for the recreational and commercial fisheries combined. Fishing mortality rates have increased since 1990 in both the eastern and western Gulf (Figure 4.2.2). The 2003 fishing mortality rate for the eastern Gulf was 0.06 and for the western Gulf was 0.07. Fishing mortality rates associated with closed season bycatch are much less than fishing mortality rates estimated for the western Gulf directed commercial fishery (F = 0.34 in 2003) and the eastern Gulf directed recreational fishery (F = 0.79 in 2003). During 2001-03, closed season dead discards (average 302,514 per year) accounted for 18 percent of total dead discards (average 1,678,173 per year).

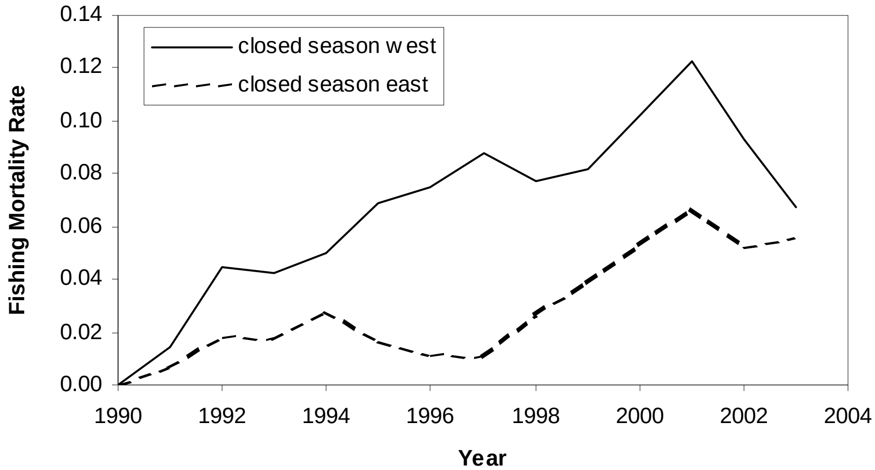


Figure 4.2.2. – Regional fishing mortality rates estimated by the 2005 stock assessment for closed season directed fishery bycatch.

In March 2006, the Council approved Amendment 26 to the Reef Fish FMP. This amendment was implemented by NMFS on January 1, 2007, and established an IFQ program for the commercial red snapper fishery. The IFQ program would eliminate closed seasons and allocate IFQ quota shares to individual fishermen. Allocation of quota shares is expected to result in consolidation of the fishery, reducing overcapacity, and will allow fishermen to decide when and where they want to fish. The IFQ should result in some reduction in "closed season" discards,; however, discards will occur from fishermen who do not possess IFQ shares or from fishermen who use their shares prior to the end of the year and continue fishing for other species caught with red snapper.

The recreational closed season was implemented to reduce fishing mortality and constrain harvest to quota levels. As indicated above, fishing mortality during the closed season has increased with the imposition of longer recreational and commercial closed seasons. However, open season discards (Table 4.2.3) have decreased to a greater extent than closed season discards have increased, resulting in some reductions in discards after implementation of recreational closures.

Bag and Trip Limits

The recreational fishery is regulated by a 4-red snapper daily bag limit per person. Red snapper discards while harvesting the daily bag limit are a result of incidental capture of undersized fish prior to reaching the bag limit and targeting of other reef fish residing in similar habitat as red snapper once bag limits have been reached. SERO (2006) reported charter anglers on average landed 2.4-2.8 red snapper per trip and private anglers landed 0.9-1.4 red snapper per trip. Based on average catch rates, the current four red snapper bag limit is not limiting for many trips. Therefore, the release of undersized fish while harvesting the bag limit is a greater factor contributing to discards than release of red snapper once the bag limit is reached.

The commercial fishery was previously regulated by 2,000 pound and 200 pound trip limits. The amount commercial fishermen could harvest per trip was based on the type of permit the fishermen possessed (Class I or Class II). The 200-pound trip limit was established to reduce bycatch by fishermen incidentally capturing red snapper while targeting other reef fish species. The recently implemented IFQ program eliminated commercial trip limits and allocated quota shares to fishermen based on historical landings. Fishermen possessing IFQ shares are now limited only by the number of quota shares they possess. Once the annual allocation associated with their quota shares has been used they can either elect to purchase additional allocation from other fishermen or continue fishing and release red snapper incidentally caught. Overall, the IFQ program is expected to reduce discards and discard mortality because it will allow commercial red snapper fishermen greater flexibility on when, where, and how they fish.

Allowable Gear

Vertical hook-and-line gear (bandit rigs, manual handlines) is the primary gear used in the commercial fishery (> 95 percent of annual landings). Longlines, spears, and fish traps account for a small portion of the commercial harvest (< 5 percent). In the western Gulf, where most commercial landings occur, commercial fishermen primarily use circle hooks (David Nieland, pers. comm.[24]). The size of circle hooks used in the fishery varies by manufacturer, geartype, and species targeted (i.e., if targeting vermilion snapper, smaller circle hooks may be used).

Longlines account for only a small fraction of red snapper dead discards (Table 4.2.3) because they are fished in deeper water and select for larger, legal-sized red snapper. Discards are primarily due to the capture of undersized fish by hook-and-line and bandit rigs. Anecdotal information suggests at least some bandit rig fishermen reel in their catch, place it on the deck of the boat, and deploy another bandit rig before culling their catch. This practice is expected to increase release mortality because of poor handling of fish and longer surface intervals. The IFQ program, based on experiences in other IFQ fisheries (e.g., halibut, sablefish; NRC, 1999), should reduce the extent of this fishing practice, because fishermen will not be constrained by trip limits and short fishing seasons. Other management measures being considered in this amendment, such as reducing or eliminating the commercial minimum size limit, would also reduce discards associated with bandit rig gear. In a study by Wilson et al. (2004) aboard commercial vessels using bandit rigs, 61 percent of red snapper released were greater than 13 inches and 86 percent were greater than 12 inches.

Rod-and-reel is the primary gear used in the recreational fishery. Anecdotal information indicates circle hooks are frequently used by recreational anglers in the western Gulf. The extent of circle hook use in the eastern Gulf is unknown. Recreational anglers also use spears to capture red snapper. Spearfishing does not affect release mortality since all fish caught are killed. Only undersized red snapper mistakenly killed while spearfishing would contribute to discard mortality.

[24] David Neiland, Center for Coastal, Energy and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana

Recreational discards are primarily due to the recreational size limit; however, allowable gears can affect release mortality rates. **Action 5** summarizes various research studies examining the effects of circle hooks, hook sizes, venting tools, and dehooking devices on survival of red snapper and other fishes.

Alternatives being considered to minimize bycatch

Reductions in dead discards can be accomplished either by reducing the number of red snapper discarded or reducing the release mortality rate of discards. To reduce the number of red snapper discards, management measures must limit fishing effort or change the selectivity of fishing gears in such a way that reduces the harvest of sublegal fish. To reduce the discard mortality rate of red snapper, sources of release mortality must first be identified (i.e., depth, hooking, surface interval, temperature) and management measures must be imposed to reduce discard mortality rates.

This amendment considers several management measures to reduce red snapper discards and discard mortality. Alternatives being considered include reducing recreational and commercial minimum size limits (Actions 1 and 4), establishing lower bag limits and shorter open seasons (Actions 1 and 3), requiring the use of circle hooks, dehooking devices, and venting tools (Action 5), and specifying minimum hook sizes for harvest (Action 5). Sections 2 and 5 provide detailed discussion of each of these alternatives and summarize their impacts on bycatch.

Bycatch reduction alternatives eliminated from further consideration

The Council and NMFS also considered, but eliminated from detailed study several additional alternatives for potentially reducing bycatch in the directed red snapper fishery, including: bycatch quotas, eliminating the recreational size limit, commercial gear restrictions (allow only vertical hook-and-line and spears; limit number of hooks on vertical line gear), establishing marine protected areas or time/area closures, etc. Rationale for eliminating each of these alternatives from further consideration is provided in Appendix A.

Practicability Analysis

Criterion 1: Population effects for the bycatch species

Although shrimp bycatch still accounts for a majority of red snapper bycatch, directed fishery bycatch is now known to have a greater effect on stock recovery than previously thought. New information on release mortality rates in the directed fishery indicates release mortality rates are substantially higher than those used in the 1999 stock assessment, resulting in 4-5 million directed fishery discards annually.

Bycatch minimization measures considered in this amendment are expected to benefit the status of the red snapper stock. Size limit projections by Porch (2005) indicate the stock would recover slightly faster if the commercial minimum size limit is reduced or eliminated. Reducing the recreational size limit is expected to slow stock recovery slightly, although changes in SPR relative to no action are negligible for minimum size limits of 13-, 14-, and 15-inches TL (see

Figure 4.2.1). The IFQ program is expected to reduce red snapper bycatch by eliminating commercial trip limits and closed seasons and allowing fishermen to fish more efficiently (NRC 1999). Gear requirements, such as venting tools, dehooking devices, circle hooks, hook restrictions (i.e., limiting the size and/or number of hooks used) are all intended to reduce the rate of release mortality. The extent these measures reduce release mortality rates is contingent on how extensive these gears are already used. Shorter open seasons and lower bag limits may increase bycatch of red snapper, but increases in bycatch resulting from these actions have been accounted for when analyzing the impacts of recreational management measures (see **Action 1**). Any increases in bycatch resulting from proposed management actions are accounted for when reducing directed fishing mortality and TAC, and therefore will provide a direct positive benefit to the red snapper stock.

The extent to which various bycatch minimization measures achieve necessary reductions in bycatch mortality are largely unknown. Target reductions in bycatch and bycatch mortality are more likely to be achieved in the commercial fishery and shrimp trawl fishery than the recreational fishery and during the closed season because of differences in management tools available for reducing bycatch, and economic conditions affecting the shrimp industry. Directed and shrimp trawl bycatch of red snapper results in forgone yield. Therefore, any reductions in directed fishery or shrimp trawl bycatch not achieved must be accounted for when setting TAC; the less bycatch is reduced, the more directed TAC must be reduced.

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

The relationships among species in marine ecosystems are complex and poorly understood, making the nature and magnitude of ecological effects difficult to predict with any accuracy. Once rebuilt, red snapper spawning potential will be 17 times larger than current levels, allowing for an additional 7-16 million pounds of directed fishery removals annually. The more bycatch can be successfully reduced, the greater the overall yield that can be obtained from the fishery. Under any rebuilding scenario considered, the stock will be significantly larger than it is currently. Red snapper are known to feed on a variety of prey, including fish, pelagic zooplankton, shrimp, squid, crabs, and various benthic organisms (McCawley 2003). Many other reef fish species have similar diets. Reductions in bycatch and fishing mortality will allow the red snapper stock to expand in size, resulting in increased competition for prey with other predators. Consequently, it is possible that forage species and competitor species could decrease in abundance in response to an increase in red snapper abundance.

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

Groupers, vermilion snapper, and gray triggerfish are the primary species of fish caught with red snapper. Preliminary information indicates red grouper are not overfished and are not undergoing overfishing. Gag was recently assessed and was determined to be undergoing overfishing, but overfished status could not be determined. Regulatory discards significantly contribute to fishing mortality in both the gag and red grouper fisheries. Vermilion snapper was also recently assessed and was determined not to be overfished or undergoing overfishing

(SEDAR 9 2006a). Gray triggerfish, another species commonly caught with red snapper, is currently undergoing overfishing and might be approaching an overfished condition (SEDAR 9 2006b). Bycatch minimization measures evaluated in this amendment could affect the bycatch of these species in one of two ways: 1) gear restrictions may reduce the bycatch or bycatch mortality of species incidentally caught when targeting red snapper, and 2) shorter seasons, lower size limits, and lower bag limits may increase effort directed toward other reef fish species, resulting in additional bycatch.

Gear requirements, such as circle hooks, hook sizes, and maximum hook limitations may reduce discards and bycatch mortality of grouper and snapper if they selectively reduce the capture of undersized fish or reduce the release mortality of fish after capture (i.e., improve handling and release practices). Because of the very different jaw morphology and feeding behavior of grouper (Burns et al. 2004), circle hooks and increased hook sizes are not expected to greatly reduce grouper discards. However, circle hooks may increase survival of discarded grouper by reducing gut hooking and hook-related mortality. Venting tools and dehooking devices may also increase survival of released fish. For vermilion snapper and gray triggerfish, circle hook and hook size requirements may benefit these stocks. Because mouth gape size for both gray triggerfish and vermilion snapper is smaller than red snapper, circle hooks and larger hook sizes will likely reduce the capture of both sub-legal and legal fish. However, bycatch does not appear to be compromising the status of either of these stocks, since gray triggerfish release mortality is relatively low (1.5 percent, SEDAR 9 2006b) and vermilion snapper are not overfished or undergoing overfishing.

As found in other IFQ fisheries (NRC 1999), the commercial red snapper IFQ program is expected to reduce bycatch of other reef fish species by providing shareholders an incentive to fish more efficiently and to better handle their catch. In contrast, recreational regulatory measures will reduce the efficiency of the fishery. Shorter open seasons and lower bag limits may result in some shifts in fishing effort to other species, thereby increasing fishing mortality and bycatch. The extent to which bycatch would change is unknown.

Criterion 4: Effects on marine mammals and birds

The effects of current management measures on marine mammals and birds are described in Section 4.2. Bycatch minimization measures evaluated in this amendment are expected to indirectly affect marine mammals and birds by reducing food availability. There is no information to indicate how reduced discards will affect marine mammals and birds feeding behind vessels. Dissociation with humans is expected to ecologically benefit marine mammals and birds by reducing dependence of discards for food and increasing the consumption of prey through natural means. Reductions of red snapper discards are not expected to have much of an effect on endangered or threatened species, since these species feed on a wide variety of fishes other than red snapper. Any reductions to the red snapper minimum size limit are expected to have the greatest effect on marine mammals and birds, since the minimum size limit is largely responsible for most regulatory discards. Gear requirements, such as venting tools, dehooking devices, circle hooks, and maximum hook limitations are intended to reduce release mortality, but undersized fish would still be susceptible to predation once released. Requiring minimum hook sizes would have small effects on marine mammals and birds if they successfully reduce the number of sub-legal fish caught and discarded.

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

Lower size limits, gear requirements and restrictions, lower bag limits, and shorter open seasons will all affect costs associated with fishing operations. Eliminating or reducing the commercial minimum size limit will increase efficiency, reduce time spent releasing fish, and increase the value of commercially caught red snapper. Fish 13- to 16-inches (1-2 pounds) are preferred by dealers and consumers and command the highest market prices per pound. The IFQ program will promote greater efficiency in fishing, processing, and disposal by reducing overcapacity, reducing the incentive to fish during unsafe conditions, and extending the availability of fresh fish products to the consumer market. Reducing the recreational size limit will increase catch rates and reduce bycatch, but the associated increase in landings and fishing mortality requires additional management measures to constrain harvest within quota levels. Shortening the open season will have direct impacts to private anglers and for-hire vessels. For-hire vessels targeting primarily red snapper would incur losses in revenue, unless these vessels target other species once the red snapper fishery is closed. Shorter recreational open seasons and lower bag limits could also affect the marketability of for-hire fishing trips by deterring customers from taking fishing trips. Losses in consumer surplus due to shorter fishing seasons and lower bag limits will also occur for all recreational anglers. Circle hooks are comparable in price to J-hooks, but would represent an initial increase in costs for those anglers currently not using circle hooks. Similarly, venting tools and dehooking devices would increase angler costs. However, all of these gear requirements represent small increases relative to total trip costs.

Criterion 6: Changes in fishing practices and behavior of fishermen

All bycatch minimization measures proposed are expected to change angler behavior and fishing practices. Reductions to the minimum size limit will increase catch rates, reduce bycatch, and affect decisions about where to fish. The technique for setting a circle hook is different than the technique used to set standard J-hooks. Circle hooks will require anglers to steadily and slowly reel in the slack in the line until the hook sets itself, rather than jerking on the line to set the hook. Because circle hooks result in more fish hooked in the jaw, removing hooks and releasing red snapper should be easier. Dehooking devices will allow fishermen to remove hooks easier and more quickly from undersized red snapper and non-targeted species without having to handle the fish as much. Venting tools will require anglers to carefully deflate the fish's gas bladder before returning the fish to the water. Shorter open seasons and lower bag limits will alter angler effort, at least initially, and may affect decisions about when and where to fish. Shorter fishing seasons will affect what species for-hire vessels and recreational anglers target once the recreational red snapper season closes. Lower bag limits may also affect angler behavior and result in red snapper becoming a secondary targeted species rather than a primary targeted species.

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

Proposed bycatch minimization measures are not expected to impact administrative costs. Size limits, bag limits, and closed seasons are currently used to regulate the commercial and recreational fishery. Eliminating the commercial size limit would reduce the burden on enforcement to determine compliance with the size limit. None of the commercial actions are expected to diminish regulatory effectiveness; Reef Fish Amendment 18A will require VMS on all vessels possessing a commercial reef fish permit and Reef Fish Amendment 26 requires commercial red snapper fishermen to notify enforcement three hours prior to landing red snapper. Gear requirements, such as circle hooks, minimum hook sizes, venting tools, and dehooking devices would result in additional regulations for enforcement. Reducing the recreational minimum size limit could significantly reduce management effectiveness (i.e., quota overages) if increases in harvest and fishing mortality from lower minimum size limits are not offset by more restrictive management measures, such as bag limits and shorter open seasons. All of these bycatch minimization measures will require additional research to determine the magnitude and extent of reductions in bycatch and bycatch mortality.

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

Reducing or eliminating the minimum size limit in the commercial red snapper sector, regardless of the TAC, is expected to positively impact the stock by reducing regulatory discards, and thus foster faster recovery rates for red snapper stocks. In addition to these long-term economic benefits that would be enjoyed by all participants in the red snapper fishery, commercial red snapper fishermen are expected to enjoy slight net revenue increases due to higher price per pound for smaller fish. In addition, harvesting cost savings resulting from shorter search time, reduced culling time and bait costs may result from a reduction in the size limit.

Reducing the recreational minimum size limit is expected to slightly slow stock recovery by a negligible amount (see Figure 4.2.1), but would increase social benefits by reducing the number of red snapper killed when released. Discards are perceived as wasteful; therefore, lower size limits will produce net benefits to the social environment by increasing the number of red snapper landed per angler and decreasing the number of red snapper discarded dead per angler. Eliminating the recreational minimum size limit would significantly slow stock recovery (Porch 2005), negatively impacting the status of red snapper stocks, and reducing long-term social and economic benefits.

Lower recreational size limits require additional management restrictions, such as lower bag limits and shorter open seasons, in order to compensate for increases in harvest. Lower bag limits and shorter open seasons will reduce consumer surplus and could negatively affect for-hire vessels if lower bag limits and shorter open seasons reduce the number of trips they can book. However, short-term economic and social impacts are expected to be outweighed by improvements in stock status as red snapper stocks rebuild.

The implementation of circle hooks, dehooking devices, venting tools, and hook sizes is expected to result in long-term social and economic benefits resulting from reductions in reef fish discards and discard mortality. These devices will reduce bycatch and improve handling practices, thereby providing a net benefit to stock recovery, which will positively affect the social and economic value of fishing activities. Requiring these devices will result in initial economic costs for persons not already possessing these gears.

Criterion 9: Changes in the distribution of benefits and costs

There is a perception that benefits and costs are not equitably distributed between the shrimp fishery and the directed red snapper fishery. The directed fishery has long expressed its frustration that little is being done to curtail bycatch in the shrimp fishery, while the directed fishery continues to be restricted in terms of TAC, fishing seasons, and bag limits. Conversely, the shrimp fishery claims it is accruing costs from using TEDs and BRDs, while any red snapper benefits accrue to others.

According to the 2005 red snapper stock assessment, fishing mortality (including discard mortality) by the directed fishery is the primary limiting factor to stock recovery for the portion of the stock in the eastern Gulf. Shrimp trawl bycatch is more important in the western Gulf, but again fishing mortality by the directed commercial fishery (including directed bycatch) is significant there as well. Nevertheless, management measures to reduce bycatch and fishing mortality in both the directed fishery and shrimp trawl fishery are being considered in this amendment.

The Council's preferred management alternative in Action 6 would reduce the fishing mortality rate on red snapper associated with shrimp trawl bycatch by 74 percent relative to the 2001-03 baseline fishing mortality rate. Similar reductions in directed fishing mortality would also occur as overfishing is phased out over the next three years. The TACs and management measures for the directed fishery in Action 1 take into account the level directed fishery bycatch can be practically reduced given available management measures (i.e., lower size limits, gear requirements, etc.). In the short-term, directed fishery costs will be greater due to a lower TAC, shorter fishing season, lower bag limit, and other restrictions. Shrimp fishery costs in the short-term will also be greater, although effort in the shrimp fishery in recent years has already significantly declined due to economic conditions resulting in a large decrease in fishing mortality relative to the 2001-03 baseline. Over the long-term, the directed fishery would receive a majority of the benefits from stock rebuilding while the shrimp fishery would be held at a constant fishing mortality reduction level, unless changed by the Council in the future.

There is a perception that reductions in fishing mortality and bycatch minimization measures are not equitably distributed between the commercial and recreational directed fisheries or the shrimp trawl fishery. Commercial bycatch reduction measures allow for greater flexibility and efficiency, whereas recreational management measures to address bycatch and fishing mortality result in more restrictive regulations to control harvest and reduce bycatch. The differing management regimes, objectives, and effects of the two fisheries make it unreasonable to attempt to apply the same regulations to both. Despite these differences, bycatch minimization measures in both fisheries are intended to provide a net benefit to the stock, by reducing mortality associated with bycatch and increasing the rate of stock recovery.

Criterion 10: Social effects

Bycatch is considered wasteful because it reduces overall yield obtained from the fishery. Minimizing bycatch to the extent practicable will increase efficiency, reduce waste, and benefit stock recovery, thereby resulting in net social benefits.

Recreational anglers perceive different commercial and recreational minimum size limits as unfair and there is concern by some that commercial fishermen will fish closer to shore, reducing the availability of red snapper to the recreational fishery. However, because a majority of commercially caught red snapper die, lower commercial minimum size limits are expected to have a net benefit to the stock as a whole by reducing commercial fishing mortality and increasing the rate of stock recovery.

Implementation of the IFQ program, which increases flexibility and efficiency in the commercial fishery, is also perceived to be unfair, because recreational anglers must incur additional management restrictions to rebuild red snapper while commercial regulations in some cases are lessened. Differences in management of the recreational and commercial fishery make it impracticable to manage the two fisheries with similar bycatch minimization measures. However, TAC reductions evaluated in this amendment are being reduced proportionally for both the directed commercial and recreational red snapper fisheries.

Gear restrictions, such as circle hooks, dehooking devices, venting tools, and hook sizes should all have positive social benefits, since these gears are known to reduce bycatch or bycatch mortality.

CONCLUSIONS

The bycatch practicability analysis in Reef Fish Amendment 22 concluded no directed fishery bycatch minimization measures would have an impact on the status of the stock. However, it was noted that the 2005 stock assessment would include new data to better assess the impacts of red snapper regulations on bycatch and the stock as a whole.

The 2005 stock assessment included numerous changes and indicated directed fishery discard mortality rates were significantly greater than previous assessments. Shrimp trawl bycatch still constitutes a significant portion of bycatch, but the directed fishery bycatch is now considered to have a much greater impact on stock status than previously thought. In the eastern Gulf, directed fishery bycatch and fishing mortality adversely effects red snapper recovery. In the western Gulf, shrimp trawl bycatch is the primary source of red snapper mortality, however, bycatch and fishing mortality in the commercial directed fishery is still significant.

Analysis of bycatch practicability factors indicates there would be positive biological impacts associated with further reducing bycatch and bycatch mortality in the directed fishery. The biomass level red snapper can be rebuilt to and the success of the red snapper rebuilding plan are contingent on reducing bycatch to practicable levels. The Council is acting to reduce directed fishery bycatch and cap or reduce shrimp effort in this amendment and will address additional shrimp trawl bycatch measures in subsequent amendment to the Shrimp FMP.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Action 1. Reduce the total allowable catch of the directed commercial and recreational red snapper fisheries and adjust regulations used to manage the recreational quota

5.1.1 Direct and Indirect Effects on Physical Environment

The alternatives in this section establish harvest limits and will not directly affect the physical environment. However, specifying TAC and recreational fishing harvest restrictions could indirectly affect the physical environment by defining the level (i.e., the amount of gear in the water at any given time) of commercial fishing effort and the duration and level of recreational fishing effort over the course of the fishing season. The commercial fishery is operating under an IFQ system resulting in no quota closure. Thus, while the TAC may affect the level of commercial fishing effort, the duration will be unaffected (i.e., the commercial fishing season will be open year-round regardless of the TAC). Level and duration of effort together define the total cumulative amount of effort (i.e., gear-hours of soak time), which affects the potential for gear to impact the physical environment.

Alternative 1 (no action) would maintain the 9.12 MP TAC, and result in no changes to the commercial quota or recreational management regulations. The primary gears used in the commercial fishery are bandit rigs (84 percent), hook-and-line (15 percent), and bottom longlines (1 percent) (Poffenberger and McCarthy 2004). Vertical line gear accounts for a majority of the commercially and recreationally landed red snapper. Hook-and-line gear has the potential to snag and entangle bottom structures. Each individual gear has a very small footprint and thus only a small potential for impact, but the cumulative impact of the commercial and recreational fishing sector results in a large amount of gear being placed in the water, increasing the potential for impact. Vertical line gear is less likely to contact the bottom than is bottom longline gear, but it still has the potential to snag and entangle bottom structures. The line and weights used by this gear type also can cause abrasions (Barnette 2001). Circle hooks are commonly used in the commercial fishery and the western Gulf recreational fishery. Because of the design of circle hooks, this gear is less likely to snag bottom habitat than other hook types. Bottom longlines have the potential to break or move hard structures on the sea floor, including rocks, corals, sponges, other invertebrates, and algae, when the line sweeps the bottom (Barnette 2001). In recent years, longline landings have made up less than 5 percent of the total landings (SEDAR 7 2005).

Direct effects to the physical environment resulting from **Alternative 1** would include physical damage to habitat associated with anchoring, hook-and-line tear-offs and abrasions, and contact with bottom structures while spearfishing. If hook-and-line gear is not removed, long-term indirect effects to habitat may occur if marine life becomes entangled or overgrown with algae (Hamilton 2000; Barnette 2001). This alternative is expected to have the greatest impacts on the physical environment when compared with **Alternatives 2-4**, because it would allow for the greatest levels of fishing effort and most opportunities for gear interactions with habitat. However, direct and indirect effects on the physical environment are expected to be small because a large portion of the catch is taken from artificial structures (i.e., artificial reefs, oil and gas platforms), the primary gear used is hook-and-line, and the directed red snapper fishery represents only a small portion of the overall reef fish fishery in the Gulf of Mexico. Also, several habitat areas of particular concern, marine sanctuaries, and marine reserves already exist in the Gulf of Mexico where red snapper occur, providing additional protection to habitat and reducing impacts to the physical environment.

Alternatives 2-4 would reduce the current 9.12 MP TAC to between 3 and 7 MP during 2008 through 2010. Reducing the TAC is expected to result in less fishing effort. **Alternative 2** would reduce the red snapper TAC to 7 MP. The commercial quota would be 3.57 MP and the recreational quota would be 3.43 MP. The lower quota would not affect the length of the commercial fishing season, since the commercial fishery is operating under an IFQ program. However, the lower TAC would affect the amount of shares commercial fishermen receive, thereby reducing directed red snapper fishing effort and gear interactions with habitat. Lowering the commercial size limit, as proposed in **Action 4**, would further reduce impacts to the physical environment because of the reduced time spent harvesting quota shares. For the recreational fishery, the reduction in TAC would require more restrictive bag limits and closed seasons to control annual landings levels. Shorter seasons, lower size limits, and lower bag limits are all expected to benefit the physical environment because they would reduce directed red snapper fishing effort and the number of gear interactions with habitat. In general, sub-options with the shortest fishing season and lowest minimum size limits are expected to reduce effort the most and have the greatest benefits to the physical environment. Shorter fishing seasons will deter some anglers from fishing once the red snapper fishery is closed and lower size limits will reduce the amount of time spent catching legal-sized fish (i.e., catch rates will increase). Lower bag limits will increase the likelihood anglers fill the bag limit. If fishermen stop fishing once reaching their bag limit, then effort and gear interactions with habitat will be reduced. If, however, fishermen continue to fish for other reef fish, such as vermilion snapper or grouper, after reaching their bag limits then effort and gear interactions would not be reduced and no or little net benefits to the physical environment would accrue relative to no action.

Based on the range of options and sub-options considered in **Alternative 2, Suboption 2(c)(ii**) (shortest season, smallest size limit) is expected to have the greatest benefits to the physical environment and **Suboption 2(b)(i)** is expected to have the least (longest season, largest size limit). Impacts to the physical environment resulting from the remaining sub-options are intermediate to these two options. Overall, the effects of **Alternative 2** on the physical environment are expected to be slightly less than **Alternative 1**, but slightly greater than **Alternatives 3-4**. However, as mentioned above, effects are expected to be small because of where red snapper fishing occurs (i.e., primarily artificial structures) and because vertical line gear is the primary gear used to harvest red snapper.

Preferred Alternative 3 and **Alternative 4** would reduce the red snapper TAC to between 5 and 3 MP, respectively, during 2008 through 2010. The commercial quota would be 2.55 MP for **Preferred Alternative 3** and 1.53 MP for **Alternative 4**. The recreational quota would be 2.45 MP for **Preferred Alternative 3**, and 1.47 MP for **Alternative 4**. Similar to **Alternative 2**, reducing the quota to between 3 and 5 MP will reduce the number of shares each commercial fisherman receives, thereby reducing directed red snapper fishing effort and gear interactions with habitat. Lowering the commercial size limits, as proposed in **Action 4**, would further reduce impacts to the physical environment because of the reduced time spent harvesting quota shares (i.e., catch rates would increase and less fish would be discarded). For the recreational fishery, **Preferred Alternatives 3** and **Alternative 4** would require more restrictive bag limits and/or closed seasons to control annual landings levels. Shorter fishing seasons will deter some anglers from fishing once the red snapper fishery is closed, lower bag limits will deter some anglers from taking fishing trips, and lower size limits will reduce the amount of time spent catching legal-sized fish (i.e., catch rates will increase). **Alternative 4** would require the greatest reduction in harvest, and therefore would impose the most restrictive bag limits and closed seasons. **Preferred Alternative 3** would impose bag limit and closed season restrictions that are intermediate to those of **Alternatives 2** and **4**. **Alternative 4** is expected to provide the greatest benefits to the physical environment of all of the alternatives considered since it will provide the greatest reduction in directed red snapper fishing effort and subsequent gear interactions with habitat. **Preferred lternative 3** is expected to reduce fishing effort more than **Alternatives 1** and **2**, but less than **Alternative 4**, and therefore provide intermediate benefits to the physical environment when compared to the other alternatives.

Based on the range of options and sub-options considered in **Alternative 3, Suboption 3(b)(ii)** and **Suboption 3(e)** (shortest season and/or smallest size limit) are expected to have the greatest benefits to the physical environment and **Suboption 3(g)** is expected to have the least (longest season, largest size limit). For the sub-options considered in **Alternative 4, Suboptions 4(c-d)** (shortest season, smallest size limit) are expected to have the greatest benefits to the physical environment and **Suboption 4(a)** is expected to have the least (longest season, largest size limit). Impacts to the physical environment resulting from the remaining sub-options for each of these alternatives are intermediate to the options discussed above.

5.1.2 Direct and Indirect Effects on Biological/Ecological Environment

Since the late 1980s, red snapper has been considered overfished and undergoing overfishing. Management efforts to rebuild the red snapper stock have been conducted since 1990. The current rebuilding plan for red snapper was approved in 2005 (GMFMC 2004a) and was based on the 1999 stock assessment (Schirripa and Legault 1999). The rebuilding plan is a constant TAC rebuilding plan of 9.12 MP annually. The plan, when adopted, specified overfishing would end by 2009 or 2010 and rebuild the stock by 2032. The Council specified the rebuilding plan would be reviewed, as necessary, after periodic stock assessments.

On March 12, 2007, the United States District Court for the Southern District of Texas, Houston Division, issued a ruling on legal challenges to the current red snapper rebuilding plan contained in Amendment 22 to the Reef Fish FMP. The Court ruled the rebuilding plan in Amendment 22 had less than a 50 percent chance of rebuilding red snapper by 2032 and, therefore, required a new rebuilding plan be established within 9 months of the ruling (i.e., December 12, 2007).

In this amendment, the Council is considering three alternative rebuilding plans in addition to no action (see Table 2.2). In revising the red snapper rebuilding plan, the Council is not considering changes to the timeframe for ending overfishing (i.e., overfishing must end by 2009 or 2010) or rebuilding the stock (i.e., stock must be rebuilt by 2032) as specified in Amendment 22 to the Reef Fish FMP.

In 2005, the most recent red snapper stock assessment was completed (SEDAR 7 2005). The assessment continued to indicate the red snapper stock was undergoing overfishing and was overfished despite many key changes to the assessment methodology and status determination criteria (see Section 3.4.1.2). According to the assessment, red snapper fishing mortality rates are too high in both the directed and shrimp trawl fisheries (SEDAR 7 2005). In comparison to previous assessments, the directed fishery now contributes a greater portion of fishing mortality than previously thought because of higher juvenile natural mortality estimates (i.e., more juvenile red snapper were assumed to die from natural causes if not caught as shrimp trawl bycatch) and higher directed fishery release mortality rates of regulatory discards. However, shrimp trawl bycatch of red snapper still remains a significant source of mortality in the western Gulf and Actions 6-8 in this amendment consider measures to further reduce shrimp trawl bycatch of red snapper.

The approved rebuilding goal for red snapper is rebuilding to a level of biomass consistent with MSY (B_{MSY}). MSY is defined as the yield associated with fishing at F_{MSY}. Fishing mortality in terms of SPR is commonly used as a proxy for F_{MSY}, and can vary depending upon the selectivity of the fishery and the level of unavoidable bycatch. For red snapper, F_{MSY} corresponds to an SPR of 26 percent.

In order to end overfishing and rebuild red snapper consistent with the currently adopted rebuilding plan, a 74 percent or more reduction in fishing mortality of red snapper is required (Thompson 2005). The SEDAR review panel recommended fishery managers focus attention on "short-term (5-10 years) directions of management advice, and how to tend toward a more desired state, without unduly emphasizing specific [long-term] targets and how to attain them (SEDAR 7 2005)." Short-term objectives will minimize the potential for errors resulting from these uncertainties while keeping the rebuilding plan on course to achieve its long-term goals. The most appropriate short-term objective for the current phase of the red snapper rebuilding plan is to set TAC at a level that will end overfishing and maintain rebuilding at or above the biomass rebuilding trajectory over the next three years, at which time directed fishery catch and effort and shrimp trawl bycatch can be reevaluated. The following examines the effects of the various Action 1 alternatives on the biological/ecological environment. All of the TACs and rebuilding plans under consideration, even the no action 9.12 MP TAC, will allow spawning biomass to increase over the short term (Thompson 2005). However, TACs in excess of 7 MP will not end overfishing (Thompson 2005), and TACs substantially less than 7 MP are likely necessary to end overfishing if bycatch cannot be adequately addressed across all sources, including the directed fishery, the shrimp trawl fishery, and during closed seasons (see Section 2.0).

Action 1 considers three alternatives in addition to no action. **Alternative 1** would maintain the current red snapper rebuilding plan and 9.12 MP TAC, and result in no changes to the commercial quota or recreational management regulations. Commercial fishing contributes to a large portion of the fishing mortality in the western Gulf, while recreational fishing contributes to a large portion of the fishing mortality in the eastern Gulf. In order to rebuild the red snapper stock, reductions in both directed and shrimp trawl fishing mortality are required. By maintaining the current TAC, no reductions in directed fishing mortality are expected to occur, unless the impacts of hurricanes during 2005 and high fuel prices reduce fishing effort and landings substantially along the Gulf coast in future years. Preliminary information indicates small reductions in effort and landings have occurred (see Action 2), but these reductions appear to be insufficient to maintain TAC at 9.12 MP and subsequently end overfishing.

Alternative 1 would continue to allow overfishing beyond 2010, would not reduce recreational dead discards, and would require more restrictive TACs and regulations in the future to end overfishing and rebuild the stock. This alternative would also violate the March 12, 2007, District Court order, which requires the Secretary of Commerce to approve a new, revised red snapper rebuilding plan by December 12, 2007. Maintaining TAC at 9.12 MP would not permit the Gulf-wide red snapper stock to attain the expected $F_{26\%SPR}$ biomass trajectory, resulting in slower than expected rebuilding when compared to the Council's rebuilding benchmark (F_{MSY} = $F_{26\%SPR}$). Of the four alternatives considered in **Action 1, Alternative 1** would reduce fishing mortality the least over the short-term and would not end overfishing by 2009 or 2010. Over the long-term, maintaining TAC at 9.12 MP would result in faster than expected stock recovery when compared to the Council's rebuilding benchmark (F_{MSY} = $F_{26\%SPR}$); however, stock recovery would only be faster if reductions in bycatch summarized in Figure 2.1 are achieved. If sufficient reductions in bycatch are not achieved, **Alternative 1** would be expected to result in slower than expected recovery relative to the Council's rebuilding benchmark. Based on bycatch management measures considered in this amendment (see Actions 1, 4, and 5) and revised rebuilding plans developed by the SEFSC (Table 2.3; Chester 2007), bycatch is unlikely to be reduced across all sources to the levels summarized in Figure 2.1.

Alternative 1 proposes no actions for reducing directed fishery discards. The recreational minimum size limit is considered the greatest source of regulatory discards. **Preferred Alternative 2** in Action 4 proposes reducing the commercial minimum size limit to 13 inches TL, but no similar management measures are proposed for reducing the recreational minimum size limit in **Action 1, Alternative 1**. This is because lowering the recreational size limit has a negligible effect on stock recovery and therefore does not significantly benefit the stock as a whole. Lowering the minimum size limit would reduce dead discards, but requires more restrictive management measures to compensate for increases in harvest (more legal-sized fish available to catch as the size limit is decreased). During 2001-03, the directed recreational fishery discarded dead an average of 0.98 million red snapper (see Section 4.2). An additional 0.30 million red snapper (includes both commercial and recreational dead discards) were killed during the closed season.

Alternative 2 would revise the red snapper rebuilding plan and reduce the TAC to 7 MP and hold it constant until 2032 (Table 2.2). This TAC is the maximum ABC that could be taken from the red snapper stock to end overfishing within the timeframe specified by the Council's rebuilding plan. The commercial quota would be 3.57 MP and the recreational quota would be 3.43 MP. **Alternative 2** would end overfishing of red snapper by 2009 or 2010, but only if fishing mortality across all sources, including closed season bycatch, can be reduced by 74 percent or more by that time. If fishing mortality cannot be reduced to required levels, then overfishing would continue and would end later than required by the Council's rebuilding plan. Based on management measures considered in this amendment and rebuilding projections runs conducted by the SEFSC (see Table 2.3; Chester 2007), bycatch is unlikely to be reduced across all sources by 74 percent (especially closed season discards); therefore, lower TACs are needed to end overfishing. Over the long-term, **Alternative 2** would result in faster than expected stock recovery when compared to the Council's rebuilding benchmark (F_{MSY} = $F_{26\%SPR}$); however, stock recovery would only be faster if reductions in bycatch summarized in Figure 2.1 are achieved. Rebuilding over the next three years would be expected to occur at a slower rate when compared to the Council's rebuilding benchmark ($F_{MSY} = F_{26\%SPR}$) unless all sources of mortality are reduced by 74-percent or more. **Alternative 2** would reduce fishing mortality more in 2008-2010 than **Alternative 1**, but less than **Preferred Alternatives 3** and **Alternative 4**. **Alternative 2** has a greater probability of ending overfishing by 2009 or 2010 than **Alternative 1**, but a lower probability than **Preferred Alternative 3 and Alternative 4**. Preliminary information from the SEFSC indicates the **Alternative 2** rebuilding plan has at least a 50 percent probability of end overfishing and rebuilding the stock to B_{MSY} if fishing mortality across all sources can be reduced by 74 percent or more. If fishing mortality across all sources, including closed season bycatch, cannot be reduced by this amount then the probability of ending overfishing is much less than 50 percent.

How successful **Alternative 2** is at ending overfishing and achieving adequate rebuilding progress is contingent on whether or not reductions in fishing mortality across all sources are met. Based on the shrimp fishery closure measures proposed in Action 7, coupled with current economic conditions in the shrimp trawl fishery and effort caps proposed in Action 6, reductions in shrimp trawl fishing mortality are likely to be met. Similarly, the preferred alternative in Action 4 would reduce the commercial minimum size limit to 13 inches, resulting in large reductions in directed commercial fishery discards. Closed season discards are expected to be reduced slightly because of implementation of the red snapper IFQ program and gear requirements (see Action 5), but most recreational management measures considered in Action 1 would increase the length of the closed season resulting in increases to closed season discards. Requiring circle hooks, (see Action 5) would reduce open and closed season discards, but not to the extent necessary to maintain a 7 MP TAC (see Table 2.3). Also, Action 5 would require the use of de-hooking devices and venting tools, which should reduce release mortality. However, once again these measures are not expected to reduce discards to a level that would allow for a 7 MP TAC. Therefore, the likelihood of **Alternative 2** achieving necessary reductions in fishing mortality across all fisheries is unlikely and lower TACs would be required to end overfishing by 2009 or 2010.

Options and sub-options for **Alternative 2** include various bag limit, size limit, and open season combinations. **Option 2(a)** would maintain the four fish bag limit and 16-inch size limit, but would reduce the length of the open season to 125-139 days. **Option 2(b)** would reduce the bag limit to three fish, maintain the 16-inch size limit or reduce it to 15-inches, and reduce the length of the open season to 137-154 days. **Option 2(c)** would reduce the bag limit to two fish, reduce the minimum size limit to either 13 or 15-inches TL, and reduce the length of the open season to 124-154 days. All management measures included in **Options 2(a), 2(b), and 2(c)** are estimated to achieve at least a 23 percent reduction in harvest.

Porch (2005) evaluated various minimum size limits for red snapper and found the 16-inch minimum size limit resulted in the fastest recovery for the stock, although size limits as low as 13-inches TL were found to only negligibly slow stock recovery (see Figure 4.2.1). Based on recreational minimum size limits ranging from 13 to 16 inches TL, yield-per-recruit (YPR) analyses indicate 16 inches maximizes the YPR assuming current fishing selectivities and discard mortality rates. In the western Gulf, where recreational release mortality rates are higher (40 percent west vs. 15 percent east), there was little difference in YPR (SERO 2006b)

During 2001-03, approximately 1.67 million red snapper were discarded dead by the directed fishery (includes dead discards). These dead discards were estimated to weigh 2.5 MP (Strelcheck, pers. comm.). Lower size limits will reduce dead discards; however, to compensate for the increase in landings and fishing mortality associated with lower size limits, additional management measures must be imposed to maintain landings within the specified recreational quota. These additional management measures diminish the benefits of lowering the size limit, because they increase discards and shorten the open season when size limits would be imposed. Lower bag limits will increase the likelihood anglers will fill their bag limit. If anglers continue targeting reef fish after filling their bag limit, then red snapper will continue to be discarded. Similarly, shortening the open season will increase dead discards during the closed season. The magnitude of dead discards during the newly closed time period will depend on whether or not fishing effort is reduced and where anglers target other species of reef fish (i.e., similar areas where red snapper occur). Comparison of recreational red snapper discards prior to and after implementation of monthly red snapper closures during the last decade indicates recreational discards were similar or slightly less after closures were imposed over similar time periods. However, these comparisons are confounded by changes in other regulations, such as increases to the recreational minimum size limit.

Based on the range of sub-options considered for **Alternative 2, Suboption 2(c)(ii)** would reduce dead discards the most, while **Suboption 2(a)(i-iv)**, and **Suboption 3(a)(i)**, would result in the smallest changes in dead discards. The remaining sub-options would result in intermediate dead discard reductions relative to the sub-options discussed above.

Preferred Alternative 3 would revise the red snapper rebuilding plan and reduce the TAC to 5 MP from 2008 through 2010 (Table 2.2). After 2010, TAC would be increased consistent with a fishing mortality rate that produces MSY. The rate TAC increases after 2010 is contingent on the amount of shrimp bycatch mortality allowed. If the shrimp bycatch mortality target is held constant at 74 percent less than the baseline fishing mortality rate during 2001-03 (see Action 6, Alternative 4), then TAC would increase at a faster rate and MSY would be 17.2 MP when the stock is fully rebuilt. Under the Council's preferred rebuilding plan, shrimp bycatch fishing mortality would be set at 74 percent less than the 2001-03 baseline fishing mortality rate in 2008 through 2010, 67 percent in 2011, and decline constantly from 67 to 60 percent between 2011 and 2032 (see **Action 6, Preferred Alternative 6**). The Council's preferred rebuilding plan would allow TAC to increase throughout the rebuilding plan and MSY would be 14.0 MP when the stock is fully rebuilt. The commercial quota would be set at 2.55 MP and the recreational quota would be set at 2.45 MP during 2008 through 2010. **Preferred Alternative 3** would end overfishing between 2009 and 2010, consistent with the Council's rebuilding plan (Chester 2007). **Preferred Alternative 3** would permit the Gulf-wide red snapper stock to attain the expected $F_{26\%SPR}$ biomass trajectory between 2009 and 2010. By 2010, relative spawning potential is estimated to be 5.4 percent (see Table 2.2). Over both the short- and long-term, **Preferred Alternative 3** has a higher probability of ending overfishing than **Alternatives 1 and 2**, but an equal or lower probability of ending overfishing relative to **Alternative 4**. When fully rebuilt, MSY would be 14.0 MP based on the Council's preferred rebuilding strategy (see Table 2.2). Preliminary information from the SEFSC indicates the preferred rebuilding plan has at least a 50 percent probability of end overfishing and rebuilding the stock to B_{MSY}. Because TAC is 0.3 MP lower than the maximum TAC allowed over the next three years (Table 2.3, projection run #1) and the rebuilding plan does not take into account reductions in release mortality resulting from circle hooks, venting tools, and dehooking devices (see Action 5), the probability of ending overfishing is estimated to be higher than 50 percent. Additionally, adjusting the rebuilding plan after subsequent stock assessments will increase the probability of successfully rebuilding red snapper.

Preferred Alternative 3 includes 15 options and/or suboptions. Options and sub-options for **Preferred Alternative 3** include various bag limit, size limit, and open season combinations. All options for **Preferred Alternative 3** would reduce the bag limit to one or two fish. **Preferred Option 3(a)(i)** would maintain the 16-inch size limit and reduce the length of the open season to 107 days. **Option 3(a)(ii)** would maintain the 16-inch size limit and start the fishing season on May 1, which would allow for a 92-day fishing season. **Option 3(b)** would maintain the 16-inch size limit and reduce the length of the open season to 57-92 days. **Suboption 3(b)(i)** would establish a May 15 – August 15 fishing season Gulfwide. **Suboptions 3(b)(ii-iv)** would allow harvest only on weekends before and after a core July fishing season. This would result in the shortest fishing season because a majority of red snapper are landed by recreational anglers on weekends (SERO 2006d). Six consecutive weekend openings prior to July 1 and 7 consecutive weekend openings after July 31 would extend the fishing season from mid-May to late September. **Option 3(c)** would reduce the minimum size limit to 15-inches TL and establish an 88-day fishing season. **Option 3(d)** would reduce the minimum size limit to 14-inches TL and **Suboptions 3(d)(i-iii)** would reduce the length of the open season to 71-77 days. **Option 3(e)** would reduce the minimum size limit to 13 inches TL and establish a 61-day fishing season. **Option 3(g)** would reduce the bag limit to one and the minimum size limit to 14-inches TL, and **Suboptions 3(g)(i-ii)** would reduce the length of the fishing season to 102-122 days. **Option 3(f)** would reduce the bag limit to one and maintain the 16-inch TL minimum size limit. **Suboptions 3(f)(i-ii)** would reduce the length of the fishing season to 138-154 days. All management measures included in **Options 3(a-g)** are estimated to achieve at least a 45 percent reduction in harvest and therefore would benefit red snapper stock recovery.

As discussed above in **Alternative 2**, sub-options that reduce the minimum size limit are expected to negligibly affect stock recovery (Porch 2005). Projections conducted by the SEFSC in January-March 2007 (Chester 2007; SERO 2007) indicate lowering the minimum size limit to 14 inches TL would allow slightly higher red snapper TACs over the next three years. In the short-term, lowering the minimum size limit is expected to speed stock recovery by a very small amount. However, over the long-term, TACs associated with lower minimum size limits are expected to be slightly less than TACs with a 16-inch recreational minimum size limit. Because the minimum size limit is the greatest source of regulatory discards, reducing the minimum size limit is expected to greatly reduce the number of dead discards. **Suboption 3(e)** would result in the greatest reduction in recreational open-season dead discards, while **Suboption 3(a)(i-ii)** and **Suboption 3(g)(i-ii)** would result in the smallest change in recreational open-season dead discards. The remaining sub-options would result in intermediate benefits to the sub-options discussed above.

YPR is maximized at 16-inches or greater in both the eastern and western Gulf; therefore reducing the minimum size limit is estimated to reduce YPR. The reduction in YPR would be greater in the eastern Gulf than in the western Gulf because of lower release mortality rates that allow more fish to survive after capture. **Option 3(e)** would result in the greatest reduction in both YPR and dead discards.

Alternative 4 would revise the red snapper rebuilding plan and reduce the TAC to 3 MP from 2008 to 2010 (Table 2.2). After 2010, TAC would be increased consistent with a fishing mortality rate that produces MSY, assuming a 50 percent reduction in red snapper bycatch mortality in the shrimp fishery (see Action 6, Alternative 2). The commercial quota would be 1.53 MP and the recreational quota would be 1.47 MP. **Alternative 4** would end overfishing between 2009 and 2010, consistent with the Council's rebuilding plan (Chester 2007). **Alternative 4** would permit the Gulf-wide red snapper stock to attain the expected $F_{26\%SPR}$ biomass trajectory by 2009 or 2010. **Alternative 4** would require shrimp trawl fishing mortality be reduced by a minimum of 50 percent and closed season red snapper fishing mortality be reduced by a minimum of 10 percent. Over both the short- and long-term, **Alternative 4** has the highest probability of ending overfishing if the Council selects a 74 percent shrimp trawl fishing mortality goal. Relative to **Preferred Alternative 3, Alternative 4** would have had a similar probability of ending overfishing if the Council had selected a 50 percent shrimp trawl fishing mortality reduction goal (Action 6, Alternative 2). Preliminary information from the SEFSC indicates the proposed rebuilding plan has at least a 50 percent probability of end overfishing and rebuilding the stock to B_{msy}. Because TAC is 0.27 MP lower than the maximum TAC allowed over the next three years (Table 2.3, projection run #7) and the rebuilding plan does not take into account reductions in release mortality resulting from circle hooks, venting tools, and dehooking devices (see Action 5), the probability of ending overfishing is estimated to be higher than 50 percent. Additionally, adjusting the rebuilding plan after subsequent stock assessments will increase the probability of successfully rebuilding red snapper.

Alternative 4 includes 7 options and/or suboptions. Options and sub-options for **Alternative 4** include various bag limit, size limit, and open season combinations. All options for **Alternative 4** would reduce the bag limit to two fish. **Option 4(a)** would maintain the 16-inch size limit and reduce the length of the open season to 39-46 days. **Suboption 3(b)(i)** would establish an August 1 – September 15 fishing season Gulfwide. **Suboptions 4(a)(ii-iv)** would allow harvest only on weekends before and after a core August fishing season. This would result in the shortest fishing season because recreational anglers land a majority of red snapper on weekends (SERO 2006d). Two consecutive weekend openings prior to August 1 and 2 consecutive weekend openings after August 31 would extend the fishing season from mid-July to mid-September. **Option 4(b)** would reduce the minimum size limit to 15-inches TL and establish a 39-day fishing season. **Option 4(c)** would reduce the minimum size limit to 14-inches TL and establish a 35-day fishing season. **Option 4(d)** would reduce the minimum size limit to 13 inches TL and establish a 31-day fishing season. All management measures included in **Options 4(a-d)** are estimated to achieve at least a 67 percent reduction in harvest and therefore would benefit red snapper stock recovery.

As discussed above in **Alternative 2 and Preferred Alternative 3**, sub-options that reduce the minimum size limit are expected to negligibly effect stock recovery over the short and long-term (Porch 2005). Projections conducted by the SEFSC in January-March 2007 (Chester 2007; SERO 2007) indicate lowering the minimum size limit to 14 inches TL would allow slightly higher red snapper TACs over the next 2-3 years. In the short-term, lowering the minimum size limit is expected to speed stock recovery by a very small amount. However, over the long-term, TACs associated with lower minimum size limits are expected to be slightly less than TACs with a 16-inch recreational minimum size limit. Because the minimum size limit is the greatest source of regulatory discards, reducing the minimum size limit is expected to greatly reduce the number of dead discards. **Suboption 4(d)** would result in the greatest reduction in recreational open-season dead discards, while **Suboption 4(a)** would result in the smallest change in recreational open-season dead discards. The remaining sub-options would result in intermediate dead discard reductions relative to the sub-options discussed above.

Alternatives 2-4 are all expected to have some negative impacts on other reef fish species due to effort shifting. Impacts on other species would be greatest for alternatives with lower TACs and shorter red snapper fishing seasons. Species likely to be impacted the most include: vermilion snapper, gray triggerfish, and gag, which all co-occur with red snapper. Vermilion snapper is not overfished or undergoing overfishing. Currently, a Council regulatory amendment is under Secretarial review that, if implemented, would alleviate regulations for vermilion snapper because a recent stock assessment indicates the stock is neither overfished nor subject to overfishing. Vermilion snapper are not usually the primary target species for most anglers, but are incidentally caught while targeting red snapper. Reducing the TAC for red snapper could indirectly affect vermilion snapper by increasing fishing mortality. However, current vermilion snapper fishing mortality rates are estimated to be currently below F_{MSY} and F_{OY} and are not projected to exceed F_{MSY} or F_{OY} over the short-term (SEDAR 9 2006a).

Stock assessments for gray triggerfish, greater amberjack, and gag in 2006 concluded these stocks were undergoing overfishing. Gray triggerfish are usually not targeted by recreational anglers, but are caught incidentally while targeting species such as red snapper. In contrast, gag and greater amberjack are commonly targeted. Reducing red snapper TACs could result in additional fishing mortality on these species, exacerbating overfishing problems. Impacts to gag, vermilion snapper, and gray triggerfish are expected to be greatest for **Alternative 4**, followed in order by **Alternatives 3, 2, and 1**. The Council is currently developing plan amendments to the Reef Fish FMP to reduce fishing mortality for these species.

5.1.3 Direct and Indirect Effects on Economic/Social Environment

5.1.3.1 Economic Environment

Under the current 9.12 MP red snapper TAC, the recreational quota amounts to 4.47 MP. Along with potential reductions in TAC, this action proposes several management measures modifying the existing recreational fishing season, bag limits, and, minimum size requirements presently in effect in the recreational red snapper fishery in the Gulf of Mexico. The expected economic effects of these measures on the recreational sector are described in this section. Detailed discussion of the economic effects of the alternative TACs on the commercial sector are presented in Section 5.3.3 in conjunction with the evaluation of alternative minimum size limits for the commercial sector and are incorporated herein by reference. A summary of the expected impacts of the respective TACs on the commercial sector, however, is provided in this section.

The expected change in recreational fishing effort and economic value as a result of the alternative TAC and associated bag, season, and size limit scenarios were estimated by the SEFSC (David Carter, personal communication[25]). The results of the analysis are provided in Tables 5.1.3.1.3-5.1.3.1.6. The change in market share for each target species and the change in value per trip expected with each regulation change for the charter and private angler sectors were derived from Green and Campbell (2005) and Gentner (2004). Gentner (2004) reports the results of a conjoint analysis survey that asked respondents to choose among hypothetical fishing trips that varied by the expected catch and keep of grouper, red snapper, dolphin, king mackerel and "other" species, the cost of the trip, and size and bag limit regulations. The survey was conducted in 2004, four years after the current recreational red snapper fishing season was established (2000). Thus, it is assumed that all survey participants were adequately aware of the seasonal constraints of the red snapper fishery and availability of other species in their area. The model developed from the survey data allows the estimation of behavioral change in response to a management change. Response options included continued fishing for the target species, substitution of another target species, or cessation of fishing. It is logically assumed that angler response to the survey questions on switching behavior when faced with increased red snapper restrictions included consideration of species availability in their fishing area, in both absolute terms, as in the case of the limited geographic range of some grouper species, and seasonal terms, as in the case of king mackerel and dolphin. The selection of grouper, king mackerel, or dolphin as substitute trips by anglers in the survey indicates knowledge or expectation that these species are available. Where the species are not available, it is assumed that the respondent selected either continued fishing for red snapper or cessation of fishing. For the headboat sector, changes in net effort and economic value were estimated based on Carter and Letson (2006), whom describe a headboat effort response model, and Carter (2003), which presents an economic analysis of the Gulf of Mexico recreational sector. Additional data on effects associated with changes in minimum size and bag limits were obtained from SERO (2006c). Detailed discussions of the analyses are provided in Appendices D-F. The results of the analysis are provided in Tables 5.1.3.1.3-6 and represent short term impacts. Changes in effort are in terms of angler trips for the charter and private sectors, and in terms of angler days in the headboat sector. The trip variable for the charter and private angler sector is not normalized to have a specific duration or time component, whereas an angler day represents a normalized 12-hour trip. The estimated changes in consumer surplus are a function of the loss in consumer surplus associated with reduced effort (fishing trips) and the reduced consumer surplus per trip associated with trips that continue to be taken, but under more restrictive bag limits.

While it is important to note that the analysis of the expected impacts of a regulatory action generally includes consideration of both short-term and long-term impacts, economic analyses presented in this document focus on short-term impacts. Although yield projections for the length of the rebuilding plan are provided in Table 2.2, the uncertainty surrounding the future evolution of the commercial shrimp fishery effort levels and corresponding red snapper bycatch mortality in the Gulf and the scheduled updated assessment of the red snapper stock in 2009 support this approach. In all likelihood, the Council may revisit the red snapper-related management measures, including TACs, following the completion of the updated assessment. It is, however, expected that, in the long run, as the red snapper stock improves and yields are increased, greater economic benefits will be derived from the resource.

[25] David Carter, Southeast Fisheries Science Center, NMFS, 75 Virginia Beach Drive Miami, Florida

The following discussion, particularly with respect to season length, reflects the impacts that would be expected to occur under no action conditions for the captain and crew bag limit (**Action 2**, **Alternative 1**). As described in Table 2.1.1, however, the recreational red snapper fishing season would be expected to be extended under the 0-fish captain and crew bag limit in **Preferred Alternative 2** (**Action 2**) by 3-7 days, depending upon the TAC alternative and sub-option and, hence, would be expected to mitigate a portion of the short-term adverse impacts described. These effects are not reflected in the following discussion. Their omission, however, would not be expected to affect the ranking of the alternatives.

Alternative 1, no action, would maintain the current 9.12 MP red snapper TAC and corresponding 4.47 MP recreational quota, and leave current season (194 days), bag, and size limits unchanged. The current red snapper recreational season is April 21 through October 31. Table 5.1.3.1.1 presents 2003 targeted fishing trips by mode for the charter and private sectors. The 2003 angler days for the headboat sector are provided in Table 5.1.3.1.2. Bag and minimum size limits presently in effect are 4 fish and 16 inches, respectively. Under this alternative, recreational fishing effort would remain unaffected and no changes in economic value derived from the recreational sector would be expected in the short run. However, continued divergence from the red snapper recovery plan would, in the long run, result in adverse impacts on the economic environment through more stringent management measures, including future TAC reductions. In the commercial sector, maintaining the current 4.65 MP commercial quota would not impact short-term net revenues. Under the status quo, however, conservation goals would not be expected to be met, likely requiring more severe restrictions than those proposed in this amendment, with accompanying increased short term adverse economic impacts.

Table 5.1.3.1.1 Targeted Recreational Fishing Trips in the Gulf of Mexico by Mode (2003) for Charter and Private Vessel Sectors.

Species	Charter	Private	Total
Grouper	26,951	299,042	325,993
Red Snapper	110,281	385,126	495,407
Dolphin	30,896	92,873	123,769
King Mackerel	41,758	409,529	451,287
Total	209,886	1,186,570	1,396,456

Sources: The base number of target trips for LA, MS, AL, and W. FL was derived from the 2003 MRFSS by Stephen Holiman at NMFS SERO. The base number of private and charter boat target trips for TX was derived the 2003 TPWD creel survey and the distribution of "species sought" reported in Tables B.9, D.9, and F.9 of Green and Campbell (2005).

Source: David Carter, SEFSC (personal communication[31])

Table 5.1.3.1.2 Head Boat Angler Days in the Gulf of Mexico, 2003

State	Angler Days	Share

Texas	74,432	33%
Louisiana	6,636	3%
Eastern Gulf of Mexico	144,211	64%
Total	225,279	100%

Sources: NMFS Head Boat Survey

Alternative 2 would reduce the red snapper TAC to 7.0 MP and establish a 3.43 MP recreational quota. Eleven management scenarios that would be consistent with achieving this quota were evaluated. The net reduction in economic value relative to **Alternative 1** (no action) in the recreational sector for this alternative ranges from approximately $21.03 million ((**Alternative 2(a)(i)**) to approximately $61.13 million (**Alternative 2(c)(iii)**). In the commercial sector, net revenue losses associated with a 7.0 MP TAC and a 3.57 MP commercial quota are estimated to be approximately $5.8 million, or a reduction of approximately 22.5 percent (see Section 5.4.3).

<u>Option 2(a)</u> would maintain the current bag and minimum size limit. Four sub-options that reduce the current fishing season were considered. A reduction in the red snapper fishing season would be expected to result in a decline in directed red snapper fishing effort and an expansion in directed effort for other species. Overall, however, a net decline in directed fishing effort is expected, with an associated reduction in consumer and producer surplus.

Sub-option 2(a)(i) would establish a May 15 through September 30 (139 days) recreational red snapper fishing season. The corresponding reduction in red snapper-directed effort in the charter and private sectors are estimated at 2,111 and 5,517 trips, respectively. These effort reductions would be mitigated by increases in directed effort for grouper, king mackerel, and dolphin. However, total directed effort would be expected decline by 1,840 trips, 3,447 trips, and 3,981 angler days, in the charter, private, and headboat sectors, respectively. The expected reduction in economic value (consumer surplus and producer surplus) relative to **Alternative 1** (no action) for this alternative is estimated at $3,863,480, $16,180,113 and $982,775, for the charter, private, and headboat sectors, respectively, or a total of approximately $21.03 million. The discussion of the expected impacts of subsequent alternatives and sub-options will note total impacts in terms of trips (charter and private anglers), angler days (headboat sector), and total economic value (all sectors); the reader is encouraged to refer to Tables 5.1.3.1.3-5.1.3.1.6 for the detailed sector results.

Sub-option 2(a)(ii) would establish a recreational season of May 15 to August 31 plus 8 weekends after August 31 (125 days). Total directed effort would be expected decline by 6,415 trips and 5,219 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $26.37 million.

Sub-option 2(a)(iii) would establish a recreational season of May 15 to August 31 plus 8 weekends after August 31 in the EEZ off Texas (125 days), and a season of May 15 to September 30 (139 days), with no weekend openings thereafter, in the rest of the Gulf. Total directed effort would be expected decline by 5,733 trips and 4,390 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated at $22.37 million, approximately. However, these losses may be overstated if anglers who traditionally fish in other states shift their effort to Texas to take advantage of the extended Texas season. Estimated losses may also be overstated since the non-uniform restrictions complicate enforcement.

Sub-option 2(a)(iv) would establish a recreational season of May 15 to August 31 plus 8 weekends after August 31 in the EEZ west of the Mississippi River (Louisiana and Texas) (125 days), and a season of May 15 to September 30 (139 days), with no weekend openings thereafter, in the rest of the Gulf. Total directed effort would be expected decline by 5,907 trips and 4,426 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $23.40 million. However, these losses may be overstated if anglers who traditionally fish in other parts of the Gulf shift their effort to west of the Mississippi River. Similar to the expected impacts of **Sub-option 2(a)(iii)**, enforcement problems would continue, effectively reducing the expectations of adverse impacts.

<u>Option 2(b)</u> would establish a 3-fish bag limit and either a 16-inch or 15-inch minimum size limit. While a bag limit lower than the status quo (4 fish) would tend to extend the recreational season due to the greater number of trips required to harvest a given number of fish, a size limit reduction has the opposite effect because it increases the likelihood of catching a legal size fish.

Sub-option 2(b)(i) would establish a 3-fish bag limit, maintain the existing 16-inch minimum size limit, and establish a May 15 to October 15 recreational red snapper fishing season (154 days). Total directed effort would be expected decline by 9,187 trips and 2,790 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $32.27 million.

Sub-option 2(b)(ii) would establish a 3-fish bag limit, reduce the minimum size limit to 15 inches, and establish a June 1 to October 15 recreational red snapper season (137 days). Total directed effort would be expected change by -10,963 trips and 1,402 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $39.28 million.

Table 5.1.3.1.3: Changes in Target Trips and Economic Effects in the Charter Sector

Alternative	Change in Target Angler Trips					Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
	Dolphin	Grouper	King Mackerel	Red Snapper	Total			
1	0	0	0	0	0	$0	$0	$0
2(a)(i)	96	82	92	-2111	-1,840	-$3,613,235	-$250,244	-$3,863,480
2(a)(ii)	105	89	98	-2162	-1,871	-$3,765,641	-$254,514	-$4,020,156
2(a)(iii)	96	82	93	-2128	-1856	-$3,635,674	-$252,422	-$3,888,096
2(a)(iv)	97	82	93	-2174	-1902	-$3,689,469	-$258,698	-$3,948,167
2(b)(i)	140	116	141	-3,207	-2,809	-$4,752,353	-$382,073	-$5,134,425
2(b)(ii)	168	139	166	-3,663	-3,191	-$5,661,060	-$433,919	-$6,094,979
2(c)(i)	202	163	207	-4,736	-4,164	-$7,787,495	-$566,323	-$8,353,819
2(c)(ii)	220	180	227	-5,123	-4,496	-$8,443,576	-$611,465	-$9,055,041
2(c)(iii)	218	176	223	-5,033	-4,416	-$8,316,757	-$600,513	-$8,917,270
2(c)(iv)	202	163	213	-4,850	-4,273	-$7,935,569	-$581,102	-$8,516,670
2(c)(v)	202	163	213	-4,896	-4,318	-$7,986,484	-$587,251	-$8,573,735
3(a)(i)	243	200	249	-5,557	-4,865	-$9,248,055	-$661,668	-$9,909,723
3(a)(ii)	231	190	253	-5,767	-5,093	-$9,372,647	-$692,702	-$10,065,349
3(b)(i)	236	194	249	-5,716	-5,038	-$9,347,560	-$685,108	-$10,032,667
3(b)(ii)	327	272	329	-7,093	-6,164	-$11,968,520	-$838,372	-$12,806,892
3(b)(iii)	236	194	272	-6,157	-5,456	-$9,906,448	-$742,053	-$10,648,501
3(b)(iv)	237	194	272	-6,284	-5,582	-$10,045,175	-$759,085	-$10,804,259
3(c)	237	195	251	-5,741	-5,058	-$9,381,993	-$687,898	-$10,069,891
3(d)(i)	243	201	263	-5,985	-5,277	-$9,749,528	-$717,696	-$10,467,223
3(d)(ii)	253	209	266	-6,001	-5,274	-$9,864,803	-$717,245	-$10,582,048
3(d)(iii)	249	207	279	-6,331	-5,597	-$10,239,723	-$761,163	-$11,000,886
3(e)	262	218	282	-6,318	-5,556	-$10,358,431	-$755,665	-$11,114,097
3(f)(i)	277	223	289	-6,564	-5,776	-$11,127,965	-$785,473	-$11,913,438
3(f)(ii)	273	219	289	-6,631	-5,851	-$11,149,623	-$795,681	-$11,945,304
3(g)(i)	266	210	275	-6,317	-5,567	-$10,800,097	-$757,082	-$11,557,179
3(g)(ii)	268	213	279	-6,401	-5,640	-$10,910,011	-$767,048	-$11,677,060
4(a)(i)	298	250	320	-7,083	-6,216	-$11,672,187	-$845,377	-$12,517,564
4(a)(ii)	322	269	335	-7,340	-6,415	-$12,214,907	-$872,384	-$13,087,291
4(a)(iii)	298	250	320	-7,090	-6,223	-$11,680,213	-$846,303	-$12,526,515
4(a)(iv)	298	250	320	-7,120	-6,253	-$11,712,473	-$850,343	-$12,562,816
4(b)	300	252	322	-7,165	-6,291	-$11,785,770	-$855,595	-$12,641,365
4(c)	302	253	325	-7,269	-6,389	-$11,917,419	-$868,866	-$12,786,284
4(d)	303	255	327	-7,303	-6,417	-$11,976,640	-$872,759	-$12,849,399

Table 5.1.3.1.4: Changes in Target Trips and Economic Effects in the Private Angling Sector

Alternative	Change in Target Angler trips					Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
	Dolphin	Grouper	King Mackerel	Red Snapper	Total			
1	0	0	0	0	0	$0	$0	$0
2(a)(i)	241	668	1160	-5517	-3,447	-$16,180,113	$0	-$16,180,113
2(a)(ii)	318	894	1482	-7238	-4,544	-$21,102,586	$0	-$21,102,586
2(a)(iii)	247	668	1280	-6072	-3877	-$17,410,008	$0	-$17,410,008
2(a)(iv)	247	668	1287	-6207	-4005	-$17,585,785	$0	-$17,585,785
2(b)(i)	416	1,107	2051	-9,953	-6,378	-$24,398,163	$0	-$24,398,163
2(b)(ii)	492	1,318	2473	-12,055	-7,772	-$30,502,939	$0	-$30,502,939
2(c)(i)	644	1,669	3170	-15,651	-10,169	-$43,751,006	$0	-$43,751,006
2(c)(ii)	707	1,866	3483	-17,124	-11,068	-$47,989,854	$0	-$47,989,854
2(c)(iii)	727	1,904	3555	-17,749	-11,562	-$49,416,820	$0	-$49,416,820
2(c)(iv)	652	1,669	3332	-16,405	-10,752	-$45,385,757	$0	-$45,385,757
2(c)(v)	652	1,669	3339	-16,549	-10,890	-$45,569,654	$0	-$45,569,654
3(a)(i)	775	2,058	3866	-19,004	-12,305	-$53,341,496	$0	-$53,341,496
3(a)(ii)	798	2,113	4067	-19,996	-13,018	-$55,746,507	$0	-$55,746,507
3(b)(i)	793	2,112	3977	-19,636	-12,755	-$54,896,761	$0	-$54,896,761
3(b)(ii)	1075	2,926	5119	-24,551	-15,432	-$70,973,600	$0	-$70,973,600
3(b)(iii)	818	2,112	4485	-21,959	-14,544	-$59,928,343	$0	-$59,928,343
3(b)(iv)	818	2,112	4498	-22,257	-14,829	-$60,303,038	$0	-$60,303,038
3(c)	792	2,112	3977	-19,615	-12,733	-$54,790,821	$0	-$54,790,821
3(d)(i)	819	2,182	4168	-20,476	-13,307	-$57,055,873	$0	-$57,055,873
3(d)(ii)	840	2,252	4255	-20,978	-13,631	-$58,452,265	$0	-$58,452,265
3(d)(iii)	862	2,304	4422	-21,625	-14,037	-$60,318,218	$0	-$60,318,218
3(e)	872	2,340	4479	-21,993	-14,302	-$61,177,115	$0	-$61,177,115
3(f)(i)	913	2,354	4525	-22,512	-14,720	-$65,117,534	$0	-$65,117,534
3(f)(ii)	930	2,414	4630	-23,006	-15,032	-$66,249,403	$0	-$66,249,403
3(g)(i)	883	2,233	4303	-21,543	-14,125	-$63,117,596	$0	-$63,117,596
3(g)(ii)	902	2,304	4419	-22,042	-14,417	-$64,321,642	$0	-$64,321,642
4(a)(i)	976	2,654	4990	-24,262	-15,642	-$68,191,903	$0	-$68,191,903
4(a)(ii)	1,032	2,816	5219	-25,581	-16,515	-$71,744,215	$0	-$71,744,215
4(a)(iii)	980	2,654	5057	-24,580	-15,889	-$68,867,936	$0	-$68,867,936
4(a)(iv)	980	2,654	5058	-24,607	-15,915	-$68,901,372	$0	-$68,901,372
4(b)	985	2,679	5035	-24,503	-15,804	-$68,797,091	$0	-$68,797,091
4(c)	995	2,709	5102	-24,825	-16,020	-$69,631,462	$0	-$69,631,462
4(d)	1,000	2,726	5117	-24,883	-16,039	-$69,864,874	$0	-$69,864,874

Table 5.1.3.1.5: Changes in Angler Days and Economic Effects in the Headboat Sector

Alternative	Change in Angler Days	Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
1	0	$0	$0	$0
2(a)(i)	-3981	-$734,119	-$248,657	-$982,775
2(a)(ii)	-5219	-$917,244	-$326,026	-$1,243,270
2(a)(iii)	-4390	-$794,632	-$274,220	-$1,068,852
2(a)(iv)	-4426	-$1,588,749	-$276,499	-$1,865,248
2(b)(i)	-2,790	-$2,566,002	-$174,308	-$2,740,310
2(b)(ii)	1,402	-$2,766,618	$87,551	-$2,679,067
2(c)(i)	2,749	-$2,583,963	$171,745	-$2,412,218
2(c)(ii)	10,164	-$2,919,838	$634,931	-$2,284,907
2(c)(iii)	490	-$2,831,284	$30,631	-$2,800,653
2(c)(iv)	2,003	-$1,462,963	$125,121	-$1,337,842
2(c)(v)	1,936	-$2,673,590	$120,964	-$2,552,626
3(a)(i)	-6,356	-$3,153,210	-$397,018	-$3,550,228
3(a)(ii)	-10,498	-$3,416,955	-$655,775	-$4,072,730
3(b)(i)	-9,349	-$3,406,276	-$583,988	-$3,990,264
3(b)(ii)	-14,839	-$4,216,049	-$926,977	-$5,143,026
3(b)(iii)	-11,163	-$3,674,033	-$697,311	-$4,371,344
3(b)(iv)	-11,324	-$3,697,895	-$707,414	-$4,405,309
3(c)	-6,258	-$3,484,546	-$390,940	-$3,875,486
3(d)(i)	-4,393	-$3,639,728	-$274,422	-$3,914,150
3(d)(ii)	-3,149	-$3,620,467	-$196,728	-$3,817,195
3(d)(iii)	-9,674	-$3,981,040	-$604,346	-$4,585,386
3(e)	-3,253	-$3,872,563	-$203,208	-$4,075,771
3(f)(i)	4,794	-$4,171,181	$299,496	-$3,871,685
3(f)(ii)	-127	-$4,424,487	-$7,944	-$4,432,431
3(g)(i)	-2,925	-$3,795,295	-$182,695	-$3,977,989
3(g)(ii)	-4,442	-$3,832,240	-$277,486	-$4,109,726
4(a)(i)	-18,965	-$4,657,264	-$1,184,712	-$5,841,975
4(a)(ii)	-19,084	-$4,682,153	-$1,192,136	-$5,874,289
4(a)(iii)	-19,004	-$4,665,487	-$1,187,165	-$5,852,652
4(a)(iv)	-19,008	-$4,666,220	-$1,187,383	-$5,853,604
4(b)	-18,253	-$4,698,082	-$1,140,252	-$5,838,334
4(c)	-17,378	-$4,710,969	-$1,085,561	-$5,796,530
4(d)	-16,598	-$4,726,418	-$1,036,845	-$5,763,263

Table 5.1.3.1.6: Changes in Recreational Effort and Aggregate Economic Effects

Alternative	Change from 2003 Target Effort			Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
	Charter	Private	Head Boat			
1	0.00%	0.00%	0.00%	$0	$0	$0
2(a)(i)	-0.88%	-0.29%	-1.77%	-$20,527,467	-$498,901	-$21,026,368
2(a)(ii)	-0.89%	-0.38%	-2.32%	-$25,785,471	-$580,540	-$26,366,012
2(a)(iii)	-0.88%	-0.33%	-1.95%	-$21,840,314	-$526,642	-$22,366,956
2(a)(iv)	-0.91%	-0.34%	-1.96%	-$22,864,003	-$535,197	-$23,399,200
2(b)(i)	-1.34%	-0.54%	-1.24%	-$31,716,518	-$556,381	-$32,272,898
2(b)(ii)	-1.52%	-0.65%	0.62%	-$38,930,617	-$346,368	-$39,276,985
2(c)(i)	-1.98%	-0.86%	1.22%	-$54,122,464	-$394,578	-$54,517,043
2(c)(ii)	-2.14%	-0.93%	4.51%	-$59,353,268	$23,466	-$59,329,802
2(c)(iii)	-2.10%	-0.97%	0.22%	-$60,564,861	-$569,882	-$61,134,743
2(c)(iv)	-2.04%	-0.91%	0.89%	-$54,784,289	-$455,981	-$55,240,269
2(c)(v)	-2.06%	-0.92%	0.86%	-$56,229,728	-$466,287	-$56,696,015
3(a)(i)	-2.32%	-1.04%	-2.82%	-$65,742,761	-$1,058,686	-$66,801,447
3(a)(ii)	-2.43%	-1.10%	-4.66%	-$68,536,109	-$1,348,477	-$69,884,586
3(b)(i)	-2.40%	-1.07%	-4.15%	-$67,650,597	-$1,269,096	-$68,919,692
3(b)(ii)	-2.94%	-1.30%	-6.59%	-$87,158,169	-$1,765,349	-$88,923,518
3(b)(iii)	-2.60%	-1.23%	-4.96%	-$73,508,824	-$1,439,364	-$74,948,188
3(b)(iv)	-2.66%	-1.25%	-5.03%	-$74,046,108	-$1,466,499	-$75,512,606
3(c)	-2.41%	-1.07%	-2.78%	-$67,657,360	-$1,078,838	-$68,736,198
3(d)(i)	-2.51%	-1.12%	-1.95%	-$70,445,129	-$992,118	-$71,437,246
3(d)(ii)	-2.51%	-1.15%	-1.40%	-$71,937,535	-$913,973	-$72,851,508
3(d)(iii)	-2.67%	-1.18%	-4.29%	-$74,538,981	-$1,365,509	-$75,904,490
3(e)	-2.65%	-1.21%	-1.44%	-$75,408,109	-$958,873	-$76,366,983
3(f)(i)	-2.75%	-1.24%	2.13%	-$80,416,680	-$485,977	-$80,902,657
3(f)(ii)	-2.79%	-1.27%	-0.06%	-$81,823,513	-$803,625	-$82,627,138
3(g)(i)	-2.65%	-1.19%	-1.30%	-$77,712,988	-$939,777	-$78,652,764
3(g)(ii)	-2.69%	-1.22%	-1.97%	-$79,063,893	-$1,044,534	-$80,108,428
4(a)(i)	-2.96%	-1.32%	-8.42%	-$84,521,354	-$2,030,089	-$86,551,442
4(a)(ii)	-3.06%	-1.39%	-8.47%	-$88,641,275	-$2,064,520	-$90,705,795
4(a)(iii)	-2.96%	-1.34%	-8.44%	-$85,213,636	-$2,033,468	-$87,247,103
4(a)(iv)	-2.98%	-1.34%	-8.44%	-$85,280,065	-$2,037,726	-$87,317,792
4(b)	-3.00%	-1.33%	-8.10%	-$85,280,943	-$1,995,847	-$87,276,790
4(c)	-3.04%	-1.35%	-7.71%	-$86,259,850	-$1,954,427	-$88,214,276
4(d)	-3.06%	-1.35%	-7.37%	-$86,567,932	-$1,909,604	-$88,477,536

<u>Option 2(c)</u> would establish a 2-fish bag limit, reduce the minimum size limit to either 15 or 13 inches, and considered geographical differences in seasons. Again, it should be noted that while the bag limit reduction will reduce the harvest rate, a reduction in the minimum size limit will increase the harvest rate. The effects of this can be clearly seen through comparison of the expected impacts of **Sub-options 2(c)(i)** and **(ii)**.

Sub-option 2(c)(i) would establish a 2-fish bag limit, reduce the minimum size limit to 15 inches, and establish a May 15 to October 15 recreational red snapper fishing season (154 days). Total directed effort in the charter/private angler sector would be expected to decline by 14,333 trips, while the headboat sector would be expected to gain 2,749 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $54.52 million.

Sub-option 2(c)(ii) would establish a 2-fish bag limit, reduce the minimum size limit to 13 inches, and establish a May 15 to September 15 recreational red snapper fishing season (124 days). Total directed effort in the charter/private angler sector would be expected to decline by 15,564 trips, while the headboat sector would be expected to gain 10,164 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $59.33 million.

Sub-option 2(c)(iii) would establish a 2-fish bag limit, reduce the minimum size limit to 15 inches, and establish a May 15 to August 31 recreational red snapper fishing season, plus allow 12 weekend openings after August 31 (133 days). Total directed effort would be expected to change by -15,978 trips and 490 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $61.13 million.

Sub-option 2(c)(iv) would establish a 2-fish bag limit, reduce the minimum size limit to 15 inches, establish a May 15 to August 31 plus 12 weekend openings after August 31 recreational red snapper fishing season off Texas (133 days), and establish a May 15 to October 15 with no additional weekend openings season in the rest of the Gulf (154 days). Total directed effort in the charter/private angler sector would be expected to decline by 15,025 trips, while the headboat sector would be expected to gain 2,003 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $55.24 million. As previously mentioned, regional seasonal disparities may create incentives for some anglers to shift their effort, thus potentially reducing the adverse impacts expected to accrue to these restrictions, while simultaneously jeopardizing necessary harvest reductions and associated benefits. Enforcement issues, and their impact on recovery goals and associated benefits, also remain.

Sub-option 2(c)(v) would establish a 2-fish bag limit, reduce the minimum size limit to 15 inches, establish a May 15 to August 31 plus 12 weekend openings after August 31 recreational red snapper fishing season west of the Mississippi River (133 days), and establish a May 15 to October 15, with no additional weekend openings, season in the rest of the Gulf (154 days). Total directed effort in the charter/private angler sector would be expected to decline by 15,208 trips, while the headboat sector would be expected to gain 1,936 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $56.70 million. The drawbacks associated with regional differences in the fishing season as discussed for previous alternatives are applicable to this alternative as well.

Preferred Alternative 3 would reduce the red snapper TAC to 5.0 MP and establish a 2.45 MP recreational quota. Management measures considered in **Options a through e (included)** establish a 2-fish bag limit; all other measures **(Options f and g)** would establish a 1-fish bag limit. Several management scenarios that would be consistent with achieving this quota were evaluated. The net reduction in economic value relative to **Alternative 1** (no action) in the recreational sector for sub-options considered under this alternative ranges from approximately $66.80 million **(Alternative 3[a][i])** to approximately $88.92 million **(Alternative 3[b][ii])**. In the commercial sector, net revenue losses associated with a 5.0 MP TAC and a 2.55 MP commercial quota are estimated to be approximately $11.5 million, or a reduction of approximately 44 percent (see Section 5.3.3).

Preferred Option 3(a) would maintain the current 16-inch minimum size limit. Two sub-options considering different starting dates for the recreational season are evaluated under this option.

Preferred Sub-Option 3(a)(i) would establish a June 1 to September 15 recreational red snapper fishing season. This option corresponds to the longest recreational fishing season (107 days) under a 5.0 MP TAC. Total directed effort would be expected to decline by 17,170 trips and 6,356 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated at $66.80 million, approximately.

Sub-Option 3(a)(ii) would establish a May 1 to July 31 recreational red snapper fishing season (92 days). Total directed effort would be expected to decline by 18,111 trips and 10,4,98 angler days, and the expected reduction in economic value relative to no action **(Alternative 1)** is estimated to be approximately $69.88 million.

Option 3(b) would maintain the current 16-inch minimum size limit. Four sub-options considering regional differences in season format are evaluated under this option.

Sub-Option 3(b)(i) would establish a May 15 to August 15 recreational red snapper fishing season (92 days). Total directed effort would be expected to decline by 17,793 trips and 9,349 angler days, and the expected reduction in economic value relative to no action (**Alternative 1**) is estimated to be approximately $68.92 million.

Sub-option 3(b)(ii) would establish a July 1 to July 31 recreational red snapper fishing season, plus allow 6 gulfwide weekend openings immediately prior to July 1, and 7 gulfwide weekend openings immediately after July 31 (57 days). Total directed effort would be expected to decline by 21,596 trips and 14,839 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $88.92 million.

Sub-option 3(b)(iii) would establish a recreational season of July 1 – July 31 plus 6 weekends immediately prior to July 1 and 7 weekends immediately after July 31 in the EEZ off Texas (57 days); and a season of May 15 to August 15 (92 days), with no weekend openings thereafter, in the rest of the Gulf EEZ. Total directed effort is expected to decline by 20,000 trips and 11,163 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated at $74.95 million, approximately. As previously discussed, these regional disparities in season length may be difficult to enforce and may lead to sizeable effort increases if anglers who traditionally fish in other states shift their effort to Texas to take advantage of the extended Texas season.

Sub-option 3(b)(iv) would establish a recreational season of July 1 – July 31 plus 6 weekends immediately prior to July 1 and 7 weekends immediately after July 31 in the EEZ west of the Mississippi River (Louisiana and Texas) (57 days); and a season of May 15 to August 15 (92 days), with no weekend openings thereafter, in the rest of the Gulf. Total directed effort would be expected decline by 20,411 trips and 11,324 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $75.51 million. Similar to **Sub-option 3(b)(iii)**, enforcement problems are expected to continue due to regional disparities.

<u>Option 3(c)</u> would reduce the minimum size limit to 15 inches, and establish a May 15 to August 10 recreational red snapper fishing season (88 days). Total directed effort would be expected to decline by 17,791 trips and 6,258 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $68.74 million.

<u>Option 3(d)</u> would set a 14-inch minimum size limit and evaluates different starting dates for the recreational season. The three sub-options considered would start the season on May 15, June 1, or May 1.

Sub-option 3(d)(i) would establish a May 15 to July 31 recreational red snapper fishing season (77 days). Total directed effort would be expected to decline by 18,584 trips and 4,393 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $71.44 million.

Sub-option 3(d)(ii) would establish a June 1 to August 15 recreational red snapper fishing season (76 days). Total directed effort would be expected to decline by 18,905 trips and 3,149 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $72.85 million.

Sub-option 3(d)(iii) would establish a May 1 to July 9 recreational red snapper fishing season (71 days). Total directed effort would be expected to decline by 19,634 trips and 9,674 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $75.90 million.

<u>Option 3(e)</u> would reduce the minimum size limit to 13 inches, and establish a June 1 –July 31 recreational red snapper fishing season (61 days). Total directed effort would be expected to decline by 19, 858 trips and 3,253 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $76.37 million.

<u>Option 3(f)</u> would set a 1-fish bag limit and a 14-inch minimum size limit. The two sub-options considered would either start the season on June 1 or on May 1.

Sub-option 3(f)(i) would establish a June 1 to September 30 recreational red snapper fishing season (122 days). Total directed effort would be expected to change by -20,496 trips and 4,794 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $80.90 million.

Sub-option 3(f)(ii) would establish a May 1 to August 10 recreational red snapper fishing season (102 days). Total directed effort would be expected to decline by 20,883 trips and 127 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $82.63 million.

Option 3(g) would set a 1-fish bag limit and a 16-inch minimum size limit. The two sub-options considered would either start the season on May 15 or on May 1.

Sub-option 3(g)(i) would establish a May 15 to October 15 recreational red snapper fishing season (154 days). Total directed effort would be expected to decline by 19,692 trips and 2,925 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $78.65 million.

Sub-option 3(g)(ii) would establish a May 1 to September 15 recreational red snapper fishing season (138 days). Total directed effort would be expected to decline by 20,057 trips and 4,442 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $80.11 million.

Alternative 4 would reduce the red snapper TAC to 3.0 MP, establish a 1.47 MP recreational quota, and establish a 2-fish bag limit. Management scenarios that would be consistent with these measures and various season formats are considered. The net reduction in economic value relative to **Alternative 1** (no action) in the recreational sector for sub-options considered under this alternative ranges from approximately $86.55 million (**Sub-option 4(a)(i)**) to approximately $90.70 million (**Sub-option 4(a)(ii)**). In the commercial sector, net revenue losses associated with a 3.0 MP TAC and a 1.53 MP commercial quota are estimated to be approximately $17.1 million, or a reduction of approximately 66 percent (see Section 5.4.3).

Option 4(a) would establish regional differences in season format. Sub-options evaluated under this option consider weekend openings in some or all Gulf regions.

Sub-option 4(a)(i) would maintain the current 16-inch minimum size limit, set a 2-fish bag limit, and, establish a August 1 to September 15 recreational red snapper fishing season (46 days). Total directed effort would be expected to decline by 21,858 trips and 18,965 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated at $86.55 million, approximately.

Sub-option 4(a)(ii) would maintain the current 16-inch minimum size limit, set a 2-fish bag limit, and, establish a August 1 – August 31 recreational red snapper fishing season, plus allow 2 gulfwide weekend openings immediately prior to August 1, and 2 gulfwide weekend openings immediately after August 31 (39 days). Total directed effort would be expected to decline by 22,930 trips and 19,084 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $90.71 million.

Sub-option 4(a)(iii) would maintain the current 16-inch minimum size limit, set a 2-fish bag limit, and, establish a recreational season of August 1 – August 31 plus 2 weekends immediately prior to August 1 and 2 weekends immediately after August 31 in the EEZ off Texas (39 days); and a season of August 1 to September 15 (53 days), with no weekend openings thereafter, in the rest of the Gulf EEZ. Total directed effort is expected to decline by 22,112 trips and 19,004 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated at $87.25 million, approximately. As previously discussed, these regional disparities in season length may be difficult to enforce and may lead to sizeable effort increases if anglers who traditionally fish in other states shift their effort to Texas to take advantage of the extended Texas season.

Sub-option 4(a)(iv) would maintain the current 16-inch minimum size limit, set a 2-fish bag limit, and, establish a recreational season of August 1 – August 31 plus 2 weekends immediately prior to August 1 and 2 weekends immediately after August 31 in the EEZ west of the Mississippi River (Louisiana and Texas) (39 days); and a season of August 1 to September 15 (53 days), with no weekend openings thereafter, in the rest of the Gulf. Total directed effort would be expected decline by 22,168 trips and 19,008 angler days. The expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $87.32 million. Similar to **Sub-option 3(b)(iii)**, enforcement problems are expected to continue due to regional disparities.

Option 4(b) would set a 2-fish bag limit, reduce the minimum size limit to 15 inches, and, establish a August 1 to September 8 recreational red snapper fishing season (39 days). Total directed effort would be expected to decline by 22,095 trips and 18,253 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $87.28 million.

Option 4(c) would set a 2-fish bag limit, reduce the minimum size limit to 14 inches, and establish a August 1 to September 4 recreational red snapper fishing season (35 days). Total directed effort would be expected to decline by 22,409 trips and 17,378 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $88.21 million.

Option 4(d) would set a 2-fish bag limit, reduce the minimum size limit to 13 inches, and establish a August 1 to August 31 recreational red snapper fishing season (31 days). Total directed effort would be expected to decline by 22,456 trips and 16,598 angler days, and the expected reduction in economic value relative to **Alternative 1** (no action) is estimated to be approximately $88.48 million.

<u>Summary</u>

Reductions in TAC from the status quo would be expected to result in short-term economic losses to fishery participants and associated businesses. In the long run, TAC reductions, which are being considered to end overfishing, return the resource to the required recovery path, and recover the stock, are expected to result in economic benefits. Analyses provided in this amendment focus on short-term impacts. The results logically reflect the expectation that the greater the reduction in TAC, the greater the short-term economic loss. For the recreational sector, the expected annual loss in economic value (consumer and producer surplus) relative to the status quo ranges from approximately $21.03 million under **Alternative 2(a)(i),** which would set a 7 MP TAC, 4-fish bag limit, 16-inch minimum size limit, and a May 15-September 30 fishing season, to approximately $90.70 million under **Alternative 4(a)(ii), which** would set a 3.0 MP TAC, 2-fish bag limit, 16-inch minimum size limit, and, a August 1 – August 31 plus 2 weekend gulf-wide openings immediately prior to August 1 and 2 weekend gulf-wide openings immediately after August 31 recreational fishing season.

If the selection of the preferred management measure were solely determined by a comparison between expected reductions in economic value relative to the no action alternative, then **sub-option 2(a)(i)**, which would result in the lowest loss of economic value, would have been the preferred measure. **Sub-option 2(a)(i)** would establish a 7.0 MP TAC and maintain a 4-fish bag limit and a 16-inch minimum size limit. However, the selection of a preferred alternative is also constrained by additional factors, including assumptions related to expected reductions in directed and bycatch mortality rates and, as indicated in a Court Opinion publish on March 12, 2007, a sufficient, i.e., more than 50 percent, probability of success of the red snapper rebuilding plan. Achievable TAC levels for different combinations of directed and bycatch mortality reductions are presented in Table 2.3. In the short run, none of the scenarios presented would support a TAC in excess of 5.0 MP while providing a sufficient likelihood of success of the rebuilding plan. Hence, the management options considered under the status quo (**Alternative 1, 9.12 MP TAC**) and **Alternative 2** (7.0 MP TAC) are expected to fail to meet the required conservation objectives and would not meet the legal mandate. Further, even if adoptable as short term measures, the subsequent TAC reductions associated with either alternative that would be necessary to achieve the long term recovery of the resource would be expected to be substantially more severe than those proposed in this amendment, resulting in even greater adverse economic impacts than those described for the proposed alternative. The exact magnitude of these greater impacts cannot be described at this time, however, since neither the necessary TAC reductions nor the explicit management measures (bag, size, and season limits) that would be adopted to constrain harvests are known. The TACs associated with **Alternatives 3 and 4** are consistent with the rebuilding target and mortality reduction assumptions. However, the selection of a preferred measure within **Alternative 4** would result in an overly restrictive management approach and unwarranted additional losses in economic value. While projections of allowable increased TACs beyond 2010 are available for Alternatives 3 and 4, as provided in Table 2.2, examination of the expected economic impacts associated with these is not attempted at this time since the projections have the potential to change as a result of the updated stock assessment (which will capture the effectiveness of the proposed measures as well as potential unpredictable environmental variability) and because the impacts will be dependent upon the manner in which the expected TAC increases are made available to the fishery, i.e., whether through a longer open season, higher liberal bag limit, or some combination thereof.

Preferred Alternative 3 would set a 5.0 MP red snapper TAC, corresponding to a 2.45 MP recreational quota. **Preferred sub-option 3(a)(i)** would maintain the current 16-inch minimum size limit, set a 2-fish bag limit, and a recreational fishing season running from June 1 to September 15, for a total of 107 fishing days. Short term effort decreases associated with the preferred sub-option are estimated at 17,170 trips and 6,356 angler days. Relative to no action, the resulting short term losses in economic value are estimated to be approximately $66.80 million under **Preferred Sub-Option 3(a)(i)**. Under a 5.0 MP TAC, this management option corresponds to the longest recreational fishing season and would minimize losses in economic value. For the commercial sector, the expected reductions in net returns resulting from TAC reductions are, for a 7.0 MP, 5.0 MP, and, 3.0 MP, approximately $5.8 million, $11.5 million, and $17.1 million, respectively.

5.1.3.2 Social Environment

Alternative 1 would maintain the status quo and keep the TAC at 9.12 MP. This would allow the commercial and recreational sectors to continue to harvest the same amount of fish as established in Amendment 22 and would not have any impact on communities dependent on the red snapper fishery in the short term. Some, charter boat captains have expressed concern that further reductions in the TAC for red snapper will require a shortened fishing season or a smaller bag limit which could potentially reduce their profits. Many commercial and recreational fishermen are against further reductions in the TAC and would prefer that reductions be made in the amount of juvenile red snapper that are allowed to be caught by shrimp trawlers. A commercial fisherman in Apalachicola, Florida said he thought that the main cause of the decline in the red snapper stock was due to the amount of juvenile red snapper caught by the shrimp trawls (Ingles, personal communication). This sentiment has been echoed by several commercial and recreational red snapper fishermen in the course of field work over the last three years.

Although maintaining the TAC at 9.12 MP will allow fishermen in the recreational and commercial fishery to continue to harvest the same amount of fish they have since 2001, it will jeopardize the future of rebuilding the stocks in the desired time frame. Keeping the TAC set at the current levels may offer short term benefits to businesses that are dependent on the red snapper fishery because recreational fishermen will need the services offered in the communities where they fish from more days out of the year. Presumably, recreational fishermen will spend more money in those communities on ice, gas, food, lodging, etc. if they have more fishing days available.

However, in the long term **Alternative 1** will not end overfishing of red snapper in the required time frame and presumably the TAC will need to be reduced, possibly below the TAC levels included in these alternatives, to end overfishing in the future. This in turn could make it harder to earn a living in the commercial red snapper fishery and may further reduce the number of days recreational fishermen can fish for red snapper. Imposing more restrictive measures on the fishery in the future could negatively impact communities which are dependent on the red snapper fishery. Setting a TAC that is projected to end overfishing will allow the stocks to be rebuilt which will benefit fishermen, businesses, and communities dependent on the red snapper fishery in the future if the red snapper stock is increased.

Alternative 2 would set the TAC at 7.0 MP. With this alternative, there would be a TAC of 3.57 MP for the commercial sector and 3.43 MP for the recreational sector. This alternative also provides for additional management measures to be imposed in the recreational sector to achieve the desired TAC.

Due to the continuing rise in the cost of fishing, including increases in the cost of fuel and insurance, along with other increases in operating costs, it is becoming more difficult for many fishermen to make a living fishing. Because the red snapper fishery is managed by an IFQ system, any reduction in the TAC from current levels for the commercial sector will result in reduction in individual catch and profits and may lead to more people exiting the fishery. This could have negative impacts on communities that are dependent on jobs that support this fishery. If a reduction in the TAC results in a shorter season for the recreational sector, it may also impact the businesses that are dependent on the commercial and recreational red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Alternative 2 will presumably not stop overfishing in the time required. It will be necessary to reduce TAC further than 7.0 mp in order to stop overfishing and rebuild the stocks. In the long term, if the TAC is not reduced now, it will take longer to rebuild the stock, and fishermen will face further restrictions and reductions in TAC in the future to compensate for a higher TAC now. Setting a lower TAC now would presumably end overfishing and could insure a faster recovery of the red snapper stock, which would provide more red snapper in the future. This will benefit the communities and fishermen that depend on the fishery in that a higher TAC will provide more red snapper for the commercial and recreational fishermen and should increase profits for those dependent on the fishery, possibly creating more jobs in the fishing industry.

Option 2(a) includes a 4-fish bag limit and a minimum size limit of 16 inches. There are various suboptions within this option. With each suboption, there will be fishermen in the Gulf of Mexico who will be for it and some who will be against it. Some recreational fishermen would support a longer, limited season, with no additional weekend openings, while others would prefer a shortened season with extended weekend openings beyond the closed season. Some recreational fishermen may decide it is not worth the fuel used to fish for a reduced number of fish. A longer season has the potential to benefit fishing dependent businesses that support the recreational red snapper sector keeping them open for more days, and sales up for longer in the season.

Keeping the minimum size limit at 16 inches may protect the species, although in personal communication with some recreational fishermen and charter boat captains, they have suggested that a minimum size limit of 16 inches is too high resulting in the mortality of many red snapper. They suggest that if the size limit is reduced, fishermen would be able to keep more of the fish they caught, which are smaller than 16 inches, and they would reach their bag limit sooner, resulting in less fish being pulled from the water and potentially dying.

Others may prefer a 4-fish bag limit, even if it reduces the number of days that can be fished. Another charter captain in Carrabelle, Florida stated that if the bag limit was reduced, some clients who come to the Gulf of Mexico to fish for red snapper and plan to take their fish home, may decide it is no longer worth the price paid for the amount of fish the may be able to catch (Ingles, personal communication).

Suboption 2(a)i allows the season to be open for 139 days which would give fishermen the maximum amount of time to fish seven days a week.

Suboption 2(a)ii would reduce the number of weeks the season is open for fishing seven days a week, but would allow for fishing for an additional eight consecutive weekends. This would extend the fishing season, on the weekends, by one month and would be advantageous to recreational fishermen who fish on the weekends. However, it would shorten the number of weeks that recreational fishermen could fish any day of the week.

Suboption 2(a)iii would reduce the number of weeks the season is open for fishing seven days a week, but would allow for fishing in the EEZ off Texas for eight consecutive weekends. This would extend the fishing season, on the weekends in Texas, and would be advantageous to recreational fishermen who fish on the weekends in that area. However, it would be a disadvantage to fishermen who fish in the rest of the Gulf because it would shorten the number of weeks that recreational fishermen could fish in the rest of the Gulf and they would not have any extended weekends to fish outside of Texas.

Suboption 2(a)iv would reduce the number of weeks the season is open for fishing seven days a week, but would allow for fishing in the EEZ west of the Mississippi River for eight consecutive weekends. This would extend the fishing season, on the weekends west of the Mississippi River, and would be advantageous to recreational fishermen who fish on the weekends in that area. However, it would be a disadvantage to fishermen who fish in the east of the Mississippi River because it would shorten the number of weeks that recreational fishermen could fish in that area and they would not have any extended weekends.

Option 2(b) includes a 3-fish bag limit and two suboptions on minimum size. For reasons stated above, some recreational fishermen would prefer to see the size limit reduced even if it reduces the number of days in a season. Some fishermen may decide they would support reducing the bag limit to three fish per person, especially if it allowed them a lower minimum size and a longer fishing season. Others would prefer to keep the current 16-inch minimum size limit so they would have a higher bag limit and a longer fishing season. Leaving the season open longer would potentially benefit people who work with businesses that depend on the red snapper fishery because fishermen would be spending money on fuel, ice, bait, etc. in the communities for a longer period of time, possibly creating jobs and increasing profits.

Option 2(c) includes a 2-fish bag limit and five suboptions regarding minimum size and fishing seasons. As explained in Option A, some fishermen would support a lower minimum size limit even though it would reduce the bag limit and number of days fished, while others may prefer a higher size limit and the option to fish longer in the season. Some fishermen may decide they would support reducing the bag limit to two fish per person, especially if it allowed them a lower minimum size and a longer fishing season. Some fishermen may decide it is not worth the effort or expense if the bag limit was set at two fish per person, and would prefer other options.

With each option for the timing and length of the fishing season, there will be fishermen who prefer one option over another. One's preference over the timing and length of the fishing season will depend on when they are most likely to fish, or for charter captains, when their clients are most likely to purchase a charter trip.

Preferred Alternative 3 sets the TAC at 5.0 MP. With this alternative, there would be a TAC of 2.55 MP for the commercial sector and 2.45 MP for the recreational sector. This alternative also provides for additional management measures to be imposed in the recreational sector to achieve the desired TAC. This alternative would assume a 74% reduction in bycatch. Even though the TAC is higher in **Alternative 3** than in **Alternative 4**, the rebuilding schedule would presumably be the same as for **Alternative 4** due to the increase in stock as a result of the higher reduction of bycatch of red snapper in the shrimp fishery. **Alternative 3** would be the most restrictive on the shrimp fishery in that it assumes a bycatch reduction of 74%.

Some fishermen remain skeptical that red snapper is being overfished, or attribute the reported decline in populations to external environmental factors such as changing environment or loss of fish habitat that can not be changed by amending fishing regulations. Recreational fishermen and charter boat captains have expressed concern that further reductions in the TAC for red snapper will require a shortened fishing season and/or a smaller bag limit. Commercial fishermen may be concerned with reducing the TAC because they operate under an IFQ system. A reduction in TAC would result in a reduction in their catch and would reduce their profits within a season. Due to the continuing rise in the cost of fishing, including increases in the cost of fuel and insurance, along with other increases in operating costs, it is becoming more difficult for many fishermen to make a living fishing. Any reduction in TAC or numbers of days fishermen can fish may result in an additional reduction in income and may lead to people exiting the fishery.

Any reduction in the TAC which results in a reduction in the number of days fished, may lead to profit losses for businesses that are dependent on the red snapper fishery, or a closure of businesses if the fishing season is shortened. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be fewer days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

It will be necessary to reduce TAC in order to stop overfishing and rebuild the stocks. If the TAC is not reduced now, it will take longer to rebuild the stock, and fishermen presumably will face further restrictions and reductions in TAC in the future to compensate for a higher TAC now. Setting a lower TAC could insure a faster recovery of the red snapper stock, which would provide more red snapper in the future and benefit the communities and fishermen that depend on the fishery.

Preferred Option 3(a) includes a minimum size limit of 16 inches and 2-fish bag limit. Suboption i allows for a total fishing season of 107 days. Suboption ii would allow for 92 days. Some recreational fishermen would prefer the option of having more days to fish and would agree to a 16- inch size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. As stated above, some recreational fishermen have described their frustration with spending a day fishing only to leave behind smaller fish floating on the surface and going home with an empty cooler, while others want a longer fishing season.

With **Option 3(b)** there would be a 16-inch minimum size limit and 2-fish bag limit. There are four suboptions that have different combinations of open seasons where the fishery will be open for seven days a week and then on extended weekends in some areas. Some fishermen may prefer a shorter season where they fish seven days a week, with the weekends only extension while others would prefer having a longer season to fish seven days a week with no extra weekend only trips.

Option 3(c) would reduce the minimum size limit to 15 inches but would also shorten the fishing season to 88 days. Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may negatively impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Option 3(d) would reduce the minimum size limit to 14 inches but would also shorten the fishing season to 76 days (suboption i), 77 days (suboption ii), or 71 days (suboption iii). Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Option 3(e) would reduce the minimum size limit to 13 inches but would also shorten the fishing season to 61 days. Some charter boat captains may decide that they can not make enough profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Option 3(f) would reduce the minimum size limit to 14 inches with a one-fish bag limit. The season would be 122 days (suboption i) or 102 days (suboption ii). Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Option 3(g) would reduce the minimum size limit to 16 inches with a one-fish bag limit. The season would be open for 154 days (suboption i) or 138 days (suboption ii). Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit.

Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Alternative 4 sets the TAC at 3.0 MP. With this alternative, there would be a TAC of 1.53 MP for the commercial sector and 1.47 MP for the recreational sector. This alternative also provides for additional management measures to be imposed in the recreational sector to achieve the desired TAC. **Alternative 4** would result in the most drastic cut in the TAC and, in the short run, would cause the most adverse effects to the fishermen and communities that are dependent on the red snapper fishery. **Alternative 4** assumes a 50% reduction in bycatch of red snapper. Even though the TAC is the lowest in **Alternative 4**, the rebuilding plan would take as in **Alternative 3** due to the level of mortality caused by bycatch of red snapper in the shrimp fishery. This alternative would be better for the shrimp fishermen, because it would require less bycatch reduction than **Alternative 3.** In the short term, this alternative would require a lower TAC which could negatively impact fishermen and communities dependent on the red snapper fishery, and it would take longer to rebuild due to the allowable bycatch level.

As stated above, some fishermen remain skeptical that red snapper is being overfished, or attribute the reported decline in populations to external environmental factors such as changing environment or loss of fish habitat that can not be changed by amending fishing regulations. Recreational fishermen and charter boat captains have expressed concern that further reductions in the TAC for red snapper will require a shortened fishing season and/or a smaller bag limit. Commercial fishermen may be concerned with reducing the TAC because they operate under an IFQ system. A reduction in TAC would result in a reduction in their catch and would reduce their profits within a season. Due to the continuing rise in the cost of fishing, including increases in the cost of fuel and insurance, along with other increases in operating costs, it is getting harder for many fishermen to make a living fishing. Any reduction in TAC or numbers of days fishermen can fish may result in an additional reduction in income and profits and may lead to people exiting the fishery.

Any reduction in the TAC which results in a reduction in the number of days fished, may lead to profit losses for businesses that are dependent on the recreational red snapper fishery, or a closure of businesses if the fishing season is too short. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be fewer days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery, which may cause a reduction of jobs in the industry.

It will be necessary to reduce TAC in order to stop overfishing and rebuild the stocks. If the TAC is not reduced now, it will take longer to rebuild the stock, or fishermen may face further restrictions and reductions in TAC in the future to compensate for a higher TAC now. Setting a lower TAC could insure a faster recovery of the red snapper stock, which would provide more red snapper in the future and benefit the communities and fishermen that depend on the fishery.

Option 4(a) includes a minimum size limit of 16 inches and a bag limit of two fish. Some recreational fishermen would prefer the option of having more days to fish and would agree to a 16- inch size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. As stated above, some recreational fishermen have described their frustration with spending a day fishing only to leave behind smaller fish floating on the surface and going home with an empty cooler, while others want a longer fishing season.

Option 4(a) includes four suboptions. **Suboption i** fishery would be open all seven days of the week for 46 days. **Suboptions ii – iv** give various combinations of times the fishery would be open for seven days a week along with weekend only openings for an extended time. For each of these options there would be fishermen who would preferred a shorter season that is open seven days a week with added weekends, while others would prefer a longer opening for seven days a week without any additional weekends.

Option 4(b) includes a 15-inch minimum size limit with a two fish bag limit with an open season of 39 days. Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Option 4(c) would reduce the minimum size limit to 14 inches with a two fish bag limit but would also shorten the fishing season to 35 days. Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may negatively impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

Option 4(d) would reduce the minimum size limit to 13 inches with a 2-fish bag limit. It would shorten the fishing season to 31 days. Some charter boat captains may decide that they can not make a profit running trips for such a limited time and may opt for a larger size fish that would allow for more days of fishing. Some recreational fishermen would also prefer the option of having more days to fish and would agree to a larger size limit. Others may prefer to reduce the number of days fished in order to keep smaller fish. Having a shorter season may impact the businesses that are dependent on the red snapper fishery in that there will be less days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the red snapper fishery.

5.1.4 Direct and Indirect Effects on Administrative Environment

Alternative 1 (status quo, no action) would not revise the red snapper rebuilding plan,would maintain the 9.12 MP TAC, and result in no changes to the commercial quota or recreational management regulations (4 fish bag limit, 16-inch size limit, and April 21 – Oct 31 season). In the short-term, this alternative will not result in any direct or indirect effects to the administrative environment, because regulations would remain unchanged.

The NMFS law enforcement, in cooperation with state agencies, would continue to monitor regulatory compliance with existing regulations and NMFS would continue to monitor both recreational and commercial landings to determine if landings are meeting or exceeding specified quota levels. In 2007, an IFQ program was implemented for the commercial red snapper fishery, requiring NMFS to monitor the sale of red snapper IFQ shares. Vessel monitoring systems are also proposed to be implemented for all commercial reef fish vessels in 2007. These administrative and enforcement actions will occur regardless of changes to the red snapper TAC and recreational red snapper management measures, and should benefit the administrative environment by reducing the burden on enforcement to determine compliance with commercial fishing regulations. Recordkeeping requirements for IFQ shares would also improve commercial quota monitoring and prevent or limit overages from occurring.

In the long term, **Alternative 1** is expected to require more restrictive future management actions to end overfishing and rebuild the red snapper stock, because the current TAC would not end overfishing in the timeframe specified by the rebuilding plan. The current red snapper rebuilding plan requires overfishing to end by 2009 or 2010 (GMFMC 2004a). Allowing overfishing to continue in the short-term by not imposing additional management measures to reduce fishing mortality would result in negative impacts to the administrative environment and require larger reductions in fishing mortality and TAC in the future.

Alternatives 2-4 reduce the TAC and impose more restrictive bag limits and/or closed seasons. These alternatives also include measures to reduce the recreational minimum size limit, which would aid in reducing bycatch, while not significantly slowing stock recovery. **Alternative 2** would reduce the red snapper TAC to 7 MP. The commercial quota would be 3.57 MP and the recreational quota would be 3.43 MP. Reducing the TAC to 7 MP will not change how landings are monitored and would not represent an additional administrative burden for determining when and if quotas are met.

Alternative 2, Options a-c would all modify the existing recreational red snapper fishing season. **Alternative 2, Option a** would maintain the 4-fish bag limit, 16-inch recreational minimum size limit, and reduce the length of the fishing season to between 125 and 139 days. **Alternative 2, Option a, Suboption i** would provide for a continuous fishing season, while **Suboptions (ii)** through **(iv)** would allow for weekend openings in portions or throughout the entire Gulf after a core fishing season. Because **Alternative 2, Option a, Suboption i** would only reduce the fishing season length, this suboption would require the fewest number of changes to current regulations. The open season would occur at the same time each year allowing anglers to plan trips well in advance. In contrast, weekend openings after a core season would represent a new regulation to enforce. Weekend openings would vary each year depending on when weekends occur after the May 15-August 31 core fishing season. Because the dates of weekend openings would not be consistent from one year to the next, angler compliance with regulations would likely be reduced. Further, **Suboptions (iii) and (iv)** would impose differing regulations in the eastern and western Gulf. Inconsistent regulations would require a line of demarcation to be created, which could cause some enforcement problems and angler confusion when fishing near the line.

Alternative 2, Option b would reduce the red snapper bag limit to three, reduce the red snapper fishing season to between 139 and 154 days, and either maintain the 16-inch TL minimum size limit or reduce it to 15-inches TL. **Alternative 2, Option b, Suboption (i) and Suboption (ii)** would only modify existing regulations and would not result in any new regulations to enforce. Lower bag limits and shorter seasons could reduce the overall burden on enforcement by making it simpler to determine whether or not anglers are complying with regulations (less fish to count; either you possess red snapper or do not possess red snapper when the fishery is closed). The lower size limit proposed in **Suboption (ii)** would increase catch rates on some trips, resulting in more red snapper to count when enforcing regulations. Because the open seasons would be continuous and occur at the same time each year, angler confusion would be reduced thereby enhancing compliance. Also, the measures proposed in **Alternative 2, Option b, Suboption (i) and Suboption (ii)** would be the same throughout the Gulf, requiring no line of demarcation.

Alternative 2, **Option c** would reduce the red snapper bag limit to two, reduce the red snapper fishing season to between 124 and 154 days, and reduce the minimum size limit to either 15 or 13-inches TL. **Alternative 2, Option c, Suboptions (i)** and **(ii)** would establish continuous fishing seasons, while **Suboptions (iii - v)** would allow for weekend openings in portions or throughout the entire Gulf after a core fishing season. The open season for **Suboptions (i)** and **(ii)** would occur at the same time each year allowing anglers to plan trips well in advance. In contrast, weekend openings after a core May 15-August 31 season would represent a new regulation to enforce. Weekend openings would vary each year depending on when weekends fall after the August 31 core fishing season closure. Because the dates of weekend openings would not be consistent from one year to the next, angler compliance with regulations would likely be reduced. Further, **Suboptions (iii - v)** would impose differing regulations in the eastern and western Gulf. Inconsistent regional regulations would require a line of demarcation to be created, which typically cause some enforcement problems and angler confusion near the line.

All five sub-options under **Alternative 2, Option c** would reduce the recreational minimum size limit. These lower size limits will increase catch rates on some trips, resulting in more red snapper to count when enforcing regulations. **Suboption (ii)** would increase catch rates the most since it would reduce the current 16-inch TL minimum size limit by 3 inches. By reducing the size limit substantially, maintaining landings within the specified quota will likely be more difficult, especially during years of high red snapper recruitment.

Overall, **Alternative 2, Option a, Suboption (i), Alternative 2, Option b, Suboption (i) and (ii)**, and **Alternative 2, Option c, Suboption (i)** would result in the least impacts on the administrative environment because these sub-options only modify existing regulations and are consistent Gulfwide. Relative to **Preferred Alternative 3, Option a, Suboption (i)**, the sub-options mentioned previously would not result in any additional burden on enforcement. However, the higher TAC for **Alternative 2** would allow for a longer fishing season, which could make monitoring of the recreational quota easier (more time to collect and analyze data) than **Preferred Alternative 3 or Alternative 4**.

Preferred Alternative 3 would reduce the red snapper TAC to 5 MP. The commercial quota would be 2.55 MP and the recreational quota would be 2.45 MP. Reducing the TAC to 5 MP will not change how landings are monitored and will not represent an additional administrative burden for determining when and if quotas are met.

Preferred Alternative 3, Options a – g would all reduce the bag limit to either one or two fish, reduce the length of the fishing season to between 61 and 154 days, and either maintain (16 inches TL) or reduce the minimum size limit (13-15 inches TL). All of the management measures would modify existing regulations. **Preferred Alternative 3, Options b, Suboptions (ii-iv)** would impose new regulations in the form of weekend openings and weekday closings.

The open season for **Preferred Alternative 3, Options a, Suboptions (i) and (ii), Option b, Suboption (i), and Options (c-g)** would establish a continuous fishing season that would occur at the same time each year. By establishing a continuous season, angler compliance would be increased and angler confusion regarding when the season is open would be reduced. Lower bag limits and shorter seasons could reduce the overall burden on enforcement by making it simpler to determine whether or not anglers are complying with regulations (less fish to count; either you possess red snapper or do not possess red snapper when the fishery is closed). However, compliance with regulations may decrease if anglers view the one or two-fish bag limit as too restrictive, thereby increasing the burden on enforcement. **Preferred Alternative 3, Options b, Suboptions (ii-iv)** all include weekend openings and weekday closings prior to and after a one-month core fishing season. Because the dates of weekend openings would not be consistent from one year to the next, angler compliance with regulations would likely be reduced. Further, **Suboptions (ii-iv)** would impose differing regulations in the eastern and western Gulf. Inconsistent regional regulations would require a line of demarcation to be created, which typically causes some enforcement problems and angler confusion when fishing near the line. Overall**, Preferred Alternative 3** has a greater likelihood of ending overfishing and rebuilding the red snapper stock than **Alternatives 1 and 2,** and a lesser or similar likelihood of ending overfishing and rebuilding the red snapper stock relative to **Alternative 4.**

Alternative 4 would reduce the red snapper TAC to 3 MP. The commercial quota would be 1.53 MP and the recreational quota would be 1.47 MP. Reducing the TAC to 3 MP will not change how landings are monitored and will not represent an additional administrative burden for determining when and if quotas are met. The commercial fishery will continue to operate under an IFQ program, with shares allocated to individual fishermen. Because the length of the recreational fishing season would be greatly shortened, monitoring the quota would be more difficult.

Alternative 4, Options (a-d) would all reduce the bag limit to two fish, reduce the length of the fishing season to between 31 and 46 days, and either maintain (16 inches TL) or reduce the minimum size limit (13-15 inches TL). All of the management measures would modify existing regulations. The open season for **Alternative 4, Option a, Suboption (i) and Options b-d** would establish a continuous fishing season that would occur at the same time each year. By establishing a continuous season, angler compliance would be increased and angler confusion regarding when the season is open would be reduced. Lower bag limits and shorter seasons could reduce the overall burden on enforcement by making it simpler to determine whether or not anglers are complying with regulations (less fish to count; either you possess red snapper or do not possess red snapper when the fishery is closed). However, compliance with regulations may decrease if anglers view the two-fish bag limit as too restrictive, thereby increasing the burden on enforcement. **Alternative 4, Option a, Suboption (ii-iv)** all include weekend openings and weekday closings prior to and after a one-month core fishing season. Because the dates of weekend openings would not be consistent from one year to the next, angler compliance with regulations would likely be reduced. Further, **Suboptions (ii-iv)** would impose differing regulations in the eastern and western Gulf. Inconsistent regional regulations would require a line of demarcation to be created, which typically causes some enforcement problems and angler confusion near the line. Overall, **Alternative 4** has the greater likelihood of ending overfishing and rebuilding the red snapper stock when compared to **Alternatives 1 and 2,** and a similar likelihood of ending overfishing when compared to **Preferred Alternative 3.**

5.2 Action 2: Post-hurricane reduction in directed recreational fishery effort/landings assumed for Action 1 TAC alternatives

Preliminary MRFSS fishing effort and landings data suggest some decrease in effort has occurred since Hurricane Katrina due to the direct effects of hurricanes, as well as increased fuel costs. Some decrease in effort was reported in all states, with the greatest changes in trips occurring in Mississippi and Louisiana during the months immediately following Hurricane Katrina.

Final MRFSS effort estimates for 2006 indicate charter trips in federal waters of the exclusive economic zone (EEZ) were up 7 percent relative to the 2001-03 average effort level and up 2 percent relative to 2002-2005 average effort level. In contrast, private trips in the EEZ during 2006 were down 13 percent relative to the 2001-03 average effort level and 15 percent relative to the 2002-05 average effort level. For all areas fished (state and federal waters), charter trips in 2006 were up by 11 percent relative to the 2001-03 average effort level and 9 percent relative to the 2002-05 average effort level, whereas private trips were up 8 percent relative to 2001-03 average effort level and 5 percent relative to 2002-05 average effort level.

The 2006 MRFSS red snapper landings in numbers of fish were 1 percent less than average MRFSS red snapper landings during 2001-03 and 3 percent less than average MRFSS red snapper landings during 2002-2005. In terms of pounds landed, the weight of MRFSS red snapper landings was 19 to 18 percent less than 2001-03 and 2002-05 average landings levels. On average, the weight of each red snapper landed in 2006 was less than the average weight of each red snapper landed during the prior four to five years (3.3 versus 4.0 pounds).

The following discussion summarizes the direct and indirect effects on the physical, biological, social, economic, and administrative environments resulting from assumptions about post-hurricane reductions in fishing effort/landings. The selection of an assumed reduction in effort has direct implications on what management measures the Council can select in adjusting the rebuilding plan for red snapper. It is assumed that Gulfwide reductions in fishing effort will be equivalent to Gulfwide reductions in red snapper landings. However, because of the wide geographic distribution of recreational red snapper landings, it is important to consider reductions in effort/landings relative to areas impacted by hurricanes in 2004 and 2005. Mississippi and Louisiana were the most significantly impacted areas of the Gulf of Mexico last hurricane season, and Alabama and west Florida were impacted in 2004. Red snapper landings from Mississippi and Louisiana prior to Hurricane Katrina accounted for 10.5 percent of the annual recreational red snapper landings in weight of fish (8.2 percent in numbers of fish). Therefore a 100 percent reduction in fishing effort/landings in these two states would result in a 10.5 percent decrease in landings. Most red snapper landings occur off Alabama, Florida, and Texas, which account for 39.7 percent, 34.0 percent, and 15.8 percent of the annual recreational red snapper landings in weight of fish, respectively (38.8 percent, 36.9 percent, and 16.1 percent in numbers of fish, respectively). Each of these states was also directly or indirectly impacted by hurricanes in 2004 and 2005, although physical impacts to vessels and infrastructure were less than those observed in Louisiana and Mississippi. Indirect effects felt by the recreational fishing industry included: fuel shortages, high fuel prices, and decreases in tourism. Some areas in Alabama and Florida were also still recovering from hurricanes that impacted those areas during the 2004-fishing season.

5.2.1 Direct and Indirect Effects on Physical Environment

Alternative 1 would not take into consideration any post-hurricane reductions in effort/landings when setting management measures proposed in Action 1. The years 2001-2003 would serve as the baseline for setting TAC reductions. Because Action 1 currently considers reductions in TAC without accounting for any post-hurricane changes in effort/landings, **Alternative 1** would have the same effects on the physical environment as described in Action 1 (see section 5.2.1). The specific impacts to the physical environment will depend on the management alternatives selected in Action 1. If no reduction in post-hurricane effort/landings is assumed, but reductions in fact occur, benefits to the physical environment would be increased by further reductions in fishing effort. Reductions in fishing effort will result in less gear (hook-and-line, anchors, spears) interactions with habitat, resulting in small benefits to the physical environment.

Alternative 2 would assume a 25 percent reduction in post-hurricane fishing effort and landings when evaluating alternative TACs and management measures in Action 1. **Preferred Alternative 3** would assume a 10 percent reduction in post-hurricane fishing effort and landings when evaluating alternative TACs in Action 1. The effects on the physical environment would largely depend on whether or not these assumed reductions occur. If a 10 or 25 percent reduction in effort/landings does occur, allowing the season to be lengthened (see Table 2.4) then benefits to the physical environment would be similar to **Alternative 1**, because fishing effort and gear interactions would be reduced approximately the same amount. Benefits to the physical environment would largely be due to lower fishing effort and less gear interactions with habitat. However, because most red snapper are harvested with hook-and-line gear and the recreational red snapper fishery accounts for only a small fraction of the overall reef fish fishery harvest, any benefits from reductions in fishing effort are expected to be immeasurably small relative to **Alternative 1.** If the assumed 10 percent or 25 percent reductions in fishing effort do not occur, then impacts to the physical environment would be greater than **Alternative 1**. Impacts would include greater fishing effort and more gear interactions with habitat relative to **Alternative 1**; however, they would still be small.

5.2.2 Direct and Indirect Effects on Biological/Ecological Environment

Direct and indirect effects on the biological and ecological environment would largely depend on whether or not assumed reductions in fishing effort occur. **Alternative 1** would assume no change in fishing effort/landings and therefore be the most precautionary management approach for selecting management measures in Action 1. Assuming no change in fishing effort/landings occurs, impacts to the biological and ecological environment would be the same as those described for various management alternatives in Action 1. However, if any reductions in fishing effort occur, but are not accounted for when determining the length of the recreational fishing season then there would be an increased likelihood necessary reductions in fishing mortality are achieved to end overfishing and rebuild red snapper to MSY. Not accounting for reductions in fishing effort that may occur would also potentially allow for faster than expected rebuilding progress, thereby ending overfishing sooner than expected. The current red snapper rebuilding plan specifies overfishing must end by 2009 or 2010 (GMFMC 2004a).

Alternative 2 and **Preferred Alternative 3** would assume a 25 percent and 10 percent reduction in fishing effort/landings, respectively, when evaluating management alternatives for the recreational red snapper fishery. Various recreational fishing season lengths assuming either a 10 or 25 percent reduction in fishing effort/landings are presented in Table 2.3. In general, if a 10 or 25 percent reduction in fishing effort/landings occurs in 2008 and beyond, and there is no increase in fishing effort over time, then the length of the recreational fishing season could be extended and benefits to the biological environment would be similar to those described in **Alternative 1**. Benefits would include decreases in landings and discards. If these benefits allow target reductions in fishing mortality to be achieved, then rebuilding progress would continue to be made, allowing overfishing to end within the timeframe specified by the red snapper rebuilding plan. If however, the reduction in effort is less than 10 percent or 25 percent, or diminishes overtime, then negative impacts to the biological environment would occur. Negative direct impacts would include landings and discards higher then levels needed to end overfishing and rebuild red snapper to the biomass associated with MSY. If landings overages occur, the Regional Administrator would be required to close the recreational fishery once the quota is projected to be met (Section 407(d) M-SFCMA). Additionally, in the long-term if TACs are not able to increase as quickly because of past landings overages, increased fishing pressure could be placed on other reef fish species caught in similar areas and habitat as red snapper. **Alternative 1** is the most precautionary of the three alternatives and would allow for the fastest rebuilding. **Alternative 2** is the least precautionary of the three alternatives. The benefits and drawbacks of **Preferred Alternative 3** are intermediate to **Alternatives 1** and **2**.

5.2.3 Direct and Indirect Effects on Economic/Social Environment

5.2.3.1 Economic Environment

The 2005 hurricane season has had devastating impacts on the northern Gulf. For example, coastal areas in Mississippi, Alabama, and Louisiana have been particularly affected. As a result, sizeable decreases in recreational fishing activities have been observed (SERO 2006). In response to these adverse effects, management measures included under this action consider a 25 percent and a 10 percent Gulf-wide reduction in recreational fishing effort.

The amount of effort expected to occur in the recreational sector directly affects the severity of regulations required to achieve the harvest reductions associated with the alternative TACs. If the observed level of effort in the fishery subsequent to regulatory action is lower than the level assumed in the determination of the harvest regulations adopted, then the harvest regulations will be more severe than necessary to achieve the target harvest restrictions, resulting in lower total harvests. While the lower harvest would be expected to possibly aid in faster stock recovery in the intermediate and long term, with accompanying increased positive economic benefits (due to greater harvests, higher bag limits, etc.), the more restrictive regulations would be expected to result in foregone economic benefits in the short term since anglers would be prevented from harvesting biologically supported catches.

Conversely, if the observed level of effort in the fishery is greater than the level assumed in the determination of the harvest regulations adopted, conservation, rebuilding, and, stock recovery goals would not be expected to be met, resulting in more severe subsequent restrictions to achieve long-term goals. While the short-term increased harvests would be accompanied with short-term increased economic benefits, the intermediate and longer term benefits derived from the resource would be reduced.

Alternative 1, which is the no action alternative, would maintain historical baseline recreational fishing effort levels without any assumed hurricane induced effort reductions in the evaluation of economic impacts expected from TAC reductions and modifications to season formats and, bag and size limits considered in **Action 1**. Therefore, the estimated changes in net fishing effort and economic values that would result from management measures included in Action 1 would be as described in Section 5.1.3.1. Since **Alternative 1** would assume historic effort levels, as modified by species switching behavior, the adoption of this alternative may create the potential for more restrictive regulation, with accompanying foregone benefits, and greater conservation gains including a greater likelihood of meeting rebuilding goals. Without any guarantee that observed post-hurricane effort reductions will be sustained in the future, this alternative is consistent with a precautionary approach to management.

Alternative 2 would assume a 25 percent reduction in post-hurricane recreational fishing effort and landings relative to pre-hurricane conditions when evaluating management scenarios resulting from measures considered in **Action 1**. A similar reduction is not assumed for the commercial fishery which is currently managed under an individual fishing quota (IFQ) system. While it is recognized that the 2005 hurricanes resulted in effort reductions in the recreational sector, the magnitude, distribution, and persistence of said reductions are not easily determined. It is unlikely, that any reduction would be uniformly persistent across the range of the fishery. Therefore, the greater likelihood is that the proposed reduction would underestimate actual effort that will occur in the fishery during the duration of the proposed regulations. As a result, conservation goals would not be expected to be met, resulting in more restrictive subsequent regulation, with accompanying adverse economic impacts, to return the resource to its recovery path. As discussed in Section 5.2, existing data do not support a 25 percent reduction in post-hurricane effort in the red snapper recreational fishery

Preferred Alternative 3 would assume a 10 percent reduction in post-hurricane recreational fishing effort and landings relative to pre-hurricane conditions when evaluating management scenarios resulting from measures considered in **Action 1**. As indicated in Table 2.4, **Preferred Alternative 3** would potentially increase the duration of the recreational fishing season by 30 days, approximately. The longer fishing season would result in added short-run economic benefits. However, **Preferred Alternative 3** would delay red snapper recovery if the extended recreational fishing season established based on the presumed effort reduction resulted in the recreational allocation being exceeded. In other terms, if assumed effort declines do not materialize or do not last, more drastic management measures, including earlier closures, will be warranted in future years, resulting in long-term adverse economic impacts. It is worth noting that if assumed effort declines were to occur, **Preferred Alternative 3**, while still providing substantial short term economic benefits, would not result in any adverse impact on the red snapper stock.

While this action focuses on effort and landings reductions attributable to the 2005 hurricane season, to the extent that hurricane induced effort/landings declines are not persistent, effort declines in the red snapper fishery may continue due to other factors such as fuel price increases, the reduction in the bag limit to only 2 fish, and general adverse economic conditions. The magnitude of any potential adverse effects that could result from the selection of **Preferred Alternative 3** would be limited to that which could accrue over a couple of years since a reevaluation of red snapper management measures is anticipated following the 2009 updated stock assessment.

Summary

Alternative 1, which would assume historic baseline effort levels in the evaluation of management measures considered under Action 1, does affect previously estimated changes in net fishing effort and in economic values. Though it could potentially establish stricter than required management measures, **Alternative 1** would be consistent with a precautionary approach to management. **Alternative 2**, which assumes a 25 percent reduction in post-hurricane fishing effort, may establish management measures that could jeopardize the rebuilding for red snapper and significantly delay its recovery. While it would potentially increase short-term benefits derived from the fishery, it could impose sizeable long-term adverse economic impacts. **Preferred Alternative 3**, which assumes a 10 percent reduction in post-hurricane fishing effort, would increase the duration of the recreational red snapper season by approximately 30 days and thus, result in short-term economic benefits. If anticipated effort declines occur, **Preferred Alternative 3** is not expected to result in any negative impact on red snapper stock recovery. However, **Preferred Alternative 3** could delay red snapper recovery or cause more stringent regulations to be implemented in subsequent years if assumed effort reductions do not occur. On the other hand, a new stock assessment in 2009 would likely ameliorate the need for drastic measures in the short term in order to maintain the current rebuilding plan. Also, potential delays in red snapper recovery and associated negative economic effects would be mitigated by expected effort declines due to recent upward trends in fuel prices. In addition, red snapper-related management measures in this document are expected to be re-evaluated following a stock assessment update scheduled for 2009.

5.2.3.2 Social Effects

Alternative 1 does not take into consideration any potential reductions in fishing effort and landings when evaluating alternative TACs in Action 1. Fishing effort in the commercial and recreational fisheries dropped in the months following hurricanes Katrina and Rita. In some areas many of boats and much of the fishing infrastructure was damaged and or destroyed. For some communities there were no docks, fuel, or ice to supply fishermen who still had boats. Storm debris filled the waterways. Fishermen and people who work in fishing dependent businesses along the northern Gulf of Mexico coast were displaced or were spending their efforts on rebuilding businesses, homes, and lives. However, we still do not know the full extent of how much this impacted the fishing industry in areas hardest hit by the hurricanes. Some commercial and recreational fishermen were able to move their boats and shift their efforts and landings to areas that sustained less damage. Others are still displaced and trying to recover from the hurricanes. Some people will never go back to working in the fishing industry. Although fishing effort is still down in some areas affected by the storm, effort has increased in other areas. Through out the northern Gulf of Mexico, docks, ice houses and processing facilities are being rebuilt, and boats are being salvaged, repaired, and returned to the water.

The TAC that will be set will be in place for at least two years. During that time, much of the fishing infrastructure will be rebuilt and recreational and commercial fishermen will return to the water. Some fishermen may perceive there is less competition now over fishing resources and may increase their efforts. Recreational fishermen in Grand Isle, Louisiana have said the "after the storm effect" has increased the amount of fish they are catching (Ingles, personal communication).

Fishing effort will continue to increase as people repair their boats and rebuild fishing infrastructure. Some fishermen may argue that the effort in the northern Gulf has been reduced so much that the TAC may not be met during the established season, leaving a surplus TAC that could have been fished. However, if the TAC is based on an assumed reduction in effort, and fishing effort and landings resume to pre-hurricane levels, it may be necessary to take further restrictive measures on the fishery than planned during the next few years in order to meet the TAC, which could have negative effects on the fishermen and communities dependent on the fishery.

Alternative 2 assumes a 25 percent reduction in fishing effort and landings when evaluating the TAC in Action 1. Some fishermen and people in fishing dependent businesses would argue that effort and landings are still down from what they were before the hurricanes of 2005 and would like the TAC to be based on an assumed reduction. Others may argue that fishing effort and landings continue to increase. If it is assumed that there is a 25 percent reduction in effort then the fishing season for red snapper can be extended and that would benefit the docks, marinas, hotels, and other businesses that cater to the red snapper fishery. However, if it is assumed that there was a 25 percent reduction in effort and landings, and effort and landings resume to pre-hurricane levels, then it may become necessary to adjust the fishing seasons, along with size and bag limits, in the future to meet the TAC. This could negatively impact charter fishing reservations, planned fishing trips, and communities that are dependent on the red snapper fishery and have arranged their businesses to accommodate a longer red snapper season.

Preferred Alternative 3 assumes a 10 percent reduction in fishing effort due to the hurricanes of 2005. If we assume that fishing effort is 10 percent below what it was before the hurricanes of 2005 then fishermen would benefit from a longer fishing season. However, if future analysis finds that the fishing effort is not reduced by 10 % since the hurricanes of 2005, then there will be adverse effects on the red snapper stock and further reductions in fishing effort will be necessary in the future to meet the TAC. Further reductions in effort in the future could negatively impact charter fishing reservations, planned fishing trips, and communities that are dependent on the red snapper fishery and have arranged their businesses to accommodate a longer red snapper season.

5.2.4 Direct and Indirect Effects on Administrative Environment

Alternative 1 would have no effect on the administrative environment. Management alternatives summarized in Action 1 are expected to reduce recreational landings to levels that approximate the annual quota. Assuming effort and landings are reduced to the necessary target levels discussed in Action 1, no in-season management changes would be necessary and the recreational fishery could operate under a fixed season length.

Alternative 2 and Preferred Alternative 3 would not effect the administrative environment if the actual reduction in effort and landings is 25 percent or 10 percent, and this post-hurricane reduction in landings/effort remains constant over time. Assuming a 10 or 25 percent reduction in effort/landings would lengthen the recreational fishing season (see Table 2.3). However, any changes to the fishing season length are expected to approximate the annual quota, requiring no in-season management changes and allowing the recreational fishery to operate under a fixed season length. If, however, the assumption is not correct and reductions in effort and landings are less than 10 or 25 percent, then the Regional Administrator would be required to close the recreational fishery once the quota is projected to be met (Section 407(d) M-SFCMA). This would result in negative effects to the administrative environment by requiring additional staff time to monitor the quota and issue quota closure notices. In-season quota closures occurred in 1997 and 1998, but were considered unfavorable by for-hire vessel operators because they required cancellation of scheduled fishing trips, which were often booked months in advance.

5.3 Action 3: Establish separate bag limit restrictions for the captain and crew of for-hire vessels

5.3.1 Direct and Indirect Effects on Physical Environment

Alternative 1 would maintain status quo regulations, which allow captain and crew to retain daily bag limits of red snapper while under charter. Direct effects to the physical environment resulting from **Alternative 1** would include physical damage to habitat associated with anchoring, hook-and-line tear-offs and abrasions, and contact with bottom structures while spearfishing. If hook-and-line gear were not removed, long-term indirect effects to habitat would occur if marine life becomes entangled or overgrown with algae (Hamilton 2000; Barnette 2001). This alternative is expected to have small, immeasurable direct and indirect effects on the physical environment, because captain and crew represent only a small portion of effort and landings while fishing under charter and a large portion of the catch is taken from artificial structures. Also, several habitat areas of particular concern, marine sanctuaries, and marine reserves are found in the Gulf of Mexico where red snapper occur, and many of these areas restrict the use of anchoring and/or gears used to harvest red snapper.

Preferred Alternative 2 would reduce the daily bag limit of red snapper for captain and crew to zero while under charter. This alternative is expected to slightly reduce fishing effort during for-hire trips, resulting in minor benefits to the physical environment in comparison to no action. Benefits to the physical environment would result from a small reduction in red snapper fishing effort resulting in less gear interactions with habitat. However, because the red snapper for-hire sector represents only a small component of the entire reef fish fishery (all commercial and recreationally caught reef fish species) and a large portion of the catch is taken from artificial structures (i.e., artificial reefs, oil and gas platforms), any benefits to the physical environment are expected to be small.

5.3.2 Direct and Indirect Effects on Biological/Ecological Environment

Reductions in landings resulting from restrictions on captain and crew retention limits are difficult to quantify because surveys used to collect recreational fishing data do not provide information on the number of captains or crew on the vessel, or whether or not the captain and crew contribute to the catch. The MRFSS intercepts and headboat logbooks during 2003-2004 indicate 9 percent and 1 percent of all charter and headboat trips catching red snapper exceeded the four red snapper bag limit, respectively. Landings in excess of the bag limit are a function of either: 1) non-compliance, or 2) captain and crew retaining bag limits of red snapper (SERO 2006a).

Alternative 1 would maintain status quo regulations and continue to allow captain and crew to retain the same daily red snapper bag limit as allowed for each passenger. During 2003-2004, captains and crew accounted for approximately 2 percent of the annual red snapper landings (SERO 2006a). Since the primary intent of eliminating the captain and crew bag limit is to extend the fishing season, **Alternative 1** would result in more restrictive management alternatives (see **Action 1**: shorter open season, more restrictive bag limit). These more restrictive management measures would directly effect the biological environment by increasing red snapper discards when the fishery is closed. Additionally, **Alternative 1** would result in higher bycatch and fishing mortality during the open season when compared to **Preferred Alternative 2** because of greater fishing effort.

Because reductions in TAC will be achieved through management measures considered in **Action 1** (or a combination of alternatives in **Action 1** and **Alternative 2** below), allowing captain and crew to retain a daily bag limit of red snapper will not directly affect progress made toward rebuilding the red snapper fishery. However, if the daily recreational bag limit (see **Action 1**) is reduced, this would allow captains and crew to retain bag limits of red snapper; compromising some of the reduction in harvest expected to occur because captains and crew could supplement their customer's landings with allowable bag limits for captain and crew.

Preferred Alternative 2 would reduce the daily bag limit of red snapper for captain and crew to zero while under charter. Prohibiting captain and crew from retaining bag limits of red snapper would extend the fishing season (see Table 2.1.1) and prevent captains and crew from supplementing their client's catch once their client's daily bag limits have been met. **Preferred Alternative 2** is expected to reduce landings by 2 percent (SERO 2006a). Reductions in landings resulting from a zero captain and crew bag limit in combination with management alternatives considered in **Action 1** will directly benefit the biological environment by reducing red snapper directed fishery landings to levels necessary to rebuild the red snapper stock. **Preferred Alternative 2** will directly reduce fishing effort directed toward red snapper, thereby reducing bycatch of red snapper by charter vessels and some headboats during the open season. Additionally, by setting the captain and crew bag limit to zero, the season can be extended slightly longer than proposed in **Action 1**, resulting in lower closed season discards. **Preferred Alternative 2** would also prevent captain and crew from supplementing client's catches, therefore increasing the likelihood that estimated reductions in landings would be achieved.

5.3.3 Direct and Indirect Effects on Economic/Social Environment

5.3.3.1 Economic Environment

Alternative 1 would maintain status quo regulations and continue to allow captain and crew to retain the same daily red snapper bag limit allowed for passengers. The status quo would allow all customary and usual harvest activities by the captain and crew and vessel to continue unchanged. Captains and crew would additionally be able to continue to benefit from the enjoyment of fishing while working, where such occurs, and by supplying their families with fresh fish (see discussion below with respect to **Preferred Alternative 2**). Given the highly competitive nature of the for-hire industry, it is not expected, on average, that the for-hire price of service reflects a premium for allowing customers to harvest/keep captain and crew limits. Further, it is unlikely that the ability to land more than the individual bag limit is a significant factor in determining whether or with what frequency for-hire trips are taken. However, allowing captain and crew to retain a daily red snapper bag limit would require more restrictive management measures (i.e., shorter open season, lower bag limit) to achieve rebuilding goals, since these fish would represent an additional source of mortality that would have to be factored into harvest controls. This is reflected in Table 2.1.1, which indicates that the recreational red snapper fishing season could remain open 4-16 days longer if the captain and crew bag limit was reduced to zero fish. These more stringent management measures would be expected to result in greater adverse economic impacts to the recreational fishery than would be expected under more liberal restrictions. This is particularly the case when the TAC is lowered, as is expected to occur under **Action 1**, and the general bag limit becomes more restrictive since a lower general bag limit increases the pressure to augment the harvests of paying passengers with the bags of captain and crew. Continuing to allow captain and crew to retain bag limits increases the pressure to take advantage of these allowable limits, even where individual operators did not allow their crew or passengers routine access to these limits, resulting in potential increased harvest by recreational anglers, thereby decreasing the ability of the management measures to meet the necessary landings reduction targets for rebuilding. Failure to meet reduction targets would increase the need and likelihood of more severe future reductions through additional management actions, (lower daily bag limits, shorter open season) with resultant increased adverse economic effects such as more trip cancellations and greater losses in economic value. These adverse impacts would be expected to induce additional adverse effects in associated shore-side industries.

Preferred Alternative 2 would eliminate captain and crew limits, thereby reducing the need for more restrictive overall limits and increasing the likelihood that target reductions and recovery goals associated with angler limits are met. As indicated in Table 2.1.1, the recreational red snapper fishing season could remain open 4-16 days longer, depending upon the TAC and other management measures selected under Action 1, if the captain and crew bag limit is eliminated. **Preferred Alternative 2** is not expected to adversely effect for-hire sector operations since recreational reef fish landings cannot be sold, and captain and crew landings are not believed to be a significant factor in determining either the cost of the for-hire service or the demand for for-hire trips. Although it is reported that some captains and crew fish while they provide for-hire services, most landings in excess of individual bag limits are likely from paying passengers who supplement their catches with captain and crew bag limits.

For those captain and crew that customarily catch and retain fish while under charter, this activity results in both pleasure and food for themselves and families. **Preferred Alternative 2** would, therefore, result in a direct loss of the benefits of taking fresh fish home from these trips. Since the cost of acquiring these fish is largely paid for by the for-hire paying passengers, this source of food is basically free. Elimination of these fish, therefore, would be expected to have adverse household budget impacts for these individuals and families. It is assumed that the value associated with catching the fish would simply be transferred from the captains and crew to anglers that would benefit from more liberal open general restrictions (higher bag or longer open season).

Summary

Alternative 1 would maintain the status quo and continue to allow for-hire captains and crew to keep a bag limit while conducting a for-hire trip. The additional harvest from this source of mortality, however, would be expected to require more severe restrictions on the general angling public in order to accomplish required harvest reductions and fishery recovery goals. **Preferred Alternative 2** would eliminate this source of mortality, and be expected to allow more liberal restrictions for the fishery as a whole, and increase the likelihood of achieving recovery goals. Although captains and crew would be expected to experience a more restrictive household food budget, although not quantified, the benefits associated with less restrictive measures for anglers and greater success associated with meeting recovery goals are expected to exceed these costs.

5.3.3.2 Social Environment

Alternative 1 would allow the captain and crew of for hire vessels to continue to keep the same daily bag limit of red snapper as allowed for each passenger. This would allow for status quo for the captain and crew and would not have any negative social impacts on them or the communities they fish from in the short run. Captain and crew may be dependent on the fish they are allowed to catch to help feed their families and if this were taken away, presumably their grocery bill would increase. Being allowed to keep their bag limit may also increase the enjoyment of the for-hire charter for the captain and crew and make it easier to retain crew.

The amount of red snapper that could potentially be caught by the captain and crew adds to the TAC. If they are not allowed to continue to harvest and keep red snapper the number of days that can be fished before the TAC is met will increase. The amount of red snapper harvested by the captain and crew is equivalent to approximately 4 to 16 days of fishing. If the captain and crew are allowed to continue to keep the bag limit, more restrictive fishing management measures may be necessary in the future to achieve the desired rebuilding plan, which could have slight negative impacts on the communities that depend on the fishing business if the fishery closed a few days earlier.

Preferred Alternative 2 would reduce the red snapper bag limit for the captains and crew of for hire vessels to zero. This could negatively impact the captain and crew who are used to keeping the bag limit and providing fresh fish for their families. As prices for fuel, insurance and equipment continue to increase, captains and crew of charter vessels are making less profit. Fresh fish they take home supplements their food budget. Being allowed to keep their bag limit may also increase the enjoyment of the for-hire trip for the captain and crew. One of the reasons stated by captain and crew for working in this industry is the enjoyment of fishing it provides. If captain and crew are no longer allowed to fish, they may not enjoy the work as much, making it harder to retain crew and making the experience less enjoyable for the captains. By being allowed to keep the bag limit, the captain and crew may also feel like they are sharing the experience with the clients, making the trips more enjoyable for everyone.

Changing the bag limit to zero for the captain and crew of the for hire sector is not expected to have any negative social impacts on the communities that depend on the red snapper fishery and may add a few days to the number of days, for the recreational fishery, that can be fished. This has the potential to benefit the communities that depend on the recreational, red snapper fishery due to increased sale of bait and tackle, and the addition of more days out of town fishermen would require food and lodging. It may also benefit the captains and crew who could sell a few more charters during those extra days.

5.3.4 Direct and Indirect Effects on Administrative Environment

Alternative 1 would maintain status quo regulations, which allow captain and crew to retain daily bag limits of red snapper while under charter. No direct or indirect effects to the administrative environment would result from this action.

Preferred Alternative 2 would reduce the daily bag limit of red snapper for captain and crew to zero while under charter. This alternative would result in an additional regulation to enforce, but could reduce the burden on enforcement by making it easier and faster to determine compliance with regulations (less fish to count and measure). Additionally, because the regulations would only apply to charter vessels and headboats, the burden on enforcement would be limited to the 1,500+ federally permitted for-hire vessels possessing limited access reef fish permits. Reducing the captain and crew bag limit to zero would also directly benefit the administrative environment by increasing consistency among regulations and making regulations more equitable across user groups; (i.e., Amendment 18A to the Reef Fish FMP prohibits commercial fishermen from retaining bag limits of reef fish; as of July 15, 2006, for-hire captains and crew are prohibited from retaining bag limits of grouper).

5.4 Action 4. Reduce the red snapper minimum size limit in the commercial fishery

5.4.1. Direct and indirect effects on physical environment

Section 3.4.1 and GMFMC (2004c) describe the physical environment inhabited by red snapper. Eggs and larvae are pelagic while juveniles are found associated with bottom features or over barren bottom. Adult red snapper are found in submarine gullies and depressions; over coral reefs, rock outcrops, and gravel bottoms; and are associated with oilrigs and other artificial structures (GMFMC 2004c). The commercial red snapper fishery uses various forms of vertical lines (rod-and-reel, electric or hydraulic reels, hand lines) and longlines. Vertical lines are used for a majority of the harvest, while longlines represent less than five percent of the total annual harvest. Vertical gear and longlines can damage habitat through snagging or entanglement. Longlines can also damage hard bottom structures during retrieval as the line sweeps across the seafloor (Barnette 2001). Anchoring over hard-bottom areas can also affect benthic habitat by breaking or destroying hard bottom structures. Generally these gears are not believed to have much negative impact on bottom structures and are considerably less destructive than other commercial gears, such as traps and trawls (Barnette 2001).

The effects of commercial size limits (**Alternatives 1-3**) on the physical environment are expected to be minor for the same reasons described above in section 5.1; however, the alternatives are expected to differ to some extent because each alternative would have different effects on the level of effort applied by the commercial fishery. Alternatives that reduce fishing effort more than others would result in greater benefits to the physical environment, because fishing related interactions with habitat would be reduced. These differences are highlighted below.

Poffenberger and McCarthy (2003) estimated from logbook supplemental information that 738,900 red snapper weighing 2.1 MP were discarded by the commercial fishery from August 2002 through July 2003. This is nearly half of the current 4.65 MP commercial quota. Most of these discards were caught by bandit gear (84 percent), followed by handlines (15 percent) and longlines (1 percent). Commercial fishermen indicated 99 percent of released red snapper were regulatory discards. Applying discard mortality rates of 71 percent for the eastern Gulf and 82 percent from the western Gulf (estimates used in the 2005 SEDAR 7 assessment), the number of fish killed because they were either too small or caught during a season closure for the above time period would be between 524,619 and 605,898 fish.

The SEDAR 7 Assessment Workshop summarized discard information from the most recent assessment and divided discards between time periods when the red snapper season was either open or closed (SEDAR 7 2005). As indicated above, all red snapper discards were regulatory discards, thus fish discarded during the open season would likely be undersized while fish discarded during the closed seasons could be above or below the 15-inch minimum size limit. For the time period 2001-2003, most discards by number occurred during the open season (57 percent), however, by weight, these discards only accounted for approximately 38 percent of the total. Weight was estimated by multiplying the number of fish by an average fish weight of 1.96 pounds for the open season and 4.25 pounds for the closed season (SEDAR 7 2005).

Regardless of the minimum size selected for this action, the total number of discards is anticipated to be reduced through the recently implemented IFQ program, which will be effective January 1, 2007. This program allocates IFQ shares to individual fishermen and would allow fishermen to fish their shares when they want. Thus, regulatory discards caused by closed seasons would likely be reduced. However, even with an IFQ program, regulatory discards associated with the current 15-inch size limit would still occur should **Alternative 1** (no action) be selected.

It is difficult to assess what affect maintaining the 15-inch minimum size limit would have on what would have been "open season" regulatory discards in light of the newly implemented red snapper IFQ program. The IFQ program would be likely to reduce fishing effort (GMFMC 2006), change harvest strategies by fishermen, and place more emphasis on targeting legal sized fish because fishermen would no longer be under monthly 10-day open season constraints. However, relative to **Preferred Alternative 2** and **Alternative 3**, which allows smaller fish to be kept, fishermen would likely spend more time fishing to harvest legal red snapper under **Alternative 1**. Thus, **Alternative 1** would have the greatest affect on the physical environment.

Preferred Alternative 2 and **Alternative 3** would likely have less of an effect on the physical environment than maintaining the current size limit. Wilson et al. (2004) found that of 399 randomly sampled undersized fish from the Louisiana commercial red snapper fishery, 61 percent of the fish were between 13 and 15 inches total length, and 86 percent were between 12 and 15 inches total length. Porch (2005) used size-based data from SEDAR 7 (2005) to examine discards by size over the whole Gulf. He considered fish 12 inches and larger to be marketable for the fishery and found if the size limit were reduced to 12 inches, 61 percent of currently discarded red snapper would be marketable. Therefore, under **Preferred Alternative 2** and **Alternative 3**, fishermen would be able to retain more fish they catch (fewer discards) and effort would be reduced. Because **Alternative 3** would provide more legal-sized fish to the fishery than **Preferred Alternative 2** and would likely reduce effort more. Thus, **Alternative 3** would be expected to have less of an affect than **Preferred Alternative 2** on the physical environment.

5.4.2 Direct and indirect effects on biological/ecological environment

Red snapper demonstrate the typical life history pattern for managed reef fish species as summarized in Section 3.4.1.3, Table 3.4.1, and GMFMC (2004a). Adult females mature as early as 2 years and most are mature by 4 years (Schirripa and Legault 1999). Red snapper have been aged up to 57 years, but most caught by the directed fishery are 2- to 4-years old (Wilson and Nieland 2001). Eastern Gulf red snapper appear to mature at smaller sizes and younger ages than western Gulf red snapper (Fitzhugh et al., 2004). Approximately 75 percent of eastern Gulf red snapper are mature by 13-inches total length compared to 15 inches in the western Gulf, and over 90 percent of eastern Gulf red snapper are mature by age 2 compared to age 4 in the western Gulf.

In the most recent stock assessment, bycatch from the directed fishery was determined to have a greater affect on rebuilding than in previous assessments (SEDAR 7 2005). Additionally, the rebuilding projections used to set TAC in **Action 1** were based on the linked, equal-proportion reduction model, which requires a 74 percent reduction in red snapper mortality in both the shrimp and directed fisheries to end overfishing. Therefore, reductions in red snapper bycatch (regulatory discards) are needed in the commercial red snapper fishery for the stock to recover.

Porch (2005) examined the effect of different commercial size limits on rebuilding. Minimum lengths ranging from 12 to 15 inches were examined; 12 inches is considered the smallest marketable size for red snapper. Porch (2005) found stock recovery rates were slightly faster with a 12-inch commercial size limit than the current 15-inch size limit. In essence, any benefit in spawning potential and YPR by harvesting a larger fish was lost to the high discard mortality rate observed in the commercial fishery (SERO 2006). For the western Gulf where the majority of commercial harvest occurs, YPR was maximized at 12-inches total length, assuming an 82 percent discard mortality rate and current fishing selectivities (SERO 2006). For the eastern

Gulf, YPR was maximized at 15-inches total length assuming a 71 percent discard mortality rate; however, the percent difference in YPR between a 15-inch and 12-inch TL fish was negligible (note: these analyses were only analyzed over the directed fishery size limits examined in Actions 1 and 4). Thus, the current 15-inch size limit contributes little towards stock rebuilding, but does contribute to a higher regulatory discard level and associated mortality compared to shorter size limits.

As mentioned in Section 5.1.4, the recently implemented red snapper IFQ program is expected to reduce regulatory discards due to elimination of season closures. Therefore, the total number of discards would be reduced in the fishery regardless of whether the size limit is reduced from the current 15-inch size limit (**Alternative 1**). However, reducing the size limit would further reduce the number of discards, although discards are still expected to occur if fishermen do not possess IFQ shares or if fishermen continue targeting reef fish after using up there red snapper IFQ shares. Wilson et al. (2004) sampled catches from 16 commercial red snapper fishing trips using #10 circle hooks on bandit gear and randomly selected 399 undersized fish. Of these fish, 61 percent were greater than 13 inches and 86 percent were greater than 12 inches. Further, Porch (2005) examined size data from SEDAR 7 (2005) and estimated that 42 percent of undersized fish were greater than 13 inches and 61 percent were greater than 12 inches.

Reductions in the size limit (**Alternatives 2 and 3**), compared to **Alternative 1** (15-inch minimum size), reduce the number of regulatory discards in the commercial red snapper fishery and may assist the red snapper stock in rebuilding more quickly. Thus, **Preferred Alternative 2** and **Alternative 3** would benefit the red snapper stock over no action. The benefit of **Preferred Alternative 2** would be intermediate to **Alternatives 1 and 3**.

Indirect effects of these alternatives on the biological and ecological environment are not well understood. Changes in the population size structure as a result of shifting the fishing selectivities and increases in stock abundance could lead to changes in the abundance of other reef fish species that compete with red snapper for shelter and food. Predators of red snapper could increase if the abundance of red snapper is increased, while species competing for similar resources as red snapper could potentially decrease in abundance if less food and/or shelter are available.

5.4.3 Direct and Indirect Effects on the Economic/Social Environment

5.4.3.1 Economic Environment

TAC reductions proposed in this joint amendment are considered for the purpose of aiding the recovery of the red snapper stock and ending overfishing by 2009-2010. It is generally assumed that the net economic benefits of ending overfishing and keeping a stock on its recovery path exceed those of not doing so, and that any measure that impedes the accomplishment of that goal reduces the pace at which the recovery can be achieved and, hence, reduces the overall net economic benefits to society. While it is important to note that the analysis of the expected impacts of most regulatory actions incorporates consideration of both short-term impacts and long-term impacts, economic impact analyses presented in this document focus on short-term impacts and are limited to a two-year time span. This approach is warranted by the uncertainty surrounding the future evolution of shrimp effort levels and associated red snapper bycatch mortality in the Gulf and by the scheduled updated assessment of the red snapper stock in 2009. In all likelihood, the Council may revisit several red snapper-related management measures, including TACs, following the completion of the update assessment.

The analysis of the expected economic impacts of the proposed management measures for the commercial red snapper sector simultaneously evaluated the impacts of quota reduction and size limit adjustments. The commercial quotas under the TAC options considered in **Action 1** (Section 5.1) range from the no action 4.65 MP (status quo TAC) to 1.53 MP (3.0 MP TAC). The current minimum size limit for commercially harvested red snapper is 15 inches. This size limit is believed to have contributed to an increase in regulatory discards in the fishery. In addition to no action alternative, this action considers a reduction in the minimum size and the elimination of size restrictions in the commercial red snapper fishery. Twelve distinct management scenarios result from the combination of size limit measures with alternative TAC options considered in this amendment.

Estimates of the change in net revenues expected to result from TAC and size limit changes in the commercial red snapper fishery were generated using a model developed by the SEFSC (Waters, personal communication[26]). These projections assumed the fishery would be managed under the newly implemented IFQ system under Reef Fish Amendment 26 (GMFMC 2006). Consistent with Weninger and Waters (2003), for the purposes of this analysis, the commercial red snapper fleet under an IFQ is assumed to be homogeneous. It is not known, however, what fleet configuration will result under an IFQ system so, for the purposes of analysis, the model incrementally assumed the fleet would be composed exclusively of 35, 45, 55, or 65-foot vessels utilizing the most efficient harvesting methods for that vessel size. This approach effectively generated a range of expected impacts under the various scenarios. The operating cost estimates, excluding payments to captains and crew, used in the analysis were generated using data in Weninger and Waters (2003) and adjusting for inflation. Since the costs do not include captain or crew payments, the results equal net returns to owners, captain, and crew.

The prices used in the model incorporate historic information collected from dealers by the SERO (Antozzi, personal communication[27]), which indicated that prior to implementation of minimum size limits, red snapper weighing slightly less than a pound, corresponding to a size between 11.5 and 13 inches, constituted a separate market category and were priced at a premium. However, since implementation of the 15-inch minimum size limit, red snapper weighing less than a pound have not been available in the commercial database and the resultant prices utilized for this assessment may not fully capture prices that develop for smaller fish under a size limit reduction. The model considered four market size categories, red snapper weighing 1-2 pounds (13-16 inches), 2-4 lbs (16-20 inches), 4-8 pounds (20-25 inches), and greater than 8 lbs (longer than 25 inches). The proportions of red snapper harvested by market size class were derived using data on the size distribution of red snapper harvested in the commercial sector provided by the SEFSC (Porch, personal communication[28]).

---

[26] Jim Waters, Southeast Fisheries Science Center, Beaufort Laboratory, NMFS, 101 Pivers Island Road, Beaufort, North Carolina
[27] Bill Antozzi, Southeast Regional Office, NMFS, 263 13th Avenue South, Saint Petersburg, Florida
[28] Clay Porch, Southeast Fisheries Science Center, NMFS, 75 Virginia Beach Drive Miami, Florida

The model results represent only activity for vessels that are expected to remain in the fishery and only incorporate historic harvest patterns for other species harvested by these vessels. Thus, the results capture neither revenues from other fisheries for vessels that exit the red snapper fishery, nor revenues for vessels that remain in the red snapper fishery that may change their harvest intensity of other species in response to either lower allowable red snapper harvests or increased flexibility to target other species induced by the IFQ program. Although not significantly related to the minimum size limit per se, vessels that remain in the red snapper fishery, or exit, may attempt to either mitigate their losses or take advantage of increased operational flexibility as a result of the IFQ system by increasing their effort in other fisheries. This behavior cannot be modeled at this time and the net revenue estimates provided do not account for this potential behavior. Therefore, actual net revenues may be greater than those estimated, resulting in the expectations of percentage change being overestimated.

Estimates of yearly net revenues for the respective management scenarios resulting from the combination of TAC options (**Action 1)** and size limit adjustments (**Action 3)** are presented in Table 5.4.3.1. Present values[29] of cumulative net revenues for a two-year time span are provided in Table 5.4.3.2. The two-year net present values are only provided to illustrate the magnitude of aggregate net revenues over the two-year time period considered in these analyses and do not affect the ordinal ranking of the alternatives determined by the first-year analysis. Changes in net revenues relative to no action (**Alternative 1**), expressed in percentage points, are provided in Table 5.4.3.3. In addition to the loss in net revenues to fishing operations, additional adverse economic impacts would be expected to accrue to shoreside dealers and processors. The market flow of red snapper under the recently implemented IFQ program and subsequent impacts of reduced alternative TACs cannot be determined other than to qualitatively state that the greater the reduction in TAC, the greater the change in product flow and, hence, the greater the adverse impact to these businesses.

[29] Present values were computed using a discount rate of 7 percent.

Table 5.4.3.1. Aggregate Net Revenues (Net Returns to Owners, Captain and Crew)

TAC	Vessel		Minimum Size Limit		
Options	Length (ft)	Number	15 inches**	13 inches	No size limit
9.12 MP**	35	95	$25,889,754	$25,909,562	$25,915,348
	45	67	$26,113,244	$26,133,053	$26,138,838
	55	51	$26,247,463	$26,267,271	$26,273,057
	65	39	$26,157,989	$26,177,797	$26,183,583
7.00 MP	35	73	$20,070,692	$20,085,895	$20,090,336
	45	52	$20,242,230	$20,257,434	$20,261,875
	55	39	$20,345,249	$20,360,453	$20,364,894
	65	30	$20,276,574	$20,291,777	$20,296,218
5.00 MP	35	52	$14,470,420	$14,481,280	$14,484,452
	45	37	$14,592,948	$14,603,807	$14,606,979
	55	28	$14,666,532	$14,677,392	$14,680,564
	65	22	$14,617,479	$14,628,338	$14,631,510
3.00 MP	35	31	$8,762,779	$8,769,295	$8,771,198
	45	22	$8,836,295	$8,842,811	$8,844,715
	55	17	$8,880,446	$8,886,962	$8,888,865
	65	13	$8,851,014	$8,857,530	$8,859,433

** indicates status quo management measures. Source: Waters, SEFSC (pers. comm.[32])

Table 5.4.3.2. Two-year Aggregate Present Value of Net Revenues (Net Returns to Owners, Captain and Crew)

TAC Options	Vessel		Minimum Size Limit		
	Length (ft)	Number	15 inches**	13 inches	No size limit
9.12 MP**	35	95	$50,085,785	$50,124,106	$50,135,299
	45	67	$50,518,145	$50,556,466	$50,567,659
	55	51	$50,777,802	$50,816,123	$50,827,316
	65	39	$50,604,707	$50,643,028	$50,654,221
7.00 MP	35	73	$38,828,347	$38,857,760	$38,866,351
	45	52	$39,160,203	$39,189,616	$39,198,206
	55	39	$39,359,501	$39,388,914	$39,397,504
	65	30	$39,226,643	$39,256,056	$39,264,646
5.00 MP	35	52	$27,994,177	$28,015,186	$28,021,322
	45	37	$28,231,216	$28,252,226	$28,258,362
	55	28	$28,373,572	$28,394,581	$28,400,718
	65	22	$28,278,673	$28,299,683	$28,305,819
3.00 MP	35	31	$16,952,292	$16,964,897	$16,968,579
	45	22	$17,094,516	$17,107,121	$17,110,803
	55	17	$17,179,929	$17,192,535	$17,196,216
	65	13	$17,122,990	$17,135,595	$17,139,277

** indicates status quo management measures. Source: Waters, SEFSC (pers. comm.[32]).

Table 5.4.3.3. Percentage Changes in Aggregate Net Revenues (Net Returns to Owners, Captain and Crew)

TAC	Vessel		Minimum Size Limit		
Options	Length (ft)	Number	15 inches**	13 inches	No size limit
9.12 MP**	35	95		0.1%	0.1%
	45	67		0.1%	0.1%
	55	51		0.1%	0.1%
	65	39		0.1%	0.1%
7.00 MP	35	73	-22.5%	-22.4%	-22.4%
	45	52	-22.5%	-22.4%	-22.4%
	55	39	-22.5%	-22.4%	-22.4%
	65	30	-22.5%	-22.4%	-22.4%
5.00 MP	35	52	-44.1%	-44.1%	-44.1%
	45	37	-44.1%	-44.1%	-44.1%
	55	28	-44.1%	-44.1%	-44.1%
	65	22	-44.1%	-44.1%	-44.1%
3.00 MP	35	31	-66.2%	-66.2%	-66.2%
	45	22	-66.2%	-66.2%	-66.2%
	55	17	-66.2%	-66.2%	-66.2%
	65	13	-66.2%	-66.2%	-66.2%

** indicates status quo management measures. Source: Waters, SEFSC (pers. comm.[32])

Alternative 1 would maintain the status quo and continue to impose a 15-inch minimum size limit in the commercial red snapper fishery. Under the various TAC options contained in **Action 1**, total fleet size is expected to range from 13 vessels under a 3.0 MP TAC if the fleet is comprised of 65-foot vessels, to 95 vessels under a 9.12 MP TAC (no action) if the fleet is comprised of 35-foot vessels. Annual net revenue estimates range from approximately $8.8 million under a 3.0 MP TAC to approximately $26 million under a 9.12 MP TAC, or a range of approximately $17.2 million. Under the **Preferred TAC Alternative 3** (5.0 MP), annual net revenues for the fishery are expected to be approximately $14.6 million, or approximately $11.4 million less than no action. **Alternative 1** would not be expected to result in changes in fishing practices, revenues or cost structures in the commercial red snapper fishery and all changes depicted in Table 5.4.3.3 are attributed to the TAC change and ultimate fleet composition that results from the IFQ program. Adoption of this alternative would, however, result in continued catch and mortality of undersized red snapper. This regulatory discard mortality represents unnecessary waste to both the resource and commercial fishery since it increases total fishing mortality and consumes time and economic resources in the fishing process. The economic impacts of these effects on fishing operations are partially depicted by the gains in net revenues associated with the alternative reductions in the minimum size limit. The impacts of the time component of handling these undersized fish cannot be modeled at this time.

Preferred Alternative 2 would reduce the minimum size limit for commercially harvested red snapper to 13 inches and is expected to result in several benefits for the red snapper stock, the commercial sector, and all participants in the red snapper fishery. The proposed minimum size limit is expected to benefit red snapper stocks by decreasing the number of regulatory discards, which is expected to foster faster stock recovery (Porch 2005). Faster recovery is expected, in the long term, to benefit all sectors of the red snapper fishery through higher TACs. The commercial sector is expected to additionally benefit from being able to retain and market smaller fish. Although total harvest will not be affected by a size limit change, since the commercial sector is quota managed and, on average, is expected to meet its quota regardless of the size limit, the commercial sector is expected to benefit from both a potential price premium for the smaller fish and be able to operate more efficiently since the bait and handling time associated with discards will be reduced. Additional operational savings could result from reduced search time since vessels will not have to avoid stocks of smaller fish.

Although positive economic impacts are expected to accrue from a reduction in the minimum size limit in the commercial sector, as depicted in Tables 5.4.3.1 to 5.4.3.3, the projected gains expected under **Preferred Alternative 2** are small and amount to less than 0.1 percent change in annual net revenues. This is seen most clearly in Table 5.4.3.3 with respect to the 9.12 MP TAC. While the minor improvement in net benefits is repeated for the alternative TAC options, the reductions in net revenues that result from the lower TACs are much greater than any improvement attributed to the size limit. It should also be noted that the modeling exercise is not capable of capturing the full extent of the economic benefits of adjusting the minimum size limit, since the operational efficiencies cannot be fully captured, and the estimates of gains should be considered lower bounds. Annual net revenues under the TAC alternatives and a 13-inch minimum size limit range from approximately $8.8 million under a 3.0 MP TAC to approximately $26 million under the 9.12 MP no action TAC**.** Under the **Preferred TAC Alternative 3** (5.0 MP), yearly net revenue estimates approximate $14.6 million.

Alternative 3 would eliminate the minimum size limit in the commercial red snapper fishery. The results in Tables 5.4.3.1 to 5.4.3.3 indicate that this alternative is expected to have a slightly greater positive economic effect than **Preferred Alternative 2**. Annual net revenue increases approximating 0.1 percent are imputable to the elimination of size limit restrictions in the commercial red snapper fishery. The red snapper stock is also expected to recover slightly faster under this alternative. Faster recovery would allow quicker TAC increases, with the associated economic benefits to the fishery and associated industries. Furthermore, fishermen are not expected to alter their fishing practices and target smaller fish because the smallest marketable size for red snapper is 12 inches. Wilson et al. (2004) estimate the proportion of released undersized snapper measuring at least 12 inches at 86 percent. As discussed in the previous alternative, the elimination of size limit restriction is also associated with potential harvesting cost savings. However, the discrepancy between the absence of size restrictions in the commercial fishery and the 15-inch recreational size limit may raise equity concerns.

Summary

Reducing the commercial red snapper size limit from the current 15-inch minimum is expected to result in increased economic benefits to the fishery and associated industries. These benefits are expected to accrue to increased operational efficiency of commercial vessels and to a potential price premium for smaller fish. This expectation holds regardless of the TAC. In the short term, **Alternative 3** is expected to result in slightly greater economic benefits than **Preferred Alternative 2**. However, perceptions of inequity between no commercial minimum size limit (**Alternative 3**) and the current minimum size limit in the recreational sector (16 inches) may erode the benefits attributable to increased commercial vessel efficiency. Thus, overall, the economic benefits of **Preferred Alternative 2** are expected to exceed those of **Alternative 3**. For the **Preferred TAC Alternative 3** (5.0 MP) and minimum size combination (13 inches, **Preferred Alternative 2**), the commercial fishery is projected to consist of 22-52 vessels and generate approximately $14.6 million in annual net revenues. These net revenues are approximately 0.1 percent greater than under the status quo minimum size limit.

5.4.3.2 Social Environment

Alternative 1 would continue the status quo and would maintain the 15-inch TL commercial minimum size limit for red snapper. This would not have any direct or indirect negative social impacts on the fishermen or fishing communities in the short term because they would continue fishing as before. Commercial red snapper fishermen interviewed in Apalachicola in 2005, said that the mortality rate was high for fish they threw back that were undersized. A few said that if the size limit were lowered, they could keep more of the fish they caught, and lead to a lower fishing mortality rate overall. If they could keep more of what they caught, they could catch their limit of fish sooner, returning to the docks sooner, and using less fuel per trip (Ingles, personal communication).

Alternative 2 would reduce the minimum size limit in the commercial red snapper fishery to 13-inches TL. Reducing the minimum size limit to 13 inches could have a direct positive impact on the fishermen in the short run. Fishermen would be allowed to keep more of the fish they catch than they can now. As explained above, fishermen have stated that if they could keep red snapper smaller than 15 inches they could harvest their catch faster, spend less energy for the amount of catch, and possibly, spend fewer days out at sea, and less fuel per trip. It could also cut down on the mortality of fish in the 13 to 15 inch range that are now thrown back and die. These fish could be harvested and brought back to the dock for sale.

Alternative 3 would eliminate the commercial red snapper minimum size limit. Eliminating the minimum size limit could have positive impacts in the short term since commercial red snapper fishermen would be able to keep all of the fish they caught, and there would not be any bycatch, unless fishermen choose to discard unmarketable fish. Fishermen would be able to spend less time, energy, and fuel harvesting their catch each trip. Allowing fishermen to keep all of the fish they keep will also allow them to use their IFQ shares faster.

5.4.4 Direct and Indirect Effects on Administrative Environment

Section 1.3 outlines the history of management of red snapper in the Gulf. A 15-inch minimum size limit, commercial Gulf reef fish permits and licenses to sell their catch, an IFQ program, and season closures are currently used to regulate the commercial harvest of red snapper. The purpose of reducing the commercial size limit would be to reduce the number of discards and discard mortality in order to rebuild the stock sooner. All of the alternatives would require administrators to make minor adjustments to the Reef Fish FMP which fall within the scope and capacity of the current management system and are not expected to significantly affect the administrative environment. **Alternative 1** would continue the current minimum size limit while **Preferred Alternative 2** and **Alternative 3** would reduce this limit. Because **Alternative 3** would eliminate the size limit, one less regulation would need to be enforced and reduce the administrative burden of red snapper management and enforcement.

5.5 Action 5. Modify fishing gear restrictions

5.5.1. Direct and indirect effects on physical environment

The alternatives in this section modify fishing gear to reduce bycatch or reduce bycatch mortality in the directed red snapper fishery and would directly affect the physical environment. Gear used in this fishery has very little impact on the physical environment. In the commercial red snapper fishery, two basic types of gear are commonly used: bottom longlines and vertical lines. Vertical lines include rod and reel, handline, and small vertical longlines known as bandit gear. Bottom longlines have the potential to break and move large pieces of structure on the bottom including rocks, corals, sponges, other invertebrates, and algae when the line sweeps the bottom, particularly during retrieval (Barnette 2001). Longlines, however, account for less than five percent of commercial snapper landings (SEDAR DW, 2004). Vertical line gear accounts for the majority of the catch, and while this gear can cause abrasions (Barnette, 2001) by the line and weights used, it is generally regarded as less likely to contact the bottom compared to longline gear.

Anecdotal information suggests circle hook use is common in both the commercial vertical and longline fisheries. Circle hooks when properly used are less likely to snag the bottom, which offers two advantages. The first is that sessile invertebrates such as sponges and corals would be left undisturbed as well as rock structures. Secondly, because gear is less prone to snags, there are fewer breaks off, thereby reducing the amount of tackle left in the water (Horst, date unknown).

The recreational red snapper fishery is predominantly a rod-and-reel fishery, which is managed with closed seasons and bag and size limits. Rod-and-reel gear has the potential to snag and entangle bottom structures. Barnette (2001) indicated lines and weights used by this fishery are less likely to contact the bottom compared to fishing gear types. The use of circle hooks, which reduce the impacts of fishing on benthic habitats, is unknown for the recreational sector; however, anecdotal information suggests fishermen in the western Gulf commonly use circle hooks.

Modifying fishing gear to reduce bycatch or bycatch mortality could indirectly affect the physical environment by increasing the efficiency of the directed red snapper and/or reef fish fishery thereby reducing the level of effort in both the commercial and recreational sectors. Alternatives in this action are expected to increase efficiency by reducing regulatory discard mortality, improving anatomical hooking location, increasing mean length at capture of targeted species, decreasing handling time, and reducing the take of non-targeted species. Circle hooks, dehooking devices, venting tools, and minimum hook sizes have been shown to be effective tools for accomplishing these goals. In some instances, gear modifications have also been shown to increase CPUE of red snapper and other reef fish species; although research studies have provided conflicting results.

For the commercial fishery, discards due to closed seasons for the commercial fishery are expected to decline under the proposed red snapper IFQ program. This program would allocate shares to qualified permit holders allowing them to fish when and where they want to, which would result in increased efficiency. An improved efficiency should reduce the total number of hooks set, and decrease the time gear interacts with the physical environment regardless of gear type. If the commercial size limit is reduced or eliminated (see Action 3), then gear interactions with habitat would be further reduced, thereby benefiting the physical environment.

Alternative 1 would allow fishermen to continue the use of existing gear with no modifications, and maintain current effort levels in the directed red snapper fishery.

Preferred Alternative 2 would require the use of non-stainless steel circle hooks when using natural baits to harvest red snapper and/or reef fish from the EEZ and require the use of venting tools and dehooking devices. Circle hooks have been shown to increase efficiency and the size of fish caught with some gear types. Sullivan et al. (1999) reported circle hooks caught 2.2 times as much weight as J-hooks in the aggregate catch of the Pacific halibut fishery after the conversion to circle hooks by some fishermen. They also reported circle hooks caught more fish than J-hooks at all observed fish sizes, and caught proportionately higher numbers of fish at sizes near the legal size limit than at smaller and larger sizes. Similarly, Henwood et al (2006) found a one-hundred fold increase in catch rates after circle hooks replaced J-hooks in a snapper and grouper bottom longline survey. Gledhill and Driggers (2006), found the mean length of red snapper at capture were greater when caught with circle hooks (Mustad 15/0) compared to J-hooks. They also found a significant difference in fish length between circle hook sizes (Mustad 11/0 versus Mustad 15/0) with the larger hooks catching larger fish. Increased catch rates and the capture of larger fish would decrease the amount of effort needed to land a commercial fishermen's IFQ share allocation. The decrease in effort would reduce the time gear has to potentially impact the physical environment, providing a positive benefit to that environment.

Powers and Shipp (personal communication) found the mean length of red snapper captured with rod-and-real gear using either circle or J-hooks to be fairly similar, but with lower CPUE for circle hooks. It is unknown why this study contrasts those above. Differences may be attributed to gear effect (longline vs. rod and reel), bait differences, sampling depth, or some other factor. Regardless of the difference, if catch rates are lower for circle hooks as documented by this study, an increase in effort by fishermen would be expected in the attempt to catch the bag limit for recreational fishermen and the IFQ allocation of commercial fishermen. This increase in effort would negatively impact the physical environment as gear interaction time with the bottom increases, albeit not substantially.

Alternative 3 would require a minimum hook size when harvesting red snapper from the EEZ. Cooke and Suski (2004) found that large hooks do result in some size selectivity towards larger fish; however, larger hook sizes do not necessarily exclude smaller fish. Thus, intermediate-sized hooks may be most appropriate for minimizing red snapper and/or other reef fish injury and mortality risk while maintaining high capture efficiencies and facilitating the capture of fish across a range of sizes (Cooke and Suski 2004).

As mentioned above, Gledhill and Driggers (2006) found a significant difference in the mean length at capture between hook sizes (Mustad 11/0, 13/0, and 15/0 circle hooks) in a bottom longline survey. Significant differences were found between the mean length of fishes caught on 11/0 and 15/0 circle hooks, with smaller fishes being caught on smaller hooks. Thus for longline gear, larger hook sizes could lead to an increase in the number of legal size fish being landed per set, reducing the number of sets by fishermen and subsequently reducing interactions of longlines with the physical environment. The effectiveness of circle hooks on increasing catch rates in the vertical line gear sector is not known; however, the depth strata over which the NMFS Pascagoula survey was conducted sampled depths similar to those vertical line and recreational fishermen tend to target. Thus, the observed effects of using circle hooks could be applicable to the commercial vertical line and recreational sectors.

Alternative 1 does not change current fishing practices in the directed fishery and so by itself should not change harvest practices in the fishery. In contrast, **Preferred Alternative 2 and Alternative 3** would be expected to reduce bycatch and bycatch mortality in the directed fishery. Information is insufficient to determine which of these alternatives would affect the physical environment less; however, both are expected to have small positive benefits.

5.5.2 Direct and indirect effects on biological/ecological environment

Gear modifications would be expected to have direct beneficial effects on the red snapper biological and ecological environment, albeit small. The most recent stock assessment indicated discard mortality by the directed fishery is more important to stock recovery than previously thought. Therefore, decreasing bycatch and bycatch mortality will assist in facilitating stock recovery.

Alternative 1 would not require additional measures to reduce discard and bycatch mortality. Because the most recent stock assessment (SEDAR 7 2005) shows reductions in dead discards are needed to rebuild the stock, selecting Alternative 1 would result in a delay in the recovery time of the red snapper stock as well as affecting those stocks that are incidentally caught by the directed red snapper fishery. These stocks include a number of species currently considered overfished or undergoing overfishing including gag, grey triggerfish, and greater amberjack.

Preferred Alternative 2 would require the use of circle hooks, venting tools, and dehooking devices, which would reduce discard and bycatch mortality in the directed red snapper or other reef fish fisheries. Since 1999, the Council has encouraged the use of circle hooks for red snapper and other reef fish in order to reduce fishing mortality. Cooke and Suski (2004) reviewed studies on circle hook effectiveness to determine the usefulness of circle hooks for fisheries management. Overall, they found mortality rates were lower for circle hooks than J-style hooks. Hooking depth, anatomical hooking location, amount of bleeding, and ease of hook removal were identified as major contributors to mortality. These factors are thought to be different for circle and conventional hooks. Circle hooks typically hook fish around the maxilla for red snapper (SEDAR 7 2005), and are less likely to be swallowed. Additionally, circle hooks were found less likely to result in bleeding than J-hooks, which tend to deep hook fish at a higher frequency (Cooke and Suski 2004). Removal of deeply ingested hooks often results in mortality (Warner 1979; Muoneke and Childress 1994), with vital organs being damaged from penetration into the pericardium or body cavity (Diggles and Ernst 1997). Kaimmer and Trumble (1997) found circle hooks caught the jaw of Pacific halibut in more than 95 percent of the observations, while J-hooks caught the jaw about 80 percent of the time.

Burns et al. (2002) found more red snapper caught with rod-and-reel gear died from hook mortality than all other causes combined, including depth, stress, and handling. Acute J-hook mortalities occurred in otherwise healthy, well fed fish when the hook penetrated or in some cases, slit the esophagus and then depending on orientation, either macerated the heart or liver. Trauma was so severe that death occurred either as the fish was being landed or a few minutes after landing. Burns (personal communication) has also shown that tag return rates for fish caught on circle hooks are greater than fish caught on J-hooks (8.6 percent return vs. 7.97 percent, respectively). Anecdotal evidence suggests circle hook use is widespread in the commercial sector, and increasing in popularity in the recreational sector. It appears mandatory use of circle hooks in all fisheries would benefit the biological environment by reducing acute and long-term mortality caused by J-hook usage.

If circle hooks do indeed increase catch rates as shown by Henwood et al. (2006), it is possible to see a negative effect on the biological environment of red snapper or other reef fish species. If not controlled increased catch rates could result in difficulties in keeping recreational catches within the specified TAC levels, which could compromise the rebuilding plan of red snapper or other reef fish species. Though this problem is expected to be limited in the red snapper fishery to the recreational sector because of the IFQ program, it may be more problematic in the other reef fish directed commercial sectors and the recreational sectors. Because the recreational sector is managed with size limits, bag limits, and closed seasons, it is more susceptible to increased catch rates. If recreational anglers catch the bag limit more frequently and land larger fish, landings could increase over current levels. This problem is further exacerbated by continued catches of the same type (larger fish, higher CPUE) during the closed season, which could again compromise rebuilding plans through increased discard mortality. In contrast, if catch rates increase the number of legal size fish landed and decrease discard mortality, a net benefit would be expected. Therefore, exclusion of smaller individuals or an increase in survival of regulatory discards would aid in rebuilding the red snapper and other reef fish stocks.

Similarly, if circle hooks decrease CPUE as determined by Powers and Shipp (personal communication), then a net benefit to the stock would occur. Lower CPUE would result in lower fishing mortality on legal sized fish. Additionally, circle hooks would reduce regulatory discards, thereby providing additional net benefits to the stock. As a result, stock recovery would be faster.

Modifying gear to reduce bycatch and bycatch mortality would also have beneficial effects on the biological and ecological environment of non-targeted species. The measures would be expected to affect other species in the same manner as red snapper. Bycatch species in the directed red snapper fishery include other reef species including vermilion snapper, gag, red grouper, grey triggerfish, and greater amberjack. Some of these species have similar mouth morphology or feeding modes as red snapper, an important factor in the effectiveness of circle hook use (Cooke and Suski 2004). As a result, hooking mortality on these species would be reduced. Burns et al. (2002) showed an increased tag return rate for red grouper caught on circle hooks compared to J-hooks (8.6 percent and 7.97 percent, respectively), which is an indicator of higher survival by circle hook caught fish. Discard mortality rates of reef fish stocks that are either overfished or are undergoing overfishing could decrease with the use of circle hooks. Reducing the catch or decreasing the discard mortality of these species has the potential to alleviate fishing and discard mortality on these stocks, allowing them to return to a healthy sustainable level.

Preferred Alternative 2 would also require the use of venting tools when harvesting red snapper and/or other reef fish from the EEZ. Venting, when properly executed, is thought to increase survival of released fish. The use of venting tools may also reduce predation on red snapper and other reef fish species. Bloated fishes with ruptured swimbladders are incapable of rapid return to benthic refugia (Burns et al. 2002). In addition, discarded undersized fish stranded at the surface become easy prey for marine mammals and sea birds as well as large piscine predators such as amberjack, barracuda, and sharks (Burns et al. 2002). Bycatch species that have been vented are less likely to stay at the surface and descend more quickly, making them less vulnerable to predators. Preliminary data from a 15-year study conducted at Mote Marine Lab (Burns and Porch, personal communication) suggest that venting increases survival in red snapper caught in deep water. This study is in contrast to earlier studies by Render and Wilson (1993) and Gitschlag and Renaud (1994), who found no increase in survival from venting. Currently, commercial fishermen are thought not to vent, and the extent of venting in the recreational side is unknown (SEDAR 7 2005).

The use of venting tools would also be expected to have beneficial effects on non-targeted species such as vermilion snapper. Collins et al. (1999) compared survival of vented and unvented black sea bass and vermilion snapper. Deflation of the swim bladder provided very significant reductions in mortality of black sea bass, and benefits of deflation increased with capture depth. Deflation for vermilion snapper was also beneficial, but to a lesser extent.

The third requirement of **Preferred Alternative 2** is dehooking devices. Cooke and Suski (2004) identified ease of hook removal as a major contributor to mortality; therefore, the use of dehookers to remove hooks and lines would likely reduce serious injury and post-release mortality of sea turtles, marine mammals, targeted species, and other incidentally caught species. Dehooking devices allow fishermen to remove hooks easier and more quickly from undersized red snapper and other reef fish species without removing the fish from the water. Leaving a fish in the water while removing the hook reduces the physiological stress incurred. Additionally, the protective slime coat of many fishes, including red snapper, remains undisturbed when a fish is left in the water and not handled during hook removal. If a fish does need to be removed from the water, dehookers are still expected to reduce handling time in removing hooks, thus increasing survival.

Preferred Alternative 2, Options a and b would require only the commercial or recreational sector to use circle hooks, venting tools, and dehooking devices, respectively. **Preferred Alternative 2, Option c** would require both sectors to comply with these requirements and **Preferred Alternative 2, Preferred Option d** would require participants in any reef fish fishery to use circle hooks, venting tools, and dehooking devices. **Preferred Alternative 2, Option a and b** would only target either the commercial or recreational sectors of the directed red snapper fishery, which account for 51 and 49 percent of the TAC, respectively. In order to maximize effectiveness of these management measures, 100 percent coverage of the directed fishery is ideal. Therefore, **Preferred Alternative 2, Option c** would be the most effective for reducing bycatch mortality of red snapper.

Preferred Alternative 2, Preferred Option d would be the optimal choice for implementing new gear requirements as this would expand circle hooks to year round usage, thereby reducing discard mortality during the recreational closed season. There is a large portion of red snapper bycatch that occurs during the closed season, when red snapper are not targeted. Because other reef fish species such as other snappers and groupers are commonly found in areas with red snapper, it is difficult for fishermen to avoid incidental catch of red snapper. **Preferred Alternative 2, Preferred Option d** would require fishermen to use circle hooks year-round when targeting other reef species. This would continue the expected benefits of reduced bycatch and bycatch mortality when red snapper are not targeted. Additionally, many reef species have similar mouth morphology or feeding modes, important factors in the usefulness of circle hooks, which would suggest benefits to these species from the use of circle hooks similar to those discussed for red snapper.

The indirect effects of requiring circle hooks would include reducing regulatory discards of non-targeted species by increasing mean length at capture and excluding some species from capture. A number of species in the reef fish fishery are regulated with size limits. Therefore, if circle hooks increase mean length at capture, a reduction in undersized fish caught would be expected. The decrease in regulatory discards could help maintain healthy stock levels as well as rebuild overfished stocks. Exclusion of some species could likewise benefit those stocks by reducing mortality within those populations.

Alternative 3 would require a minimum hook size when harvesting red snapper and/or other reef fish species. Cooke and Suski (2004) found that large hooks result in some size selectivity towards larger fish; however, they do hook smaller fish as well. Thus, intermediate-sized hooks may be most appropriate for minimizing injury and mortality risk while maintaining high capture efficiencies and facilitating the capture of fish across a range of sizes. Additionally, Trumble et al. (2000) found survival by injury type much greater with smaller hooks than larger hooks in the Pacific halibut fishery. Survival rates for moderate and severe injuries were 1.5-2.0 times higher for small hooks than for large hooks (Trumble et al. 2000).

Alternative 3, Option a would require specific hook sizes as described in either s**uboption i, suboption ii**, **suboption iii**, or **suboption iv** in the commercial fishery. **Alternative 3, Option b** would require specific hook sizes as described in the various **suboptions** in the recreational fishery. **Alternative 3, Option c** requires the use of these same hook sizes in both sectors of the directed fishery. As Gledhill and Driggers (2006) found, larger hooks tend to capture larger fish, thereby reducing the number of regulatory discards due to size.

Alternative 3, Option d would require the same sub-option of hook sizes in the reef fish fishery. As stated previously, due to the similarity of habitat usage, many red snapper are incidentally caught during the closed season for the directed fishery. Requiring the use of circle hooks year-round will reduce bycatch and bycatch mortality during the recreational red snapper closed season. Additionally, the minimum hook size for red snapper would do well to reduce bycatch and bycatch mortality in other reef fish fisheries because of the similar characteristics of habitat usage, mouth morphology, or feeding mode. However, determining an appropriate hook size is difficult to assess at this time without an appropriate scientific study. Therefore, it would seem prudent to rely on public testimony from fishermen, who look to optimize size at landing, to determine the appropriate hook size for the directed red snapper and other reef fish fisheries.

The indirect effects on the biological environment of dehooking devices and venting tools are unknown; however, they are expected to decrease bycatch mortality by increasing survival rates. As more bycatch is returned to the water alive, red snapper and/or reef fish populations are expected to increase in size leading to increased competition for space, increased foraging, and increased predator-prey interactions.

The Council's preliminary rebuilding goal of 20-35 percent SPR would require that bycatch mortality be reduced by 68 to 80 percent across all fisheries for red snapper. **Alternative 1** provides no method for achieving this goal while **Alternatives 2 and 3** provide methods for reducing bycatch and bycatch mortality in the directed commercial and/or recreational fisheries. Although anecdotal information suggests most commercial fishermen and a large portion of western Gulf recreational fishermen use circle hooks, the extent of usage in the eastern Gulf is unknown.

5.5.3 Direct and Indirect Effects on the Economic/Social Environment

5.5.3.1 Economic Environment

Alternative 1 would maintain the status quo and not establish any new restriction on the type or size of hooks used in the Gulf of Mexico red snapper fishery, nor mandate the use of dehooking devices or venting tools. Since no new requirements would be imposed, all customary practices would continue. No additional expenses would be imposed on fishery participants in either sector as a consequence of this alternative. Therefore, no short-term direct impacts would accrue to the fishery or associated industries, and no short-term indirect effects on the economic environment are expected. This alternative would not, however, reduce the bycatch and bycatch mortality problems associated with current gear requirements. Continued mortality associated with the absence of gear modifications would be expected to result in slower recovery and more restrictive harvest allowances than would otherwise be possible, with attendant loss in economic benefits. Continuation of this alternative through Council action would, therefore, be expected to delay rebuilding, where applicable, and reduce allowable harvests and associated economic benefits to the directed fisheries and associated businesses.

Preferred Alternative 2 would mandate the use of circle hooks, venting tools, and dehooking devices, with options to apply these requirements to the commercial sector, the recreational sector, both sectors, or the entire reef fish fishery.

In the commercial sector, on average, vertical line fishermen account for close to 95 percent of the red snapper landed in the Gulf (Waters 2006). In addition, almost all commercial vertical line fishermen use circle hooks to fish for red snapper. During public testimony and subsequent discussions, for-hire operators and private anglers indicated that circle hooks are used by an increasing proportion of fishermen in the recreational sector. Moreover, fishing equipment suppliers and large-scale retailers currently offer a wide variety of comparably priced hooks, including circle hooks.

Around the Gulf, state agencies and extension and research services, e.g., Alabama Department of Conservation and Natural Resources and Florida Sea Grant, have conducted workshops or designed educational brochures detailing proper dehooking and venting procedures and indicating simple methods for altering commonly available instruments such as hypodermic needles to serve as venting tools. For-hire operators also indicated that they routinely share appropriate dehooking methods and proper fish venting techniques with their customers. Needle-nose pliers can be used as dehooking devices. Ready-made dehooking devices and venting tools are available for purchase from various sources for less than $15 each. Therefore, due to the widespread availability of educational materials and instruments for proper catch and release techniques, their increasing use by fishermen in both sectors, and the low cost of recommended instruments, the requirements of this alternative are not expected to be burdensome or costly.

The bycatch mortality reductions expected to accrue to this alternative would be expected to have positive effects on stock recovery, supporting larger harvests, with associated increased economic benefits to the fishery and related industries relative to the no action.

Preferred Alternative 2, Option a would apply the circle hook, dehooking, and venting gear requirements only on the commercial red snapper sector. As previously indicated, vertical line fishermen, which account for about 95 percent of the commercial red snapper harvest, almost exclusively use circle hooks to harvest red snapper. In addition, circle hooks are readily available and comparably priced with other hooks. Thus, mandating the use of circle hooks would not be expected to substantially increase the fishing costs or adversely affect the economic performance of commercial operations.

Although many commercial operations indicate that they already use dehooking devices and venting tools, it is not possible to accurately estimate the number of commercial reef fish vessels that already carry these instruments onboard. However, given their relatively low cost, the acquisition of these recommended tools is not expected to result in substantial additional out-of-pocket expenses for commercial red snapper fishermen. While requiring the possession of dehooking devices and venting tools onboard appears to be straightforward and inexpensive, the monitoring and enforcement of their effective use would be impossible without expensive observer coverage, and no such requirement is proposed. The amount of time devoted to proper dehooking and venting of released fish is limited by the number of the crew, so the effectiveness of the venting requirements may vary with vessel operation. On average, the top 50 vessels in terms of red snapper harvest carried 4.0 crew per trip; vessels outside the top 131 carried an average of 2.4 crew per trip (Waters 2006).

Preferred Alternative 2, Option b would impose the circle hook, dehooking, and venting gear requirements only on the recreational red snapper sector. The increasing use of circle hooks in the recreational sector and their competitive pricing with other hook types suggests that mandating their use would not result in noticeable increased costs to fishermen and, hence, not adversely affect their fishing behavior, nor induce other adverse economic effects on the economic environment. Similarly, the widespread availability of free educational opportunities and affordable recommended instruments for proper catch and release indicate that the adoption of this option would not result in significant adverse economic effects.

Preferred Alternative 2, Option c would impose the circle hook, dehooking, and venting gear requirements on both sectors of the red snapper fishery. As discussed above, neither sector, recreational or commercial, is expected to be significantly impacted by these requirements. This action would be expected to have stock benefits, with associated economic benefits, albeit small. These benefits would be expected to be greater under this option than under **Preferred Alternative 2, Option a** or **Option b** since the entire red snapper fishery would be encompassed by the action.

Preferred Alternative 2, Preferred Option d would expand the scope of this management measure to encompass both sectors and all reef fish fisheries. For the reasons mentioned above, for-hire operators, private recreational anglers and commercial fishermen in the reef fish fisheries are expected to be marginally impacted by these requirements since the use of this gear has become increasingly common and the cost of the hooks is competitive with other types. Therefore, the adoption of this measure would not be expected to result in substantial increased costs or direct or indirect short-term adverse effects on fishing behavior or performance of fishery participants or associated industries. Due to its wider scope, this option would also be expected to improve the enforceability of the requirements. Greater long-term positive economic effects would be expected since stock benefits would accrue to a greater number of species. Hence, a wider range of fisheries, and associated industries, would benefit from expanded harvests and reduced bycatch mortality.

Alternative 3 would mandate the hook size for prosecuting the red snapper or reef fish fisheries, with options to apply these requirements to the commercial sector, the recreational sector, or both sectors.

Alternative 3, Option a would set hook size requirements only in the commercial red snapper fishery. None of the sub-option size specifications would be expected to result in any discernable impact on fishing costs or practices because the required sizes fall within the range of hook sizes commonly used by commercial red snapper fishermen. No discernable differences between the sizes are expected since price differences between hooks of varying sizes are negligible. Operational costs would not be expected to increase, nor would catch rates be expected to be adversely affected, and the overall profit performance of individual vessels and the fishery as a whole would not be expected to change. Some stock benefits would be expected in the long-term due to decreased incidental catch and bycatch mortality, supporting larger directed harvests, with accompanying increases in economic benefits to the directed fishery and associated industries. Full benefits of the requirement, however, may not be achieved since application to a single fishery would be difficult to monitor and enforce.

Alternative 3, Option b would set hook size requirements only in the recreational red snapper fishery. Although more diversity may exist in the hook sizes used in the recreational red snapper fishery, similar to the situation with **Alternative 3, Option a**, the adoption of this option would not be expected to result in substantial additional costs or changes fishing behaviors in the recreational sector, since hook price differences are negligible and catch success would not be expected to be sufficiently impacted to alter fishing patterns or reduce demand for fishing trips. Some stock benefits would be expected in the long-term due to decreased incidental catch and bycatch mortality, supporting larger directed harvests, with accompanying increases in economic benefits to the directed fishery and associated businesses. Full benefits of the requirement, however, may not be achieved since application to a single fishery would be difficult to monitor and enforce.

Alternative 3, Option c would set hook size requirements on both the commercial and recreational sectors of the red snapper fishery. As discussed for **Alternative 3, Option a** and **Option b**, this option would not be expected to result in any substantial direct or indirect adverse economic impacts on the directed fishing sectors or associated businesses. Again, some stock benefits would be expected in the long-term due to decreased incidental catch and bycatch mortality, supporting larger directed harvests, with accompanying increases in economic benefits to the directed fishery and associated businesses. Since this option would encompass both harvest sectors, the potential stock benefits, and associated economic benefits, would be greater than under **Alternative 3, Options a** or **b**. Enforcement would remain a problem, however, since application would be restricted to the red snapper fishery.

Alternative 3, Option d would expand the scope of this management measure to encompass both sectors and all reef fish fisheries. While the requirements would be extended to a larger number of fisheries and fishery participants than under the previous options, the same conclusions on an expected absence of substantial direct or indirect adverse economic impacts on participants in the directed fisheries or associated industries applies. In addition to increasing the survival rate of red snapper discards, this measure would be expected to lower the bycatch and discard mortality of all reef fish species, supporting stock benefits for all these species and associated catches, with associated economic benefits to the directed fishery participants and associated businesses. Due to the wider scope of application, this option would be expected to be more effective in achieving the desired goals since it would be easier to monitor and enforce.

Summary

Alternative 1 would not impose any additional gear requirements or restrictions on either the red snapper or reef fish fisheries and would not, therefore result in any direct or indirect short-term impacts to participants in the directed fisheries or associated businesses. The gear requirements and restrictions considered by **Alternatives 2 and 3** have the intended purpose of reducing bycatch and bycatch mortality, with attendant gains in long-term stock conditions and economic benefits. Each alternative comes with attendant costs, through new gear purchases, though such costs are not expected to be substantial, particularly in the case of **Preferred Alternative 2** and **Alternative 3.**

Continued mortality associated with the absence of gear modifications would be expected, however, to result in slower recovery and more restrictive harvest allowances than would otherwise be possible, with associated loss in economic benefits. Continuation of the status quo through Council action would, therefore, be expected to delay rebuilding, where applicable, and reduce allowable harvests and associated economic benefits to the directed fisheries and associated businesses. From the long-term perspective, the expected impacts of the hook specification, dehooking gear, and venting gear alternatives are largely indistinguishable when considered for application to a specific fishery. However, the expected benefits of applying the requirements to all reef fish fisheries (**Preferred Alternative 2, Preferred Option d** and **Alternative 3, Option d**) are expected to exceed the benefits of such requirements being applied only to the red snapper fishery or sector thereof (**Alternative 2, Options a-c** and **Alternative 3, Options a-c**). From the long-term perspective, stock improvements and attendant economic benefits would be expected to be realized with **Preferred Alternative 2, Preferred Option d** and **Alternative 3, Option d.**

5.5.3.2 Social Environment

Alternative 1 would not have any impacts on the fishermen or fishing communities because it would maintain the status quo.

For **Preferred Alternative 2 and Alternative 3** in this action there are no major direct or indirect community social impacts. The negative or positive effects to the communities dependent on the red snapper fishery can not be quantified. This action should not alter how often or where a recreational or commercial fisherman fish and would not have any impacts on the businesses which are dependent on the red snapper fishery.

There are minor impacts on commercial and recreational fishermen in that if a minimum hook size is adopted, the use of a non-stainless steel circle hooks is required, or the use of venting tools and dehooking devices is required, in that fishermen will have to replace their gear if they are not already using the specified gear. Some fishermen prefer to be able to choose the types and size of hooks they use when they fish, regardless of what may be best for the fish, while others may prefer to use which ever hook is the most environmental friendly. If the Council chooses to set standards for the type and size of hook that must be used, some fishermen will agree that it is in the interest of saving the species, and that the hooks specified will do the most towards allowing fishermen to release a red snapper alive. There may be positive effects on the society as a whole if the hooks chosen help to preserve the resource and aid in the rebuilding of the stocks.

5.5.4 Direct and Indirect Effects on Administrative Environment

Modifications to gear are expected to have a direct effect on the administrative environment. Regulations constraining allowable gear types in a fishery place a burden on NMFS, and enforcement personnel.

Alternative 1 is not expected to have a direct effect on the administrative environment as it maintains existing gear with no modifications. **Preferred Alternative 2 and Alternative 3** have a direct effect on the administrative environment in that new regulations would need to be enforced. Currently there are no definitions in Part 622 of the Code of Federal Regulations for circle hooks, J-hooks, venting tools, or dehookers. If such devices were to be required, enforceable definitions would need to be added to the regulations. Fishery enforcement agents would need to check fishermen to ensure these new regulations are being followed.

The suboptions under **Alternative 3** specify hook sizes, which eliminates the confusion caused by various sizing methods used by manufacturers. This specificity of hook size (using outside diameter and hook point to shank measurements) is expected to decrease the burden on the administrative environment. These specifications clearly define the expectations of hook size by providing measurable criterion for enforcement.

Federal and state enforcement agencies are limited by their resources to enforce and prosecute fishery violations. Any additional regulations would cause these agencies to re-evaluate priorities and resource allocations. Thus, enforcement of other regulations may be restricted if resources are allocated to address required regulations for this action.

5.6 Shrimp Actions 6, 7, and 8

Action 6. Establish a Target Reduction Goal for Juvenile Red Snapper Mortality in the Shrimp Fishery of the northern and western Gulf of Mexico

Action 7. Consider establishing shrimp fishing restrictions to reduce effort to achieve a fishing mortality reduction target for juvenile red snapper in the northern and western Gulf of Mexico established in Action 6

Action 8. Establish a framework procedure to adjust shrimp fishing effort in the northern and western Gulf of Mexico

In combination, **Actions 6, 7, and 8** are intended to establish, achieve, and maintain a target bycatch reduction goal for the shrimp fishery of the western Gulf of Mexico. These actions are linked much like the combinations of TAC, bag and size limits and fishing seasons established in **Action 1**. The selection of a preferred alternative for **Action 6** sequentially affects the decision-making process in regard to the selection of a preferred alternative for other two actions. For this reason, the three actions are being considered together for this discussion of environmental consequences.

Selecting **Alternative 1 (No Action)** for **Action 6** would not require any further action under **Actions 7 or 8**, and would maintain status quo in the way the shrimp fishery operates. This would not provide the fishing mortality reductions required to rebuild the red snapper stock, and would not prevent re-expansion of effort in areas where red snapper are abundant, should economic conditions improve in the shrimp fishery.

Effort in the shrimp fishery is already lower than the 50 percent reduction target established by **Alternative 2 of Action 6**, thus there would be no immediate need to implement more restrictive measures such as outlined in **Action 7,** or to establish a framework as proposed in **Action 8**. A target reduction goal of 50 percent from the 2001-2003 baseline years would provide some level of future restriction preventing a re-expansion of the shrimp fishery, while providing some flexibility to the shrimp fleet to harvest shrimp at the currently defined OY level. Achieving a higher target reduction goal of 74 percent reductions in red snapper mortality would be dependent on external factors, such as continued economic problems, leading to further declines in shrimp effort. Nevertheless, during the short run (2007-2011), rebuilding trajectories are relatively insensitive to decreases in shrimp bycatch mortality rates due to recent strong year classes (Thompson 2005).

Alternative 3 of **Action 6** would establish a 60 percent reduction target that does not meet the recommended fishing mortality reduction goals established in the red snapper stock assessment. Estimates of effort in 2006 suggest that the fishery may already be below this target. Therefore, similar to **Alternative 2**, the selection of **Alternative 3** would not have predicated the immediate need for action alternatives under Action 7 or 8. As discussed above for **Alternative 2**, this level of reduction would allow rebuilding, just not at a rate to end overfishing by 2009-2010.

Alternatives 4, 5 and **Preferred Alternative 6** of **Action 6** would establish a 74 percent target reduction goal for the shrimp. Because the fishery may not have met this target, and could exceed this target should the fishery re-expand in the future, the selection of this target triggers the need for a mechanism to address shrimp fishing effort as proposed in **Actions 7 and 8**.

The NMFS estimates shrimp fishing effort in 2006 was less than that documented for 2005. As noted elsewhere, at least some portion of the vessels active during the first half of 2005 were damaged by hurricanes and were not salvaged. In addition, effort appears to be continuing to shift closer to shore to reduce fuel costs.

5.6.1 Direct and Indirect Effects on Physical Environment

In combination, the actions are intended to reduce effort expended in areas where juvenile red snapper are most abundant. In so doing, there may be some positive direct benefits to the physical environment. Trawling, in general, is recognized for its potential impacts to benthic environments, both from the large heavy doors drug along the bottom and from the nets and tickler chains that scrape along the surface of the sea floor. While most shrimp trawling occurs over relatively smooth bottom, small- and meso-scale structure exists in these areas (sponges, worm tubes, etc.). Patterson et al. (2005) identified juvenile red snapper were more likely found in areas where some low-level relief occurred, such as shell bottom. Areas such as these are not often associated with high concentrations of shrimp, but Patterson et al. (2005) also recognized that Workman and Foster (1994) identified similar concentrations of juvenile red snapper were found on sand-silt bottoms compared to shell-rubble bottoms. Patterson et al. (2005) suggested these similarities may have been because of undisclosed small-scale relief and complexity to the habitat. The general consensus is that trawling impacts these small-scale complexities with damage to the existing benthic faunal community.

However, Sheridan and Doerr (2005), comparing the fauna and physical characteristics of an area off Texas closed seasonally to shrimp trawling to an area open to shrimp trawling, found little difference in the physical environment between the two areas during a 7-month closure. They had hypothesized there would be changes in the faunal structure due to the presence/absence of trawling, but differences were not pronounced. The authors suggested longer-term and broader-scale physical parameters, such as currents and storm events, had a bigger effect than shrimp trawling on the sedimentation and physical characteristics of the area in question. These authors cite several other studies with similar conclusions. Additional studies presented in this same volume (Barnes and Thomas [editors] 2005) presented similar results of limited ability to discern major physical impacts between trawled and untrawled (but trawlable) areas.

Selection of **Action 6, Alternatives 2 or 3** would not require additional action by fishery managers, except to monitor total effort on an annual basis. Effort in the fishery is already below these target levels, and there are no reasonable expectations for the fishery to expand in the near future. Effort in the fishery is expected to decline, due to external economic factors, through at least 2012. Thus, there would be no additional physical impacts from the selection of **Action 6,**

Alternatives 2 or 3. Selection of the **Alternative 4, 5 or Preferred Alternative 6 for Action 6** would more than likely require future action by fishery managers to maintain this reduced level of effort, and provide the most potential for benefits to the physical environment within the restricted zone. Implementation of any of the alternatives in **Action 7**, other than the no action alternative (**Alternative 1**), would further reduce trawl effort; this would be expected to reduce overall physical environmental disturbances in the areas restricted. On the other hand, if effort simply shifts to shallower waters, there would be a negative impact in these nearshore waters from increased perturbation.

Action 7's alternatives cannot be analyzed quantitatively because they are defined in open-ended terms, varying in both time and space. Only the minimum (no closures) and the maximum (the full area closed for the entire proposed time frame) can be reviewed at this time. Any benefits and impacts from other scenarios would be in-between these levels of affects. **Preferred Alternative 2**, without a specified time frame, would provide the potential for the longest closure period. Theoretically, the 10 to 30-fathom closure could begin with the start of the Texas Closure and continue for the entire year for all of Statistical Zones 10-21. Under such a scenario, this alternative provides the greatest opportunity for benefits to the physical environment in the areas closed to trawling. A more likely scenario under **Preferred Alternative 2** would be a closure of this depth zone for a period not exceeding the 60-day Texas Closure, and would be equal to the time frame of **Alternative 4**. A specific maximum closure of 4 months, **Alternative 3**, would provide the longest level of closure. It is not expected that benefits would be permanent as the areas would be re-opened to trawling each year.

Action 8 is primarily administrative and so will have no direct or indirect effect on the physical environment.

5.6.2 Direct and Indirect Effects on Biological Environment

The impacts on the biological environment are discussed in detail in Section 4 (Bycatch Practicability Analysis) and are only summarized here. The impact of shrimp trawl bycatch on the red snapper stock is a major part of the evaluation in this EIS. The red snapper stock is not projected to recover without substantial shrimp trawl bycatch reduction. Nevertheless, the 2005 red snapper assessment indicated the directed fishery bycatch (especially in the eastern Gulf) is now known to have a greater effect on stock recovery than previously thought. The 2005 stock assessment used higher natural mortality rates for juvenile red snapper than previous assessments, reducing the impacts of discards attributed to the shrimp trawl fishery. Over the next five years, rebuilding trajectories for red snapper are relatively insensitive to decreases in shrimp bycatch mortality rates due to recent strong year classes (Thompson 2005), but over the long term, the red snapper stock cannot be rebuilt without reductions in shrimp trawl bycatch mortality. All three seasonal closure alternatives in **Action 7** are intended to achieve a reduction in red snapper fishing mortality according to the target reduction level in **Action 6, Preferred Alternative 6**. The alternatives only differ in geographic scope and seasonality, and differences among the alternatives are related to social and economic impacts. As noted in Section 5.6.1 (Physical Environment), **Action 7's** alternatives cannot be analyzed quantitatively because they are defined in open-ended terms, varying in both time and space. Only the minimum (no closures) and the maximum (the full area closed for the entire proposed time frame) can be reviewed at this time. Any benefits and impacts from other scenarios would be in-between these levels of affects.

The probability of ending overfishing and achieving adequate rebuilding progress is contingent on whether or not reductions in fishing mortality across all sources are met. As discussed in Section 5.1, linked bycatch reduction targets of 74 percent between the directed red snapper fisheries (both recreational and commercial) and the shrimp fishery are unlikely to be met for the recreational fishery because of closed season bycatch, which lessens the benefits achieved by shrimp trawl effort reductions.

While some shrimp effort may be redistributed to other areas under the proposed closures, there is expected to be an overall reduction in shrimp trawl effort. The majority of finfish taken in shrimp trawls, including red snapper, are age 0 and age 1 fish, and most do not survive the capture event. However, many of the common species, such as Atlantic croaker, spot, and longspine porgy are short-lived, and have high natural mortality rates. The bulk of the bycatch finfish species are not managed at the state or federal level; most are not targeted by any specific recreational or commercial fishery. Thus, there are no active assessments regarding the status of this collective group of groundfishes. Even so, actions to reduce fishing mortality on these various groundfish species would be expected to improve the stocks. As detailed in the SEIS developed for Shrimp Amendment 9, increasing stock size of the groundfish stocks could negatively impact the biomass of shrimp by 5.9 percent to 8.2 percent because of increased predation, although this was not anticipated to affect yield (Martinez, et al. 1996). There is no new information to change this conclusion.

There is insufficient information available in regard to the differences in the quantity and species composition on a scale that would allow estimation of differential impacts to the faunal communities among the various closure alternatives proposed in **Action 7**. Each of the alternatives under **Action 7** is intended to achieve a level of fishing mortality reduction in red snapper. The same levels of reduction in fishing mortality would be expected for most of the other finfish stocks, if one assumes the fauna and shrimp effort are homogeneously distributed over time and space. In addition, there is insufficient information to assess how much effort will be redistributed outside of the proposed closure areas. As discussed under **Action 7** in Section 2, seasonal closures that lead to relocation of effort by the shrimp fleet to nearshore waters would most likely increase the level of finfish bycatch. The ratio of finfish biomass to shrimp biomass is often twice as high for nearshore waters as it is for offshore waters.

Similar to the impacts on the physical environment, implementation of any of the alternatives in **Action 7**, other than the No Action alternative (**Alternative 1**), would further reduce trawl effort; this would be expected to reduce overall impacts on the biological communities, at least for the short term. **Action 7, Preferred Alternative 2** would provide the potential for the longest closure period (could be year-round), providing the most opportunity for benefits to the biological community associated with the shrimp grounds. If the closure under this alternative was designed to mirror the Texas Closure, then the benefits and impacts would be the same as **Alternative 4**, being a two month closure of the 10 to 30-fathom zone. **Action 7, Preferred Alternative 2** would provide the longest potential level of closure, covering a four-month period, assuming the **Preferred Alternative 2** matched the Texas Closure. It is not expected benefits of any of the closures would be permanent as the areas would be re-opened to trawling each year.

As noted above, the benefits of any of the closures in **Action 7** are also contingent upon the (as of now) unknown level of redistribution of effort outside the closed area.

As noted in 5.6.1, there is inconclusive evidence as to the actual impacts of trawling on the benthic faunal community. Much like other marine environments, perturbation tends to eliminate or further reduce rare ephemeral species, reduce potential for a single species or species-group to establish domination of the habitat, and thus improve the opportunities for increasing diversity among species that can occupy a broad ecological niche. Sheridan and Doerr (2005) did not find any major impacts to benthic faunal communities when comparing trawled versus non-trawled areas.

There are no expected impacts to protected resources or sea birds, other than unquantifiable impacts associated with reduced bycatch discards, which are utilized by dolphins and sea birds.

There would be no biological impacts in regard to **Action 8**, which would or would not establish a framework procedure by which to make in-season adjustments to the scope of any of the closures proposed in **Action 7** based on the reduction target levels selected in **Action 6**. Any adjustments to the scope of the closures would be effective the next year. Any impacts would be administrative in nature. Without a framework procedure, fishery managers would have to either action through emergency or interim rules, or amend to the FMP to adjust the scope of the closure within the boundaries of the proposals outlined under **Action 7.** With a framework procedure, the adjustments could be made through a proposed and final rule.

5.6.3 Direct and Indirect Effects on the Economic/Social Environment

5.6.3.1 Economic Environment

The direct and indirect economic effects of alternatives considered under **Actions 6, 7, and 8** are discussed in this section. Details of the analysis for alternatives considered under **Action 7** are provided in **Section 6.5.7** and only a summary of that analysis is presented here.

It should be noted that the analysis of the expected economic impacts of these actions and alternatives considers only impacts to the shrimp fishery and does not holistically capture the benefits to the bycatch species and associated fisheries and businesses. This perspective functionally assumes, though it has not been quantitatively demonstrated, a static bycatch goal and assumption that the benefits of this goal exceed the costs of achieving the goal. With the narrow focus on the shrimp fishery, any alternative that would result in the lowest adverse impacts on shrimp fishery while achieving the bycatch reduction goal would be the preferred choice.

Action 6 is an administrative action since it would merely establish a benchmark for fishery evaluation and guidance for subsequent regulatory action. As such, this action would not be expected to result in any direct impact on the shrimp fishery or associated businesses. Direct impacts only accrue to measures that restrict the performance of the fishery, either in terms of total allowable harvest, the manner in which these harvests may be realized, or the manner in which they may be marketed. However, this action sets a benchmark, and subsequent evaluation of the fishery relative to the benchmark selected would be expected to precipitate subsequent action with potential indirect economic impacts. As the benchmark becomes more restrictive, the greater becomes the potential that subsequent restrictive measures will be required for the directed shrimp fishery with accompanying adverse impacts.

Alternative 1 would maintain the status quo and would not establish a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico. If a target reduction goal is not established, no remedial measures would need to be adopted under **Action 7**. As a result, no direct or indirect adverse economic impacts on the Gulf shrimp industry or associated businesses would be expected to result from this alternative.

Alternative 2 would establish a target reduction goal of 50 percent less than the juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico observed during the benchmark years of 2001-2003. Current evidence indicates that, as of 2005, effort had already decreased within the 10 to 30-fathom zone of the northern and western Gulf of Mexico to such a point that a 50 percent reduction in juvenile red snapper mortality had already been achieved. Current information on shrimp prices, fuel prices, and the impacts of the 2005 hurricanes suggest that effort should be even lower in the near future. As such, potential remedial measures under **Action 7** would not be needed at this time. Thus, no indirect adverse economic impacts on the Gulf shrimp industry are expected to result from this alternative in the short-term. However, should effort in this area increase in the future and the reduction target becomes binding, this alternative would require the consideration of effort restrictions, including, but not necessarily limited to, those described under **Action 7,** thereby potentially resulting in indirect long-term adverse economic impacts to the fishery and associated businesses.

Alternative 3 would establish a target reduction goal of 60 percent less than the juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico observed during the benchmark years of 2001-2003. Current evidence indicates that, as of 2005, effort had already decreased within the 10 to 30-fathom zone of the northern and western Gulf of Mexico to such a point that a 50 percent reduction in juvenile red snapper mortality has already been achieved. Current information on shrimp prices, fuel prices, and the impacts of the 2005 hurricanes suggest that effort should be even lower in the near future. Effort estimates for 2006 indicate that effort has continued to decrease, and is now at a level that would achieve a 65 percent reduction in juvenile red snapper mortality relative to the 2001-2003 baseline. Thus, the fishery has already attained and in fact surpassed the 60 percent target reduction goal. As such, under this alternative, potential remedial measures under **Action 7** would not need to be considered at this time. Thus, no indirect adverse economic impacts on the Gulf shrimp industry are expected to result from this alternative in the short-term. However, should effort in this area increase in the future and the reduction target becomes binding, this alternative would require the consideration of effort restrictions, including, but not necessarily limited to, those described under **Action 7,** thereby potentially resulting in indirect long-term adverse economic impacts to the fishery and associated businesses.

Alternative 4, Alternative 5, and Preferred Alternative 6 would establish a 74 percent target reduction goal from the 2001-2003 benchmark years for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico. Existing evidence indicates that, as of 2005, effort had already decreased within the 10 to 30-fathom zone of statistical areas 10-21 of the Gulf of Mexico to such a point that a 50 percent reduction in juvenile red snapper mortality has already been achieved. Current information on shrimp prices, fuel prices, and the impacts of the 2005 hurricanes suggest that effort should be at similar or lower levels in the near future. Effort estimates for 2006 indicate that effort has continued to decrease in 2006, and specifically to a level that would achieve a 65 percent reduction in juvenile red snapper mortality relative to the benchmark years of 2001-2003. Therefore, as of 2006, the fishery had not yet achieved the 74 percent target. Thus, these alternatives may require additional restrictions on effort, as considered under **Actions 7 and 8**.

As such, **Alternative 4, Alternative 5, and Preferred Alternative 6** would not be expected to result in any direct short-term or long-term adverse economic impacts. However, **Alternative 4, Alternative 5, and Preferred Alternative 6** would be expected to result in indirect, adverse impacts in the short-term, particularly on fishing vessels traditionally active in the 10 to 30-fathom zone of the northern and western Gulf of Mexico and on onshore businesses associated with those vessels if additional closures as contemplated in **Actions 7 and 8** are implemented. Further, since A**lternative 4** would maintain the 74 percent reduction target until the red snapper stock is rebuilt in 2032, it would be the most likely to result in indirect adverse economic impacts on the Gulf shrimp industry in the long-term. **Alternative 5** and **Preferred Alternative 6** could reduce the likelihood of such adverse economic impacts in the long-term, relative to A**lternative 4**, if the target is reduced, which would in turn allow effort to increase, in future years as a result of information from updated red snapper stock assessments. **Preferred Alternative 6** would most likely mitigate such indirect, adverse effects in the long-term since it specifies that the target will in fact be reduced to 67 percent in 2011 and down to 60 percent in 2032. Conversely, **Alternative 5** does not specify if or when a reduction in the target may be implemented or the magnitude of such a reduction but relies on future stock assessments for red snapper.

Action 7, **Alternative 1** (no action) would not impose any effort restrictions on the Gulf shrimp fishery and would not, therefore, result in any direct adverse economic impacts on the fishery or associated businesses. However, if status quo effort reductions in the fishery are not sufficient to achieve target goals for rebuilding the red snapper stock, this alternative could result in more severe future restrictions, resulting in potentially greater adverse economic impacts than the adoption of shrimp fishery effort restrictions at this time.

It should be noted that, for the purpose of evaluating economic impacts associated with alternatives considered under **Action 7**, the longest potential closures under **Alternatives 3 and 4** can be easily bracketed between January-April and October-November, respectively. However, as written, **Preferred Alternative 2**, which only requires the same starting date as the Texas closure, and could potentially close statistical areas 10-21 for up to 364 days, i.e., from May 15 to May 14 of the following year. Thus an evaluation of the maximum potential impacts under **Preferred Alternative 2** should be based on an unrealistic year-round closure. However, as a plausible example, the evaluation of maximum potential impacts under **Preferred Alternative 2** is based on the Texas closure, which customarily starts on May 15 and ends on July 15, approximately.

Among the alternatives that could restrict effort in the shrimp fishery, **Alternative 3** (January through April closure in the 10 to 30-fathom zone within statistical areas 10-21) would likely generate the least adverse economic impacts on the Gulf shrimp industry. Determination of whether **Preferred Alternative 2** (A closure beginning May 15 in the 10 to 30-fathom zone of statistical areas 10-21) or **Alternative 4** (October through November closure in the 10 to 30-fathom zone within statistical areas 10-21) could create the largest adverse economic impacts on the Gulf shrimp industry is less clear. However, because vessels operating in the western Gulf would have greater flexibility to fish during the Texas closure under **Alternative 4** (i.e., they could continue to fish off Louisiana), relative to **Preferred Alternative 2**, these vessels have a greater ability to mitigate the adverse economic impacts expected to accrue under **Alternative 4** compared to **Preferred Alternative 2**.

Moreover, a key point of the analysis is that **Preferred Alternative 2** could consistently impact more entities than **Alternative 4**. And, in both cases, if implemented at their maximum scope, the magnitude of these impacts is potentially large enough to force some entities to leave the industry, particularly in the harvesting sector, but also in the dealer sector and possibly the processing sector as well. Therefore, it is likely that the greatest number of entities could be forced to leave the industry under **Preferred Alternative 2**. Under all three alternatives that could restrict effort, the losses in revenue will generate multiplier effects, both in terms of output/income and employment, throughout the local, regional, and national economies. Although a single multiplier is generally applied to such revenue reductions to determine the overall impacts on output/income and employment, and the revenue reductions under **Alternatives 3** and **4** within the harvesting sector are basically equivalent; actual impacts are highly dependent on the extent to which firms within and linked to the harvesting sector are not just forced to reduce their level of operations, but to cease operations. Given the likelihood that **Preferred Alternative 2** could cause more firms to exit the Gulf shrimp industry than **Alternative 4**, the bulk of the evidence suggests that **Preferred Alternative 2** would generate the greatest adverse economic impacts to the Gulf shrimp industry and, thus, the least net economic benefits to the nation.

Action 8 is also an administrative action since it would merely establish a framework for adjusting the closed season if the fishery exceeds the established benchmark. As such, this action would not be expected to result in any direct impact on the shrimp fishery or associated businesses. Direct impacts would only accrue to any subsequent action that restricts effort in the fishery. However, the establishment of a framework can reduce the time required to take action, should corrective action be required, thereby potentially reducing the severity and cost of the action. Therefore, while **Action 8** would not be expected to result in any direct adverse economic impacts on the fishery or associated businesses, the action would be expected to have indirect impacts via the effects of potential future management actions.

Alternative 1 would maintain the status quo and not establish a framework procedure for adjusting the shrimp effort target and closed season. Since this is an administrative action, no direct economic impacts would be expected to accrue. **Alternative 1**, however, would be expected to delay the pace at which corrective action, if necessary, could be taken, thereby potentially increasing the severity, and associated adverse economic costs, of potential future actions to rebuild the red snapper stock. Thus, the indirect impacts associated with **Alternative 1** would be expected greater adverse economic costs of adjustment.

Preferred Alternative 2 would establish a framework procedure to adjust shrimp fishing effort in the northern and western Gulf of Mexico. Since the action is administrative in nature, no direct adverse economic impacts on the Gulf shrimp industry or associated businesses would be expected. The establishment of a framework, however, would facilitate increased flexibility and speedier action with respect to adjusting the benchmark (**Action 6**) and remedial measure (**Action 7**), should such be appropriate. Quicker action would be expected to reduce the cost of the management process and increase the benefits associated with the action. It is assumed that the action itself is unaffected by the presence or absence of a framework, and only the process itself is affected. It should also be noted that the benefits perspective is not unidirectional. If the need is to increase bycatch reduction, quicker action, while increasing the speed at which the costs of effort reduction are imposed on the shrimp fishery, increases the pace at which the benefits to the bycatch species are realized and the benefits focus is on the bycatch species (recall the assumption that any bycatch reduction target is assumed to result in the superior economic outcome to the nation). If the determination is that the shrimp fishery effort reductions are excessive, then quicker action can reduce the costs of said restriction faster. Hence, the benefits focus is on the shrimp fishery. Regardless of the determination, quicker action is assumed to result in greater economic benefits.

Summary

Since **Action 6** is an administrative action, none of the alternatives would be expected to result in any direct, adverse economic impacts in the short-term or long-term. **Alternative 1**, **Alternative 2, and Alternative 3** would also not be expected to result in any direct or indirect short-term adverse economic impacts. **Alternative 1** would not establish a benchmark on which to base subsequent effort control, and current effort reductions are believed to be within the benchmarks that would be established by **Alternatives 2 and 3**. Hence, no additional restrictions on the shrimp fishery would be required at this time under **Alternative 1, Alternative 2,** or **Alternative 3**. However, increases in or changes in the spatial distribution of effort (i.e. into the 10 to 30-fathom zone within statistical areas 10-21) in the shrimp fishery could require future effort restrictions under **Alternatives 2 and 3**. Thus, **Alternative 2** and **Alternative 3** could indirectly cause adverse economic impacts in the long-term. **Alternative 4, Alternative 5, and Preferred Alternative 6** would be expected to result in indirect adverse economic impacts if further effort restrictions need to be placed on the fishery, the range of which is described under **Action 7**. Whether and to what extent these restrictions mirror those considered under **Action 7** cannot be determined at this time. But, if so, the discussion for **Action 7** provides a range of potential impacts. The need for future actions will be assessed in reports based on the preferred alternatives selected in **Action 7 and Action 8.**

Alternative 1 under **Action 7** would not be expected to result in any direct adverse economic impacts since no effort restrictions would be imposed on the shrimp fishery. However, if status quo effort reductions in the fishery are not sufficient to achieve target goals, continuation of this alternative may result in more severe future restrictions, resulting in potentially greater adverse economic impacts than the adoption of effort restrictions at this time. Each of the alternatives that could enact effort controls would be expected to result in greater adverse economic impacts in the future relative to **Alternative 1**. Among these alternatives, **Alternative 3** would be expected to result in the least adverse economic impacts on the shrimp fishery, affecting fewer vessels, fewer pounds of shrimp, and less shrimp revenues. Ranking of **Preferred Alternative 2 and Alternative 4** is less clear. However, since **Preferred Alternative 2** could potentially result in more firms exiting the industry than **Alternative 4**, the total adverse economic impacts associated with **Preferred Alternative 2** would be expected to exceed those of **Alternative 4**.

Action 8 is also an administrative action and, hence, no direct short-term or long-term adverse economic impacts would be expected to result from either **Alternative 1** or **Preferred Alternative 2**. The adoption of a framework procedure for addressing effort in the shrimp fishery would generally be expected to facilitate faster corrective action, reducing both the cost of action and pace at which benefits for the action would be received. Thus, **Preferred Alternative 2** would be expected to result in greater indirect economic benefits than **Alternative 1**.

5.6.3.2 Social Environment

Action 6 is an administrative action that would set a benchmark for regulating the fishery in the future. Establishing target reductions in bycatch and a framework procedure to adjust shrimp fishing effort now will allow fisheries managers the ability to move forward with regulations in the future. None of the target alternatives would have any direct or indirect impacts on the social environment in the short term. **Alternative 1** would have positive effects on the shrimpers, and others who depend on the shrimp fishery in that it would not establish a target reduction. However, it would not reduce the bycatch of red snapper, which would have negative impacts on those that depend on the red snapper fishery. If there has not been enough reduction in effort due to people leaving the fishery, when the target reduction is set, **Alternative 2** would have less impact on the shrimp fishery than **Alternatives 3 or 4** because it would have a target reduction in effort of 50 percent as compared to the 60 percent reduction in **Alternative 3** or the 74 percent reduction in **Alternative 4, 5, and Preferred Alternative 6.**

Alternative 3 of **Action 6** would be more restrictive on the shrimp fishery than Alternative 2 because it would establish a target reduction of 60 percent as compared to a 50 percent reduction as required by **Alternative 2.** It would be less restrictive than **Alternative 4, Alternative 5 or Preferred Alternative 6** which establishes a 74 percent reduction in effort. Reductions in effort for the shrimp fishery will have negative impacts for the shrimp fishermen and those who depend on the fishery, but the greater the reduction in shrimp effort, presumably the quicker the red snapper stocks will be rebuilt. Rebuilding the red snapper stock will have positive effects on the red snapper fishermen and those who depend on the red snapper fishery.

Alternatives 4, 5, and Preferred Alternative 6 would be the most restrictive on the shrimp fishery because it requires the greatest amount of reduction in effort. This could have negative impacts on the shrimp fishermen, businesses, and communities that depend on the shrimp fishery and may cause more people to leave the fishery. **Alternative 4, 5, or Preferred Alternative 6** would be of the most benefit to the fishermen, businesses, and communities that depend on the red snapper fishery in that it would allow the red snapper stock to be rebuilt in the shortest time frame.

Action 7 would consider establishing shrimp fishing restrictions to reduce effort in the Western Gulf of Mexico established in **Action 6.** **Alternative 1** of **Action 7** would have positive effects on the shrimpers, and others who depend on the shrimp fishery in that it would not establish fishing restrictions. However, if it were determined that further restrictions were warranted to reduce red snapper by catch, no action would have a negative impact on those that depend on the red snapper fishery. If there has not been enough reduction in effort due to people leaving the fishery, when the target reduction is set, Preferred **Alternative 2** would probably have the most negative impacts overall on the shrimp fishermen, processors, and dealers. There would be a similar loss in landings, based on value, as in **Alternative 4**. **Alternative 2** would protect juvenile red snapper from shrimp trawlers which would help to rebuild the stocks and would benefit those that depend on the red snapper fishery. As Table 6.5.7.1.2 illustrates, if **Alternative 2** is chosen, there would be a seasonal closure in the 10-30 fathom zone of selected areas within statistical zones 10-21 in the western Gulf of Mexico in conjunction with the beginning of the Texas closure. Based on a comparison of 2005 data, this would lead to a loss of 6,818,710 pounds of shrimp with a value of $17,204,177. This closure would impact 961 boats that fish for shrimp. Further restrictions on the shrimp fishery will cause more people to exit the fishery and could cause a loss of jobs that are dependent on the shrimp fishery.

As shown in Table 6.5.7.1.1, **Alternative 3** would have the least impacts on the shrimp fishery, and based on 2005 data, would lead to a loss of 2,598,291 pounds of shrimp with a value of $9,490,920. This closure would impact 446 boats that land shrimp during this time.

Alternative 4 would have less negative impacts on the fishermen, processors, and fishing communities than A**lternative 2**, but more negative impacts than **Alternative 3**. As shown in Table 6.5.7.1.3, based on 2005 data, **Alternative 4** would lead to a loss of 4,961,424 pounds of shrimp with a value of $16,289,175. This closure would impact 485 vessels that land shrimp during this time.

As discussed elsewhere in this document, any further restrictions placed on the Gulf shrimp fishery could force more fishermen to leave the fishery. Many shrimp fishermen are already operating at a minimal profit level. They have changed the way they fish, such as shorter trawling times, less days out, less time “sampling” to see where shrimp are, and staying closer to where they normally unload to conserve fuel. Many shrimp boat captains have also reported they have reduced the number of crew they hire to save on costs. Some choose to only fish for shrimp when the catch rates are high. For many, the only way to stay in business is to increase the amount of shrimp they harvest. Even with cost-cutting measures, many shrimpers are just barely making a profit. If their yearly catch is reduced due to closures or other restrictions, some will have no choice but to exit the fishery. Likewise for processors that depend on the shrimp fishery. Some will be impacted by seasonal closures more than others, depending on where the boats they buy from fish. A significant reduction in volume or value of shrimp may force some processors out of business creating a loss of jobs in that sector.

Action 8 is administrative and would have no direct or indirect impacts on fishermen, fishing dependent businesses, or fishing communities that depend on the shrimp fishery. **Alternative 1** would not establish a framework procedure to adjust shrimp fishing efforts and would not have nay impact on the people who are dependent on the shrimp fishery. However, there may be negative impacts to the red snapper fishery if further reductions in effort are warranted to reduce bycatch.

Preferred Alternative 2 is administrative and would establish a framework procedure to adjust shrimp effort if needed in the future. It would not establish and direct or impacts on the fishermen, fishing dependent businesses, or fishing communities but would allow fishery managers a means to determine if further reductions in shrimp effort are needed.

5.6.4 Direct and Indirect Effects on the Administrative Environment

Actions 6 and 8 are primarily administrative actions. Selection of either of the bycatch reduction targets proposed in **Action 6** would provide fishery managers with a benchmark from which to evaluate the need to modify the fishery restrictions imposed under any of the various **Action 7** alternatives (other than No Action). Selection of any of the alternatives under **Action 8,** (other than No Action) would ease the administrative burden of implementing additional regulatory actions to meet the target selected in **Action 6**.

There would be an increased administrative burden on the Council and NMFS to determine if additional action is needed to modify the selected alternative in **Action 7**. No matter which alternative is selected under **Action 8**, NMFS would have to collect the effort information on an annual basis, report those findings to the Council for their review and recommendation of any potential modifications to the fishery restrictions imposed by **Action 7**. Without a framework procedure (i.e., selection of the No Action **Alternative 1** to **Action 8)**, the Council would have to initiate FMP amendment procedures as prescribed in the M-SFCMA. Under any of the framework options of **Action 8**, NMFS would have additional administrative costs developing supporting analyses for the proposed regulations to meet the requirements of applicable law, such as the National Environmental Policy Act.

The largest administrative effect would be enforcement of any fishing restrictions imposed under **Action 7**. To effectively monitor the shrimp fleet operating in the western Gulf would require, preferably, the use of VMS aboard all vessels. The Council is currently developing options including a requirement for VMS in the shrimp fishery in an upcoming amendment to the shrimp FMP. Alternatively, under the Council's approved standardized bycatch reporting requirements, a sample of the shrimp fleet will be required to be equipped with electronic logbooks (ELBs) or carry observers. ELBs do not provide real time monitoring of vessel activities, but information collected by the ELBs would provide after-the-fact documentation of vessel locations during specified season/area closures for a representative sample of the fleet. Observers would provide real-time monitoring opportunities, but this would represent a very small fraction of the overall fleet.

5.7 Cumulative Effects Analysis (CEA)

As directed by NEPA, federal agencies are mandated to assess not only the indirect and direct impacts, but cumulative impacts of actions as well. The NEPA defines a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 C.F.R. 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect is when the combined effects are greater than the sum of the individual effects.

This section uses an approach for assessing cumulative effects that was initially used in Amendment 26 to the Reef Fish FMP is based upon guidance offered in CEQ (1997). The report outlines 11 items for consideration in drafting a CEA for a proposed action.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

Cumulative effects on the biophysical environment, socio-economic environment, and administrative environments are analyzed below.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The CEQ cumulative effects guidance states this step is accomplished through three activities. The three activities and the location in the document are as follows:

I. The direct and indirect effects of the proposed actions (Section 5.1-5.6);
II. Which resources, ecosystems, and human communities are affected (Section 3.0); and
III. Which effects are important from a cumulative effects perspective (information revealed in this CEA)

2. Establish the geographic scope of the analysis.

The immediate areas affected by this action and analyzed in this CEA are the federal waters of the Gulf of Mexico. These are the waters extending from the seaward side of the state waters of Texas, Louisiana, Mississippi, Alabama, and the west coast of Florida state waters to 200 miles.

As stated in Section 3.0, red snapper are distributed in waters off the Yucatan, throughout the Gulf, to the waters off North Carolina. While recent evidence suggests Gulf red snapper undergo longer migrations and have lower site fidelity than previously estimated (Patterson et al. 2001), there is little evidence from multiple tagging studies that Gulf red snapper move beyond Gulf waters. However, Burns (2004) reported one adult red snapper tagged off northwestern Florida was recaptured off northeastern Florida. Red snapper have pelagic larvae, thus, some exchange of fish between regions could occur. However, larval movement patterns are not well understood. Within the Gulf, evidence suggests there are eastern and western stocks based on genetic and life history data (SEDAR 7 2005).

Most red snapper are sold in markets outside of the Gulf. Major markets include New York, Montreal, and Toronto (Antozzi, personal comm[33]). Other, but less important markets include San Francisco, Los Angeles, Seattle, Vancouver, and the Gulf States. However, most red snapper are landed in the Gulf and would primarily affect local communities. Prior to the implentation of the red snapper IFQ program, approximately 98 percent of Class 1 licensed reef fish vessel owners had mailing addresses in the Gulf. These fishermen received 91 percent of the IFQ shares. Additionally, approximately 93 percent of the reef fish permitted dealers are located in the Gulf States.

Brown, white, and pink shrimp use a variety of habitats in the Gulf as they grow from planktonic larvae to spawning adults. Brown and white shrimp eggs are demersal and occur offshore. The larvae occur offshore and begin to migrate to estuaries as postlarvae. Postlarvae and juveniles are common to highly abundant in all Gulf estuaries from the Florida panhandle to Texas and are associated with shallow vegetated habitats. Adult brown shrimp occur in neritic Gulf waters (i.e., marine waters extending from mean low tide to the edge of the continental shelf) and are associated with silt, muddy sand, and sandy substrates. Adult white shrimp are demersal and generally inhabit nearshore Gulf waters to depths less than 30 m on bottoms of soft mud or silt.

Pink shrimp occupy a variety of habitats, depending on their life stage. Eggs and early planktonic larval stages occur in marine waters. Eggs are demersal, whereas larvae are planktonic until the postlarval stage when they become demersal. Juveniles inhabit almost every U.S. estuary in the Gulf but are most abundant in Florida. Juveniles are commonly found in estuarine areas with seagrass where they burrow into the substrate by day and emerge at night. Adults inhabit offshore marine waters with the highest concentrations in depths of 9 to 44 m.

Well over 100 MP of penaeid shrimp tails are landed annually. In 2005, total food shrimp landings and revenues were 136.56 MP (tails) and $347.34 million dollars, respectively. Unfortunately, the destination beyond first sale for shrimp has not been documented well enough to determine what markets domestic shrimp are sold in. However, shrimp are popular seafood in the United States and so is likely sold in most major United States seafood markets. Most (>97 percent) permit owners have vessels located within Gulf communities (see Table 3.5.2.1).

3. Establish the timeframe for the analysis

The commercial fishery for red snapper began in the 1840s, and by the 1870s red snapper were established as a major commercial product, based out of Pensacola, Florida (Bortone et al. 1997). The early catches were taken close to Pensacola, Florida, and Mobile, Alabama, and were dominated by large (10 lb.) fish (Shipp 2001) caught in depths of 60 to 240 feet (Bortone et al. 1997). Landings reached a peak of about 2 MP around 1880, and then began to decline (Shipp 2001). As vessels were required to venture further from port to find red snapper, the fishery expanded toward Tampa (Shipp 2001). By 1885, new fishing grounds were discovered from Tampa to Dry Tortugas in depths greater than 20 fathoms, and on the Campeche Banks off

Mexico (Bortone et al. 1997, Camber 1955). In Texas, a red snapper fishery initially developed in the 1880s, concentrated on grounds close to shore and on grounds known as "Galveston Lumps" or the "Western" (Camber 1955). In 1929, the total catch of red snapper was estimated to be 9.987 MP, of which the commercial fishery produced a maximum of 8 MP (Shipp 2001). As the recreational fishery began to develop, party boats began to appear in the 1930s. One of the first party boats, the Miss Panama, was built in 1933 (Chester 2001).

The shrimp fishery originated as an inshore fishery using cast nets, haul seines, and bar nets. In 1902, fishermen first began going into deeper water, pulling a haul seine from a power-driven boat. In 1913, the first otter trawl was used to catch shrimp. As the shrimp trawl fishery developed, so too did its impact on mortality of juvenile red snapper. By 1988, the red snapper stock assessment estimated that the shrimp trawl bycatch accounted for 12 million juvenile red snapper discarded dead. As a result, a 1990 regulatory amendment called for a 50 percent reduction in shrimp trawl bycatch mortality of red snapper as part of the red snapper rebuilding program. The November 1990 reauthorized Magnuson Act prohibited the Council from implementing shrimp trawl BRDs or seasonal closures to reduce bycatch until 1994. By that time, the shrimp trawl fishery was credited with a 10 percent reduction in red snapper bycatch as a result of reductions in effort, but a 44 percent reduction in F would still be needed to meet the overall 50 percent reduction goal.

It would be advantageous to go back to when the red snapper and shrimp stocks were in a natural, or somewhat modified (but ecologically sustainable) condition. However, data collection for many fisheries including red snapper and shrimp began when these species were already fully exploited. For the commercial red snapper fishery, general canvass data are available from 1962-2004, but recreational landings information was not collected until 1981, and those landings data through 1985 are highly uncertain. In addition, a recent review by the National Research Council highlighted numerous shortcomings in the design and implementation of recreational survey methods, which has eroded public confidence in the recreational data and increased the level of uncertainty (NRC 2006). Landings data employed in annual shrimp assessments uses data from 1960 to present.

Management of red snapper did not begin until the implementation of the Reef Fish FMP in 1984, which established size and bag limits. Red snapper quotas were not put in place until 1990 in Reef Fish Amendment 1 (see Section 1.2). Amendment 1 began a red snapper rebuilding program that was designed to rebuild the stock to a 20 percent spawning stock biomass ratio by the year 2000. Shrimp management was established through the Shrimp FMP implemented in 1981. The principal thrust of the plan was to enhance yield in volume and value by deferring harvest of small shrimp to provide for growth.

Red snapper stock assessments have, from the beginning, identified shrimp trawl bycatch as a significant source of mortality to the red snapper stock. In October 1990, a regulatory amendment that was submitted to NMFS included a proposed 50 percent reduction of red snapper bycatch in 1993 by the offshore EEZ shrimp trawler fleet, to occur through the mandatory use of finfish excluder devices on shrimp trawls, reductions in fishing effort, area or season closures of the shrimp fishery, or a combination of these actions. However, a provision in the November 1990 reauthorized Magnuson Act prohibited the Council from implementing shrimp trawl BRDs or seasonal closures to reduce bycatch until 1994.

As new information was developed about the longevity and biology of red snapper and the rate at which the stock could reasonably be expected to recover, the rebuilding target and deadline were periodically revised. In 1996, a goal of recovering to a 20 percent SPR by 2019 was adopted (regulatory amendment 1996).

With the passage of the Sustainable Fisheries Act of 1996 (SFA), new requirements were established for rebuilding of overfished stocks, requiring a new rebuilding plan. In November 2005, Reef Fish Amendment 22 was approved by NMFS and established a new red snapper rebuilding plan that met the requirements of the SFA. The revised rebuilding plan began in January 2001, ends overfishing between 2009 and 2010, and rebuilds the stock to B_{MSY} by 2032. The plan also calls for periodic reviews of the stock to ensure the plan is making adequate rebuilding progress. The most recent red snapper stock assessment was completed in July 2005. However, this was prior to Hurricanes Katrina and Rita in 2005, which devastated large areas of the northern Gulf coast and seriously damaged the infrastructure of both the red snapper and shrimp fisheries.

This amendment and associated DSEIS is designed to examine red snapper TAC and management measures to keep the rebuilding plan on a trajectory to achieve its eventual goal, and to address red snapper bycatch mortality in both the shrimp trawl and directed fisheries. Regulatory measures identified as preferred may be implemented through an interim rule. The Council may also select similar preferred measures through future amendments to the Reef Fish and Shrimp FMPs.

Because of the uncertainties about the future of the red snapper and shrimp fisheries created by the 2005 hurricanes, this amendment and associated DSEIS focuses on a short-term goal of reducing red snapper fishing mortality in 2007 in order to achieve adequate rebuilding progress consistent with the Council's approved rebuilding plan. The TAC analyses are based on both a "linked" scenario, whereby any decreases in the directed red snapper fishery are matched by equal percent reductions in shrimp trawl bycatch mortality; and "delinked" (preferred) where the proportions are different (see Section 2.0, Action 1 discussion). It should be noted that stock status over the short-term is relatively insensitive to changes in shrimp trawl bycatch, due to recent strong red snapper year-classes and a lag between shrimp trawl bycatch mortality on age 0 and 1 fish, and the subsequent directed fishery on age 3 and above fish.

4. **Identify the other actions affecting the resources, ecosystems, and human communities of concern**.

Past actions affecting the red snapper fishery and shrimp trawl bycatch are summarized in Section 1.2. Shrimp Amendments 9 and 10 established two criteria for BRDs used in the Gulf of Mexico. Amendment 9 established a requirement, with limited exceptions, for the use of certified BRDs in shrimp trawls towed in the Gulf of Mexico EEZ shoreward of the 100 fm (183 m) depth contour and west of 85°30' W. longitude (western Gulf), the approximate longitude of Cape San Blas, Florida. To be certified for use in the western Gulf, BRDs were required to reduce bycatch mortality of juvenile red snapper by a minimum of 44 percent from the average level of mortality on these age 0 and age 1 groups during the years 1984 through 1989. Amendment 10 required BRDs in shrimp trawls fished in the EEZ east of 85°30' W. longitude (eastern Gulf). To be certified for use in the EEZ of the eastern Gulf, a BRD was required to reduce the weight of the finfish bycatch by at least 30 percent. This new criterion was established because juvenile red snapper are not common in the eastern Gulf. A recent amendment under review by NMFS would make the bycatch reduction criterion consistent at the 30 percent reduction in weight level.

The red snapper rebuilding plan adopted under Reef Fish Amendment 22 established an initial constant catch TAC of 9.12 million pounds. In order for this TAC to achieve the rebuilding goal of B_{MSY} by 2032, there would need to be a shrimp trawl bycatch mortality reduction of up to 50 percent. This level of bycatch reduction appeared to be achievable, as testing of the Jones-Davis BRD produced red snapper bycatch reductions of 52-67 percent, and fisheye BRDs produced reductions of 59-70 percent (Reef Fish Amendment 22). However, the reductions achieved in actual fishing turned out to be far less. With fisheye BRDs, the red snapper bycatch reduction during 2001-2003 was 4.3 – 19.1 percent (11.7 percent average) (presentation by D. Foster at March 2005 GMFMC meeting), while the three types of funnel BRDs that have been certified (extended funnel, expanded mesh, and the Jones-Davis) produced about a 20 to 25 percent reduction in overall red snapper bycatch (presentation by D. Foster at August 2005 GMFMC meeting).

Other factors contributing to reductions in shrimp trawl bycatch mortality include reductions in fishing effort due to an unfavorable economic environment. The shrimp fishery in the Gulf has been experiencing economic losses since approximately 2001 primarily due to reduced prices from competition with imports and high fuel costs. These economic losses have resulted in effort reductions through the exodus of vessels from the fishery, and reductions are expected to continue through at least 2012.

Because early and late juveniles are often associated with structures, objects or small burrows, as well as being abundant over barren sand and mud bottom, this species is not as susceptible to habitat loss in coastal areas as some other reef fish species. However, there are concerns about the effects of open-loop liquefied natural gas (LNG) terminals. Open-loop LNG terminals have been proposed in essential habitat for shrimp, red drum, king mackerel, red snapper, blue fin tuna and other important species. These facilities would use large quantities of seawater to warm chilled LNG to a gaseous state. Due to large changes in temperature, chlorination, and physical damage caused by the process, pelagic red snapper eggs and larva would be destroyed. It is unknown at this time what the cumulative impacts of multiple terminals would have on Gulf species. On the other hand, currently most of these facilities have modified their proposals for open-loop systems and have opted for closed-loop systems in which the water is reused resulting in far less impacts to marine biota.

Amendment 26 to the Reef Fish FMP was recently implemented by NMFS and established an IFQ program for the commercial red snapper fishery beginning in the 2007 fishing year. Quota shares are freely transferable to other reef fish permit holders during the first 5 years following implementation and to any one thereafter.

During 2004 and 2005, the northern Gulf was severely impacted by frequent and severe hurricanes. On September 16, 2004, Hurricane Ivan came ashore near Gulf Shores, Alabama, causing damage in Alabama and the Florida Panhandle. On August 29, 2005, Hurricane Katrina made landfall near Buras, Louisiana, causing severe or catastrophic damage along the coastlines of Alabama, Mississippi and Louisiana. Just a few weeks later, Hurricane Rita made landfall on September 24 near the Texas-Louisiana border, causing severe damage along the Louisiana and extreme northeastern Texas coasts and completely destroying some coastal communities. All of these hurricanes had been Category 5 storms, but weakened to Category 3 or 4 prior to landfall. Hurricanes Rita, Katrina and Ivan were the 4th, 6th, and 9th most intense Atlantic hurricanes ever recorded. Hurricanes Katrina, Ivan and Rita ranked as the 1st, 4th, and 9th costliest hurricanes on record (National Hurricane Center date unknown). Extensive damage was done to the infrastructure for both the shrimp and red snapper fisheries as vessels, docks and seafood processing plants were destroyed or heavily damaged.

The extent of the hurricane damage is still being determined. Initial losses to seafood production from Katrina alone are estimated at $1.1 billion for Louisiana and could exceed $200 million for Alabama, exclusive of infrastructure. For shrimp, the Louisiana Department of Wildlife and Fisheries estimated the 12-month potential loss at dockside at more than $81 million, with 12-month potential production losses at the retail level at almost $540 million. A total of 15 major fishing ports, 177 seafood processing facilities, 1,816 federally permitted fishing vessels, and an unknown number of state permitted fishing vessels were located in the region affected by Katrina (source – CRS Report for Congress, Report RS22241, updated September 19, 2005). Clearly, the level of fishing effort for both shrimp and red snapper has been at least temporarily reduced, but the magnitude and duration of the reduction is unknown.

Recent actions include a VMS requirement for permitted commercial reef fish vessels implemented through Reef Fish Amendment 18A, which has an effective date of December 7, 2006. This amendment examined enforcement and monitoring issues, including simultaneous commercial and recreational harvest on a vessel, maximum crew size on a USCG inspected vessel when fishing commercially, use of reef fish for bait, and VMS requirements on commercial reef fish vessels. This amendment also addressed administrative changes to the framework procedure for setting TAC for reef fish, and measures to reduce bycatch and bycatch mortality of endangered sea turtles and smalltooth sawfish taken inadvertently in the commercial and charter/headboat reef fish fisheries. The effective date for these other actions was September 8, 2006.

Red grouper regulatory amendments established commercial trip limits for all grouper species, reduced the red grouper recreational bag limit, and established a February 15 to March 15 recreational seasonal closure for red grouper, gag, and black grouper. The intended effect of these amendments was to slow the rate of commercial grouper harvest, prolong the commercial fishing season, reduce recreational red grouper landings to levels consistent with the rebuilding plan, and prevent or minimize increases in gag and black grouper fishing mortality resulting from more restrictive recreational red grouper management actions. These trip limits could cause reef fish fishermen to redirect their effort to red snapper once grouper trip limit was met. However, individual red snapper quota shares would ensure red snapper were not over harvested through this behavior. Effective dates for these amendments were December 29, 2005 for the commercial fishery and July 17, 2006 for the recreational fishery.

Reef Fish Amendment 25 and Coastal Migratory Pelagics (CMP) Amendment 17 (a joint plan amendment) extended the current moratorium on for-hire Reef Fish and CMP permits indefinitely by creating a limited access system. The intended effect of these amendments was to cap the number of for-hire vessels operating in these two fisheries at the current level. The final rules associated with this amendment became effective on June 15, 2006.

GMFMC (2005b) defined MSY and OY for the penaeid shrimp stocks in the Gulf, established bycatch reporting methodologies and improved collection of shrimping effort data in the EEZ, required completion of a Gulf Shrimp Vessel and Gear Characterization Form, established a moratorium on the issuance of commercial shrimp vessel permits; and required reporting and certification of landings during the moratorium. The final rule associated with this amendment became effective in September 2006.

In April 2005, NMFS was sued by Coastal Conservation Association, the Ocean Conservancy, and the Gulf Restoration Network challenging the red snapper rebuilding plan put in place through Amendment 22. The consolidated lawsuit requested that the Court set aside the rule implementing the red snapper rebuilding plan, and establish a deadline for revising the plan. On March 12, 2007, the Court agreed with the plaintiffs' claims and specifically found the rebuilding plan was based on flawed assumptions, should have considered the practicability of additional bycatch reduction in the shrimp trawl fishery, and did not demonstrate a 50 percent probability of rebuilding the red snapper stock by 2032. The Court disagreed with some of the Plaintiffs' claims that NMFS did not consider an adequate range of rebuilding alternatives as required by NEPA, and denied CCA's claim that NMFS erred in denying CCA's petition for interim or emergency rulemaking to address shrimp trawl bycatch. In its decision, the Court is requiring NMFS to establish a revised red snapper rebuilding plan within nine months of the Court opinion, or by December 12, 2007. Additionally, the Court is requiring that the current red snapper rebuilding plan be maintained until replaced by the revised plan.

At its August 2006 meeting, the Council voted to delay consideration of regulatory actions needed to address red snapper overfishing until January 2007 when additional data and information from 2005-2006 is available for the directed red snapper and shrimp trawl fisheries, particularly the MRFSS and shrimp effort data. However, by postponing the development of a plan amendment, measures to address overfishing during the 2007 fishing season would not occur, further delaying progress in stock recovery. Thus, to address overfishing on the red snapper stock for 2007, NMFS developed a temporary rule published in the *Federal Register* on April 2, 2007. This rule: Sets the red snapper TAC at 6.5 MP - a commercial quota of 3.315 MP and a recreational quota of 3.185 MP; reduces the red snapper recreational bag limit from four to two fish per person per day; prohibits captain and crew of for-hire vessels from retaining the recreational bag limit; reduces the current commercial 15-inch minimum size limit to 13 inches to reduce bycatch; and establishes a target red snapper bycatch reduction goal for the shrimp fishery. Because these measures are temporary and only last 180 days, the interim rule would need to be extended for an additional 186 days to ensure these measures are effective for the 2007-fishing year, or a new interim rule could be developed extending 2007 measures and putting in place measures selected through this amendment.

The Council is working on other actions including a Reef Fish amendment to address overfishing of gag, greater amberjack, and gray triggerfish; a Reef Fish amendment to establish a grouper IFQ program; and a generic aquaculture amendment.

Foreseeable future actions include changes to the BRD certification criteria through a regulatory amendment to the Shrimp FMP to allow certification of three funnel-type BRDs. The Gulf fisheye and expanded mesh BRDs are being decertified through a framework action. The Council approved this amendment in August 2006; currently it is under Secretarial review. The Council has also initiated an amendment to address overfishing in greater amberjack, gray triggerfish, and gag, an amendment to rescind some or all management of the vermilion snapper management measures implemented by GMFMC (2004b), and an amendment to evaluate an IFQ program for the Gulf grouper fishery.

The Magnuson-Stevens Reauthorization Act (MSRA) was enacted on January 12, 2007. It added provisions strengthening the requirements to end and prevent overfishing and rebuild U.S. stocks. It requires annual catch limits (ACLs) and corresponding accountability measures (AMs) to ensure that overfishing does not occur. It also requires conservation and management measures be prepared and implemented within 2 years of notification that a stock is "overfished" or "subject to overfishing" in order to end overfishing immediately and begin rebuilding stocks. The NMFS understands an ACL to mean a specified amount of a fish stock (e.g., measure of weight or numbers of fish) for a fishing year that is a target amount of annual total catch that takes into account projected estimates for landings and discard mortality from all user groups and sectors. The MSRA restricts ACLs to not exceed the recommendations of Council SSCs, and plan amendments must specify mechanisms for establishing ACLs. Measures are required by the MSRA to ensure accountability and ACLs will need to be developed in 2010 for stocks subject to overfishing and 2011 for all other stocks.

5. **Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.**

This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components. According to the CEQ guidance describing stress factors, there are two types of information needed. The first are the socioeconomic driving variables identifying the types, distribution, and intensity of key social and economic activities within the region. The second are the indicators of stress on specific resources, ecosystems, and communities.

The red snapper fishery has operated under a 9.12 MP TAC since 1996. The commercial sector, as a result of a derby type rush to catch as many fish as possible before quota closures took effect, has until recently filled its quota within 60 to 80 fishing days. In an effort to spread out the fishing days across as much of the calendar year as possible, regulations were passed that split the quota into spring and fall sub-quotas, allowing commercial red snapper fishing during only the first 10 to 15 days of each month, and setting vessel trip limits. This effectively spread out the fishery but did not end the derby. During open periods, fishermen would forego sleep and put off vessel maintenance in order to maximize their fishing, and would fish in weather conditions that they would normally not fish in. An IFQ system has replaced seasonal system of monthly openings and trip limits. Without the fear of quota closures, fishermen now are able to fish at times of their choosing. Actions in this amendment and associated DSEIS that significantly affect commercial red snapper fishing include a possible reduction in TAC and a reduction in the commercial minimum size limit. A reduction in TAC will result in a reduction in the value of individual quota shares, which may be seen by fishermen as a personal property loss over which they have no control. Reducing the commercial minimum size limit will reduce dead discards and increase efficiency.

The recreational red snapper fishery has been, and will continue to be, regulated primarily through bag limits, minimum size limits, and closed seasons. The Sustainable Fisheries Act of 1996 mandated that the recreational red snapper fishery be managed under a quota system similar to the commercial fishery, and that it be closed when the quota is met. Recreational catches are monitored through a system of surveys from which catch estimates do not become available until several months after the data are collected. This type of monitoring system does not lend itself to management that requires in-season actions such as quota closures. Nevertheless, the Council and NMFS attempted to conduct quota management of the recreational fishery during 1997-1999 through a combination of catch estimates for the early part of the year and projections for the later part of the year. The result was a November 27 recreational quota closure in 1997, and a closure that occurred earlier each subsequent year as for-hire vessels began cautioning their clients to take their fishing vacations earlier in the year or risk a closure. Finally, in 2000, as a result of the economic disruptions and the inadequacy of the recreational data for in-season monitoring, the Council and NMFS switched to a fixed April 21 – October 31 open season that was projected to allow the recreational allocation to be filled. While this alleviated the pseudo-derby fishery that appeared to be starting in the recreational sector, it also put an end to any hope for a winter/early spring recreational fishery upon which some regions, particularly south Texas, had relied upon. A reduction in TAC may require an even shorter season. If this becomes necessary, the alternatives in this amendment and associated DSEIS have put a priority on keeping the season open at least during May 15 to August 15, which is considered the peak of the recreational fishing season. Reducing the bag limit can alter season length, but bag limit reductions may reduce the satisfaction that some fishermen get from a fishing trip. Reducing the recreational minimum size limit may, conversely, increase fishermen's satisfaction by allowing them to keep fish that they feel would die if released because they were too small. However, reductions in size limits would increase the rate of harvest and require a shorter season or other more restrictive management measures to compensate for the increase in harvest. Gear restrictions would help to reduce release mortality, but may alter some fishermen's behavior while fishing and handling fish.

As previously described, the shrimp trawl fishery has been in a long-term decline due to economic conditions and competition from inexpensive foreign imports. However, as a result of this decline, reductions in effort have, and are, occurring that can be applied to the reductions in shrimp trawl discard mortality needed for the red snapper rebuilding plan to succeed.

All three of the above fisheries have been impacted by the hurricanes that struck in the Gulf of Mexico during 2004 and 2005, resulting in temporary, and possibly permanent, reductions in effort. Under the commercial IFQ system, fishermen who choose to leave the fishery or are unable to fish can sell either their annual shares or their percent quota allocation to other red snapper fishermen. Consequently, overall commercial harvest is unlikely to be permanently impacted by the hurricanes, although availability of seafood houses with sufficient offloading capability may be a problem for some period of time. The recreational fishery is impacted by a loss of infrastructure, i.e., fishing docks, hotels, restaurants, etc. As the infrastructure rebuilds, the recreational fishery should rebound, but the rate at which this will occur is not known. MRFSS recreational fishing effort and landings data suggest some decrease in effort and landings have occurred in 2006 due to the direct effects of hurricanes, as well as increased fuel costs.

The shrimp fleet suffered losses in vessels, docks, and facilities, and a possible loss of some shrimping grounds due to debris making the bottom untrawlable. Consequently, there will likely be at least a short-term reduction in shrimping effort beyond what would have occurred for solely economic reasons, resulting in a corresponding reduction in shrimp trawl red snapper discards. In order to rebuild red snapper, large reductions in shrimp trawl effort are necessary. To maintain the shrimp trawl bycatch reductions occurring from hurricanes and economic conditions, this amendment and associated DSEIS proposes to cap shrimp effort at post-hurricane levels. Capping effort at these levels takes into account uncertainty about participation and effort in the shrimp fishery following the particularly severe 2004 and 2005 hurricane seasons, and the recent implementation of the 10-year shrimp permit moratorium. It also provides the shrimp fishery some flexibility in harvesting OY.

6. **Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.**

This section examines whether resources, ecosystems, and human communities are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

Currently, the red snapper stock is estimated to be at a relative stock status of about 1.5 percent SPR. This is higher than the estimated status in 1990 of 1.1 percent SPR (Porch, personal communication), but is below the level that can sustain an optimal harvest based on red snapper population demographics. Reef Fish Amendment 22 established biological thresholds and status criteria for the red snapper stock, and includes a plan to rebuild the stock to the biomass where MSY or OY can be harvested on a continuing basis. The maximum fishing mortality threshold (MFMT) was set at F_{MSY}, and MSY was set at the yield associated with fishing at F_{MSY}. The initial TAC was set at 9.12 MP; TAC is to be reevaluated periodically.

The values for MSY and B_{MSY} as calculated by NMFS are dependent on the age and size distribution of the total kill of red snapper across all fisheries, including dead discards from the directed and shrimp trawl bycatch fisheries. The “best” scenario for calculating MSY and B_{MSY} occurs when reductions in the directed fishing mortality and shrimp trawl discard mortality are linked, i.e., for a given percent reduction in the directed F there is an equal percent reduction in shrimp trawl bycatch F. Under the linked scenario, MSY and B_{MSY} occur at an SPR of 26 percent. Unfortunately, it is unlikely that the directed fishery bycatch mortality can be reduced to the target 74 percent reduction analyzed in the stock assessment for both the directed and shrimp trawl fisheries. Consequently, further reductions in TAC to the 5.0 MP level were needed to maintain the rebuilding target of 26 percent SPR by 2032.

Harvest is presently constrained to a TAC of 9.12 MP, which may change through alternatives considered in **Action 1**. Current regulations (season closures, bag limits, size limits, trip limits, and a quota) have been developed to ensure the harvest does not exceed TAC. Therefore, the stock is protected from further biological stresses identified in Step 5 above, and the red snapper fisheries must operate within the financial constraints of the TAC and bycatch reduction examined in Actions 4-8.

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects. The first stock assessment of red snapper was conducted in 1986, followed by assessments in 1989, 1990, 1992, 1995, 1997, 1998, and 1999. The most recent assessment was completed in 2005 through the SEDAR process. The assessment shows trends in biomass, fishing mortality, fish weight, and fish length dating to the earliest periods of data collection. For these assessments, reliable commercial landings data are available back to 1962, although the SEDAR assessment used sporadic landings data going back to the 1880s. Recreational data are only available since 1981.

Shrimp are assessed each year and current assessment methods are based on Nichols (1984). The assessment shows trends in catch, effort, CPUE, and recruitment. For these assessments, reliable data are available back to 1960.

Information is lacking on the social environment of the red snapper and shrimp fisheries, although economic data are available. For red snapper, fishery-wide ex-vessel revenues are available dating to the early 1960s, and individual vessel ex-vessel revenues are available from 1990 when the logbook program was initiated. Cost data are based on a 1994-1995 survey conducted by Waters (1996). Multiple databases exist to gauge participation and conditions in the Gulf shrimp fishery from the 1990s. However, these databases have weaknesses that are discussed in detail in Section 3.5.1.4 and were the impetus behind developing a federal shrimp permit for vessels operating in the Gulf EEZ. To evaluate the economic environment of the shrimp fishery, a composite of all data sources was used to generate information on this fishery.

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities. Cause-and–effect relationships are presented in Table 5.6.1.

Table 5.6.1. The cause and effect relationship of fishing and regulatory actions within the time period of the CEA.

Time periods	Cause	Observed and/or expected effects
1962-1983	Growth and recruitment overfishing	Declines in mean size and weight
1984	13-inch minimum size limit for the recreational and commercial fisheries	Slowed rate of overfishing
1990	3.1 MP quota for commercial fishery and 7 fish bag limit	Further slow rate of overfishing
1991-1992	2.04 MP commercial quota	Continue to slow rate of overfishing
1992	Establish red snapper Class 1 and 2 endorsements and respective trip limits	Slow rate of harvest and begin derby fishery
1993-1998	3.06 MP commercial quota	Continue to slow rate of overfishing
1994	Increase minimum size to 14 inches in the commercial and recreational fisheries	Increase yield per recruit, increase the chance for spawning, and slow rate of overfishing
1995-1997	Increase minimum size to 15 inches in the commercial and recreational fisheries and reduce the bag limit to 5 fish	Increase yield per recruit, increase the chance for spawning, and slow rate of overfishing
1997-2005	Reduce recreational season length	Constrain harvest in recreational fishery
1998	Shrimp trawls in the EEZ required to use NMFS-certified BRDs west of Cape San Blas	Reduce fishing mortality rate on age 0 and age 1 red snapper
1998-2005	Reduce bag limit to 4 fish	Reduce fishing mortality rate in recreational fishery
1996-2005	Raise TAC to 9.12 MP	Reduce rebuilding rate for fishery
2000-2005	Raise recreational minimum size limit to 16 inches	Increase yield per recruit, increase the chance for spawning, slow rate of overfishing
2004	Shrimp trawls in the EEZ required to use NMFS-certified BRDs east of Cape San Blas	Further reduce fishing mortality rate on age 0 and age 1 red snapper
2004	Implement red snapper rebuilding plan	Provide mechanism to monitor harvest for rebuilding
2004-2005	Hurricanes Ivan, Katrina, Rita	Temporary reductions in both directed and bycatch mortality due to loss of infrastructure, high fuel costs, and drop in tourism.
2007	Set 2007 TAC at 6.5 MP, reduce commercial minimum size limit to 13 inches, reduce recreational bag limit from 4 to 2 fish, and establish a target red snapper bycatch reduction goal for the shrimp fishery.	Further reduce fishing mortality on the red snapper stock while measures in Amendment 27/14 are being developed.

9. Determine the magnitude and significance of cumulative effects.

The main objective of this amendment and associated DSEIS is to reduce overfishing in the short-term while the Council evaluates long-term measures to reduce overfishing and allow the stock to recover. Actions 1-3 consider red snapper TAC and associated recreational fishing management measures while Actions 4-8 consider short-term measures to reduce red snapper bycatch mortality in both the directed and shrimp trawl bycatch fisheries. A change in TAC is needed in order to keep the red snapper rebuilding plan on a trajectory to achieve the target B_{MSY} by 2032 and to end overfishing by 2009 or 2010 (GMFMC 2004a). The present 9.12 MP TAC was adopted with the expectation that there would be at least a 44 percent reduction and up to a 50 percent reduction in shrimp trawl bycatch mortality, based upon test results from the currently certified BRDs. However, in 2005 it was learned that bycatch reduction from BRDs had failed to reach those levels. Additionally, the new stock assessment indicates directed fishery landings and bycatch mortality have a greater influence on stock recovery than previously thought. Consequently, the rebuilding targets will not be achieved without further reductions in both the directed fishery and shrimp trawl mortality.

Complicating matters is the damage to red snapper and shrimping infrastructure caused by a series of destructive hurricanes in 2004 and 2005. The amount of damage and reduction in effort is not yet known, nor is the time that it will take to rebuild. However, due to recent strong red snapper year classes plus the lag time between spawning and entry of a year class into the fishery, stock status trajectory in the short run is relatively insensitive to future decreases in shrimp bycatch mortality rates (Thompson 2005). Thus, TAC can be set based on the short-term goal of ending overfishing by 2009 or 2010 rather than the long-term goal of B_{MSY} by 2032. The shrimp trawl bycatch reductions associated with the new TAC will still need to be achieved during this time frame in order to avoid future reductions in TAC after the next red snapper stock assessment.

Commercial fishing management measures to constrain harvest to the commercial quota are unnecessary to consider in this amendment and associated DSEIS since the commercial fishery is under an IFQ system (GMFMC 2006). The IFQ program is expected to eliminate the derby fishery and allow the commercial harvest to be spread out over the year as fishermen fish according to market conditions and the amount of individual quota held rather than a need to race to catch as much fish as possible before the overall quota is reached. For this reason, trip limits and closed seasons are no longer considered necessary to spread out the harvest. (Commercial size limits are considered in this amendment and associated DSEIS under actions to reduce bycatch and bycatch mortality.) However, if the TAC is reduced, the pounds associated with a given percentage of the quota will also be reduced proportionately. This will result in a short-term negative economic impact on commercial fishermen, but by assuring that the rebuilding plan remains on its trajectory, the long-term benefits will be positive.

Recreational fishing management measures to implement TAC and control the rate of harvest are needed since real-time recreational quota monitoring is not possible with current recreational data collection methodologies and technology. The basic tools for controlling recreational harvest are bag limits, size limits and closed seasons. For each of the alternatives in **Action 1** to reduce TAC, several options and suboptions are provided with combinations of bag limits, size limits, and closed seasons that are calculated to allow the recreational allocation to be filled.

There will be a negative socioeconomic impact from having additional fishing restrictions, but having a choice of combinations will allow the negative impacts to be minimized.

The TACs and rebuilding plans in **Action 1** reflect a long-term need to set harvest at a rate that ends overfishing and rebuilds the red snapper stock. Analyses of management actions in Action 1 are based on recreational landings and effort during 2001-2003. During 2006 and 2007, and possibly subsequent years, there may be some temporary reduction in effort due to the effects of the hurricanes in 2004 and 2005. **Preferred Alternative 3** in **Action 1** assumes no reduction in effort and landings due to these hurricanes. Reductions from the 2004 and 2005 hurricanes are expected to occur only over the short-term, with increases in effort and landings expected to occur over the longer-term.

Action 2 evaluates how much post-hurricane effort should be assumed in setting recreational measures in **Action 1**. The range of reduction in effort is from 0-25 percent. The magnitude in reduction is difficult to ascertain because the magnitude of change varies between fishing sectors, **Preferred Alternative 3** would continue to assume a 10 percent reduction which would add approximately 30 days to the recreational fishing season from that indicated in **Preferred Alternative 3 in Action 1.** Thus, it would have significant benefits to the social and economic environments in the short term, but there could be negative benefits to the biological environment if the additional harvest jeopardizes the rebuilding plan. On the other hand, the stock is scheduled to be re-evaluated in 2009 at which time this assumption may change, and other management adjustments can be made.

Action 3 proposes elimination of the red snapper bag limit for captain and crew of for-hire vessels. Its purpose is to reduce the recreational harvest rate and allow for a longer season, which would benefit the for-hire sector by allowing them to make more trips. It is estimated a zero captain and crew bag limit will extend the season by only 3-7 days. For some captains and crew, the economic benefits of making a few extra trips may be offset by the social cost of being unable to keep personal catches. The impacts of this action on both the biological and socioeconomic environments are small in comparison to the other actions in this amendment and associated DSEIS, but cumulatively, will contribute toward conservation of the resource.

The remaining actions considered in this amendment and associated DSEIS (**Actions 4-8**) are intended to reduce bycatch mortality either through gear restrictions in the directed fishery (type and size of hook), reduction in the commercial minimum size limit to reduce dead discards, or actions to control shrimping effort. All of these actions will have some initial economic costs, but will contribute to less bycatch mortality and more efficient use of the red snapper resource. For the red snapper fishery, these actions would cumulatively have a long-term beneficial effect on both the biological and socioeconomic environment.

To address overfishing on the red snapper stock for 2007, NMFS developed a temporary rule published in the *Federal Register* on April 2, 2007. This rule: Sets the red snapper TAC at 6.5 MP - a commercial quota of 3.315 MP and a recreational quota of 3.185 MP; reduces the red snapper recreational bag limit from four to two fish per person per day; prohibits captain and crew of for-hire vessels from retaining the recreational bag limit; reduces the current commercial 15-inch minimum size limit to 13 inches to reduce bycatch; and establishes a target red snapper bycatch reduction goal for the shrimp fishery. Because these measures are temporary and only last 180 days, the interim rule would need to be extended for an additional 186 days to ensure these measures are effective for the 2007-fishing year. Either that, or a new interim rule could be developed extending 2007 measures and putting in place measures selected through this amendment.

The NMFS has recently implemented the red snapper IFQ program developed through Reef Fish Amendment 26. This amendment establishes an IFQ system beginning in 2007 for commercial red snapper harvest. It also establishes red snapper bycatch monitoring programs. The NMFS recently approved GMFMC (2005b), which has an effective date of October 26, 2006 (71 FR 56039). This amendment establishes a permit moratorium on the shrimp fishery and is the first step towards a limited entry system. Controlling shrimp effort could be important in future efforts to limit juvenile red snapper bycatch from shrimp trawls. These amendments on the whole and taken in conjunction with this amendment and associated DSEIS should provide further protection to the red snapper stock.

Reasonably foreseeable actions include: a shrimp regulatory amendment to revise BRD certification criteria, a joint Shrimp/Reef Fish plan amendment to reduce red snapper bycatch and revise the red snapper rebuilding plan, a Reef Fish amendment to establish a grouper IFQ program, reef fish amendments to address overfishing in the gag, gray triggerfish, and greater amberjack fisheries, and a generic aquaculture amendment. These actions would provide a positive benefit to the red snapper stock by reducing bycatch, continue red snapper stock rebuilding, enhance reef fish fishing efficiency, and develop alternative sources of seafood to relieve pressure on domestic stocks. One negative effect for the IFQ program could be the revised rebuilding plan. Since TAC will be reduced substantially under **Preferred Alternative** 3 in **Action** 1, and could be reduced further based on results of future stock, commercial red snapper fishermen may feel that the former derby fishery would give them an advantage in their individual harvests over the IFQ program. Thus industry support for the program could decline.

The major non-Council/non-fishery related actions affecting the red snapper fishery are hurricanes. It is difficult to assess what the results of Hurricanes Ivan and Katrina are. However, tag/recapture data (Patterson et al. 2001) suggests hurricanes do move sedentary stocks significant distances. If enough vessels are damaged and not replaced, fewer vessels fishing for red snapper could result.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The cumulative effects of the red snapper rebuilding plan on the biophysical and socioeconomic environments are positive since they will ultimately restore the red snapper stock to a level that will allow the maximum benefits in yield and recreational fishing opportunities to be achieved. However, short-term negative impacts on the socioeconomic environment may occur to the red snapper fishery due to the need to limit directed harvest and reduce bycatch mortality. These negative impacts can be minimized for the recreational fishery by using combinations of bag limits, size limits and closed seasons that will provide the least disruption while maintaining TAC. The implementation of the IFQ program and reducing minimum size limits should reduce these impacts for the commercial fishery. For the shrimp fishery, as long as effort does not exceed levels required for red snapper bycatch reductions, the fishery will not be affected;

however, if exceeded, shrimp effort may need to be further restricted, therefore having a negative effect on the fishery unless better BRDs can be developed.

11. Monitor the cumulative effects of the selected alternative and modify management as necessary.

The effects of the proposed actions are, and will continue to be, monitored through collection of landings data by NMFS, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations.

5.8 Unavoidable Adverse Effects

Catch quotas, minimum size limits, bag limits, and seasonal closures, are generally effective in limiting total fishing mortality, the type of fish targeted, the number of targeted fishing trips, and/or the time spent pursuing a species. However, these management tools have the unavoidable adverse effect of creating regulatory discards. Discard mortality must be accounted for in a stock assessment as part of the allowable biological catch, and thus restricts TACs. SEDAR 7 (2005) reports the discard mortality rate in the commercial and recreational red snapper fisheries is higher than previously thought. The best available scientific information estimates a commercial discard mortality rate ranging from 71 percent (eastern Gulf) to 82 percent (western Gulf), and a recreational discard mortality rate ranging from 15 percent (eastern Gulf) to 40 percent (western Gulf). Despite the much lower release mortality rates (especially in the eastern Gulf), the recreational fishery releases significantly more fish and therefore kills more fish through discard mortality than the commercial fishery. During the 2001-2003 benchmark years, the recreational fishery released approximately five times as many red snapper as the commercial fishery. To reduce these sources of discard mortality, NMFS and the Council are proposing actions such as reducing minimum size limits for the commercial fishery and requiring the use of circle hooks in the recreational and commercial fisheries. These are intended to reduce bycatch and discard mortality, but may result in quotas and allocations being met earlier in the fishing year, causing the fishery to close earlier, with unavoidable adverse social and economic effects.

For the shrimp actions (**Actions 6-8**), the Council has chosen an initial 74 percent reduction target as preferred in **Action 6**, thus the Council may have to take action in the future because the fishery has not yet reached this target. However, the fishery may be close to achieving this reduction target and will be judged by what the final 2007 effort data shows and if implementation of the aforementioned change in the BRD requirements occurs. Should the target in **Action 6** not be achieved, future effort restriction would be needed to obtain the necessary reductions in red snapper fishing mortality. **Action 7** provides how reductions can be achieved, and **Action 8** provides a range of potential methods to implement measures in **Action 7**. Because it is unknown where current effort is relative to the reduction target, it is difficult to assess what the impacts of these actions would be. The discussion for **Action 6** provides a range of potential impacts, including indirect adverse economic impacts.

Actions considered in this amendment should not have adverse effects on public health or safety since these measures should not alter actual fishing practices, just how or when activities can occur. Unique characteristics of the geographic area are highlighted in Section 3. Adverse effects of fishing activities on the physical environment are described in detail in Sections 5.1-5.6, and measures to protect them are described in Sections 1.2 and 3.3. Uncertainty and risk associated with the measures are described in detail in Sections 5.1-5.6, as well as assumptions underlying the analyses.

5.9 Relationship Between Short-term Uses and Long-term Productivity

The primary objective of this amendment and associated DSEIS is to end overfishing by 2009-2010 and allow the red snapper stock to recover by the target date of 2032. This objective requires reducing fishing and bycatch mortality from both directed and incidental harvest sectors. Over the next approximately 24-year rebuilding schedule, many of the current participants may never recuperate losses incurred from the more restrictive management actions imposed in the short-term. However, with recovery of the stock in the future, future participants in the red snapper fishery will benefit. Overall, short-term impacts of actions such as reductions in total allowable harvest for the directed fishery would be offset with much higher allowable catch levels as the stock recovers and is rebuilt. For the shrimp fishery, short-term actions are not necessary at this time due to the economic downturn that has occurred. However, should the economic environment reverse its current trend, future measures to cap effort maybe necessary to allow the red snapper stock to continue to rebuild.

5.10 Mitigation, Monitoring, and Enforcement Measures

The process of rebuilding the red snapper stock is expected to have a negative short-term effect on the social and economic environment, and will create a burden on the administrative environment. These negative effects are carried over to the shrimp trawl fishery to obtain needed juvenile red snapper bycatch reduction. No alternatives are being considered that would avoid these negative effects because they are a necessary cost associated with rebuilding the red snapper fishery. The range of alternatives has varying degrees of economic costs and administrative burdens. Some alternatives have relatively small short-term economic costs and administrative burdens, but would also provide smaller and more delayed long-term benefits. Other alternatives have greater short-term costs, but provide larger and more immediate long-term benefits. Therefore, it is difficult to mitigate these measures and managers must balance the costs and benefits when choosing management alternatives for the directed and shrimp trawl fishery.

To ensure the red snapper stock rebuilding plans in Action 1 and the needed reductions in shrimp trawl bycatch in Action 6 are achieved, Action 1 alternatives include a periodic review of progress made towards rebuilding. These reviews are designed to incorporate new information and to address unanticipated developments in the red snapper and shrimp fisheries, and would be used to make appropriate adjustments in the red snapper regulations should insufficient or unexpectedly rapid rebuilding progress occur. These assessments would be requested as needed by the SEDAR Steering Committee. It should be noted that these periodic stock assessments are not meant to replace the scheduled review by the Secretary of Commerce of rebuilding plans/regulations of overfished fisheries required under §304(e)(7) of the M-SFCMA that is to occur at least every two years to ensure adequate progress toward stock rebuilding and ending overfishing. Additionally, NOAA Fisheries annually reports on the status of stocks in its Report to Congress.

Reviews will be based on periodic stock assessments. The next assessment is scheduled to occur in 2009 and should benefit from updated landings information through state and federal fishery monitoring programs. Additionally, NMFS and other government agencies support research on red snapper and shrimp trawl bycatch by federal, state, academic, and private research entities.

Based on annual updates on the harvest or on projected stock status from the periodic stock assessments, the Council may need to take management action should the red snapper harvest exceed, or is expected to exceed, the harvest dictated by the rebuilding plan. Actions that the Council could employ to further restrict harvest include, but would not be limited to changes in TAC, size limits, bag limits, seasonal closures or area closures. The Council has four options for implementing these measures. The first is to amend the Reef Fish or Shrimp FMP to include new information and management actions. Recent plan amendments put forth by the Council have taken between two and three years from conception to implementation. The second method is a regulatory amendment based on the framework established in Amendments 1 and 4 of the Reef Fish FMP to set TAC. Appropriate regulatory changes that may be implemented through framework include: 1) setting the TAC's for each stock or stock complex to achieve a specific level of ABC; and 2) bag limits, size limits, vessel trip limits, closed seasons or areas, gear restrictions, and quotas designed to achieve the TAC level (GMFMC, 1989; 1991). However, TAC and catch limits may be adjusted only after a new stock assessment has been completed. Recent regulatory amendments have taken between 9 months and two years from conception to implementation.

The NMFS may take other management actions through emergency or an interim measures. Emergency actions and interim measures only remain in effect for 180 days after the date of publication of the rule and may be extended by publication in the *Federal Register* for one additional period of not more than 186 days provided the public has had an opportunity to comment on the emergency actions and interim measures. The M-SFCMA further states that when a Council requests that an emergency action and interim measure be taken, the Council should also be actively preparing plan amendments or regulations that address the emergency on a permanent basis.

What type of rule making vehicle the Council decides to select should harvests exceed those described by the rebuilding plan is difficult to predict. Actions would be dictated by the severity of overages in harvest and by the time frame needed to implement a regulatory change. If the overage in harvest is small, but would still allow the stock to recover within the maximum time frame required by NMFS guidance, the Council would likely institute a change in existing management measures to reduce harvest through a plan or regulatory amendment. Should the overage be severe, the Council could ask for an emergency action or interim rule that would severely restrict or halt the harvest of red snapper while the Council explores management measures that would bring the harvest to levels consistent with those defined by the rebuilding plan.

Current red snapper regulations are labor intensive for law enforcement officials. The NMFS law enforcement officials work cooperatively with other federal and state agencies to keep illegal activity to a minimum. Violators are penalized, and for reef fish commercial, reef fish for-hire, and commercial shrimp operators, permits required to operate in their respective fisheries can be sanctioned.

The Council's red snapper IFQ program for the commercial reef fish fishery was actually designed with enforceability in mind and with full input by federal and state law enforcement officers. This program incorporates VMS, pre-departure and post-landing notification requirements, a dockside monitoring component, and real-time data management to account for all red snapper landed including a checks-and-balances system matching quota allocations with fish purchased. Law enforcement officers for the first time will be able to correlate where fish have been caught, where they were physically landed, to whom the catch (or portion of the catch) was sold, and where the product moved in commerce.

Reef fish management measures include a number of area-specific regulations where reef fish fishing is restricted or prohibited in order to protect habitat or spawning aggregations of fish, or to reduce fishing pressure in areas that are heavily fished. To improve enforceability of these areas, the Council has established a VMS program for the commercial reef fish fishery to improve enforcement. VMS allows NMFS enforcement personnel to monitor compliance with these area-specific regulations, and track and prosecute violations.

5.11 Irreversible and irretrievable Commitments of Resources

There are no irreversible or irretrievable commitments of agency resources proposed herein. The actions to change quotas/allocations, size limits, bag limits, and fishing seasons are readily changeable by the Council in the future. There may be some loss of immediate income (irretrievable in the context of an individual not being able to benefit from compounded value over time) to some sectors from the restricted fishing seasons.

5.12 Any Other Disclosures

There are no additional disclosures regarding the proposed actions.

6.0 REGULATORY IMPACT REVIEW

6.1 Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the proposed regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866 and provides some information that may be used in conducting an analysis of impacts on small business entities pursuant to the Regulatory Flexibility Act (RFA). This RIR analyzes the probable impacts that the alternatives in this joint amendment to the Reef Fish and the Shrimp FMPs would have on the commercial and recreational reef fish sectors and on the shrimp industry.

6.2 Problems and Issues in the Fisheries

Problems addressed by the proposed Joint Reef Fish FMP/Shrimp FMP amendment are discussed in Section 1.2 of this document and are included here by reference. In general, problems and issues addressed in this document include the overfished condition of the red snapper stock, the unsustainable red snapper mortality imputed to the directed fishery, and, the sizeable incidental take of juvenile red snapper attributed to the shrimp fishery.

6.3 Objectives

Management measures considered in this joint amendment aim to address SEDAR 7 (2005) assessment recommendations to further reduce directed and bycatch fishing mortality rates on the red snapper stock. Consistent with the Court Opinion issued on March 12, 2007, reductions in red snapper fishing mortality rates that would result from this joint amendment are also designed to improve the likelihood of success of the red snapper rebuilding plan.

6.4 Description of the Fisheries

Descriptions of the red snapper and shrimp fisheries are provided in Sections 3.1 and 3.2 of this document and are included here by reference.

6.5 Impacts of Management Alternatives

Section 6.5 contains summaries of the expected economic impacts associated with the management measures for the red snapper fishery (**Actions 1-5).** Detailed analysis of shrimp-related management actions **(Actions 6-8)** are provided in Section 6.5.6 below. Detailed analyses and discussion for all management measures for the red snapper fishery are contained in Section 5.0 and are incorporated herein by reference.

6.5.1 Action 1: Directed Red Snapper TAC

A detailed analysis of the expected impacts of this action is contained in Section 5.1.3.1 and is incorporated herein by reference. Reductions in TAC from the status quo would be expected to result in short-term economic losses to fishery participants and associated businesses. In the long run, TAC reductions, which are being considered to end overfishing, return the resource to the required recovery path, and recover the stock, are expected to result in economic benefits. Analyses provided in this amendment focus on short-term impacts. The results logically reflect the expectation that the greater the reduction in TAC, the greater the short-term economic loss. For the recreational sector, the expected annual loss in economic value (consumer and producer surplus) relative to no action ranges from approximately $21.03 million under **Alternative 2(a)(i)** which would set a 7 MP TAC, 4-fish bag limit, 16-inch minimum size limit, and a May 15-September 30 fishing season, to approximately $90.70 million under **Alternative 4(a)(ii).** The alternative associated with the greatest loss in economic value would set a 3.0 MP TAC, 2-fish bag limit, 16-inch minimum size limit, and, a August 1 – August 31 plus 2 weekend gulf-wide openings immediately prior to August 1 and 2 weekend gulf-wide openings immediately after August 31 recreational fishing season. **Preferred Alternative 3** would set a 5.0 MP red snapper TAC, corresponding to a 2.45 MP recreational quota. **Preferred Sub-option 3(a)(i)** would maintain the current 16-inch minimum size limit, set a 2-fish bag limit, and a recreational fishing season running from June 1 to September 15, for a total of 107 fishing days. Effort decreases associated with the preferred option are estimated at 17,170 trips and 6,356 angler days. Relative to no action, resulting losses in economic value approximated $66.80 million under **Preferred Sub-option 3(a)(i)**. Under a 5.0 MP TAC, this management option corresponds to the longest recreational fishing season and would minimize losses in economic value. For the commercial sector, the expected reductions in net returns resulting from TAC reductions are, for a 7.0 MP, 5.0 MP, and, 3.0 MP, approximately $5.8 million, $11.5 million, and $17.1 million, respectively.

6.5.2 Action 2: Post-hurricane Reduction in Directed Fishery Effort Assumed for Action 1 TAC Alternatives

A detailed analysis of the expected impacts of this action is contained in Section 5.2.3.1 and is incorporated herein by reference. **Alternative 1**, which would assume historic baseline effort levels in the evaluation of management measures considered under Action 1, does not affect previously estimated changes in net fishing effort and in economic values. Though it could potentially establish stricter than required management measures thereby limiting short term economic benefits, **Alternative 1** would be consistent with a precautionary approach to management. **Alternative 2**, which assumes a 25 percent reduction in post-hurricane fishing effort and landings, may establish management measures that would jeopardize the rebuilding of the resource and significantly delay red snapper recovery. **Preferred Alternative 3**, which assumes a 10 percent reduction in post-hurricane fishing effort, would lengthen the recreational red snapper season by approximately 30 days and therefore, result in increased short term benefits derived from the fishery. **Preferred Alternative 3** is not expected to result in any negative impact on red snapper stock recovery provided that anticipated effort declines occur. However, **Preferred Alternative 3** could hamper red snapper recovery and cause more stringent regulations to be implemented in subsequent years if assumed effort reductions do not materialize.

6.5.3 Action 3: For-Hire Captain and Crew Bag Limit

A detailed analysis of the expected impacts of this action is contained in Section 5.3.3.1 and is incorporated herein by reference. **Alternative 1**, which would maintain the status quo and continue to allow for-hire captains and crew members to keep a bag limit while on charter, does not affect fishing practices in the charter industry. Therefore, no short term effects on the economic environment are expected from this measure. However, the status quo alternative does not contribute to the red snapper recovery in the Gulf and thus may lead to more stringent management measures in the future. **Preferred Alternative 2** would prevent for-hire captains and crew members from retaining a red snapper bag limit while on charter. The implementation of this measure could potentially add 4 to 16 days to the recreational fishing season. **Preferred Alternative 2** would increase the likelihood that the landings reduction targets in **Action 1** are reached, supporting return to the specified rebuilding path for red snapper and reducing the need for more severe future regulatory changes with accompanying increased adverse economic effects. However, positive effects resulting from this alternative, which is expected to foster red snapper recovery, may be mitigated by for-hire operators who continue to fish and share their catch with customers who did not manage to catch their limit.

6.5.4 Action 4: Commercial Minimum Size Limit

A detailed analysis of the expected impacts of this action is contained in Section 5.4.3.1 and is incorporated herein by reference. In and of itself, the proposed commercial red snapper minimum size limit would be expected to have less than a 0.1 percent positive economic impact on a projected approximately $26.0 million fishery. Some additional unquantifiable positive economic benefits may accrue due to decreased bait expenses, increased operational efficiency, and increased ex-vessel price. In tandem with the proposed 5.0 MP TAC, this action would be expected to result in a reduction in net revenue to the commercial fishery of approximately $7.0 million. The harvest of smaller fish may result in the re-development of a new market category commanding a price premium. However, the dominance of imports in the market and potential price movements as a result of the implementation of the IFQ program would be expected to bear a greater weight on price determination such that the size limit decrease would not be expected to have a significant effect on consumer prices.

6.5.5 Action 5: Fishing Gear Modifications

A detailed analysis of the expected impacts of this action is contained in Section 5.5.3.1 and is incorporated herein by reference. **Alternative 1** would not impose any additional gear requirements or restrictions on either the red snapper or reef fish fisheries and would not, therefore result in any direct or indirect short-term impacts to participants in the directed fisheries or associated businesses. The gear requirements and restrictions considered by **Alternatives 2 and 3**, and **4** have the intended purpose of reducing bycatch and bycatch mortality, with attendant gains in long-term stock conditions and economic benefits. Each alternative comes with attendant costs, through new gear purchases, though such costs are not expected to be substantial, particularly in the case of **Preferred Alternative 2** and **Alternative 3.**

Continued mortality associated with the absence of gear modifications would be expected, however, to result in slower recovery and more restrictive harvest allowances than would otherwise be possible, with associated loss in economic benefits. Continuation of the status quo through Council action would, therefore, be expected to delay rebuilding, where applicable, and reduce allowable harvests and associated economic benefits to the directed fisheries and associated businesses. From the long-term perspective, the expected impacts of the hook specification, dehooking gear, and venting gear alternatives are largely indistinguishable when considered for application to a specific fishery. However, the expected benefits of applying the requirements to all reef fish fisheries (**Option 2(d)** and **Option 3(d)**) are expected to exceed the benefits if the requirements are applied only to the red snapper fishery or sector thereof (**Options 2(a-c)** and **Options 3(a-c)**). From the long-term perspective, stock improvements and attendant economic benefits would be expected to be realized with **Preferred Alternative 2-option d** and **Alternative 3.**

6.5.6 Action 6: Target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico

Alternative 1 would maintain the status quo. This alternative does not establish a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico. If a target reduction goal is not established, potential remedial measures would not need to be considered under **Actions 7** and **8**. As a result, no direct or indirect adverse economic impacts on the Gulf shrimp industry are expected to result from this alternative.

Alternative 2 would establish a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico. Specifically, this target would be 50 percent less than the levels of juvenile red snapper mortality observed during the benchmark years of 2001-2003. Existing evidence indicates that, as of 2005, effort had already decreased within the 10 to 30-fathom zone of statistical areas 10-21 in the Gulf of Mexico to such a point that a 50 percent reduction in juvenile red snapper mortality had already been achieved. Current information on shrimp prices, fuel prices, and the impacts of the 2005 hurricanes suggest that effort should be even lower in the near future. As such, potential remedial measures under **Actions 7** and **8** would not need to be considered at this time. Thus, no indirect adverse economic impacts on the Gulf shrimp industry are expected to result from this alternative in the short-term. However, should effort in this area increase in the future to a level such that the 50 percent reduction target would no longer be met (e.g., to effort levels experienced in the years preceding 2005), then this alternative would require the consideration of remedial measures under **Actions 7** and **8**. Since the action of establishing a target reduction goal is basically administrative in nature, this alternative would not generate any direct, adverse economic impacts on the Gulf shrimp industry. However, this alternative could impose indirect adverse impacts on the Gulf shrimp industry in the long-term by creating the possibility that remedial measures might be implemented in the future.

Alternative 3 would establish a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico. Specifically, this target would be 60 percent less than the levels of juvenile red snapper mortality seen during the benchmark years of 2001-2003. Existing evidence indicates that, as of 2005, effort had already decreased within the

10 to 30-fathom zone of statistical areas 10-21 in the Gulf of Mexico to such a point that a 50 percent reduction in juvenile red snapper mortality has already been achieved. Current information on shrimp prices, fuel prices, and the impacts of the 2005 hurricanes suggest that effort should be even lower in the foreseeable future. Effort estimates for 2006 indicate that effort has continued to decrease, and is now at a level that would achieve a 65 percent reduction in juvenile red snapper mortality relative to the 2001-2003 baseline. Thus, the fishery has already attained and in fact surpassed the 60 percent target reduction goal. As such, under this alternative, potential remedial measures under **Actions 7** and **8** would not need to be considered at this time. Thus, no indirect adverse economic impacts on the Gulf shrimp industry would likely result from this alternative in the short-term. However, should effort in this area increase in the future to a level such that the 60 percent reduction target would no longer be met (e.g., to effort levels experienced in the years preceding 2006), then this alternative would require the consideration of remedial measures under **Actions 7** and **8**. Since the action of establishing a target reduction goal is basically administrative in nature, this alternative would not generate any direct, adverse economic impacts on the Gulf shrimp industry. However, this alternative could impose indirect adverse impacts on the Gulf shrimp industry in the long-term by creating the possibility that remedial measures might be implemented in the future.

Alternative 4, Alternative 5, and **Preferred Alternative 6** would also establish a target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico. However, under these alternatives, the target would be 74 percent less than the levels of juvenile red snapper mortality seen during the benchmark years of 2001-2003. Existing evidence indicates that, as of 2005, effort had already decreased within the 10 to 30-fathom zone of statistical areas 10-21 of the Gulf of Mexico to such a point that a 50 percent reduction in juvenile red snapper mortality has already been achieved. Current information on shrimp prices, fuel prices, and the impacts of the 2005 hurricanes suggest that effort should be even lower in the foreseeable future. In fact, effort estimates for 2006 indicate that effort has continued to decrease, and is now at a level that would achieve a 65 percent reduction in juvenile red snapper mortality relative to the 2001-2003 baseline. Therefore, as of 2006, the fishery has not yet achieved the 74 percent target.

Thus, under **Alternatives 4, 5, and Preferred Alternative 6**, remedial measures under **Actions 7** and **8** may need to be considered. Since this action is basically administrative in nature, this alternative would not generate any direct, adverse economic impacts on the Gulf shrimp industry. Further, since **Alternative 4** would maintain the 74 percent reduction target until the red snapper stock is rebuilt in 2032, it would be the most likely to result in indirect adverse economic impacts on the Gulf shrimp industry in the long-term. **Alternative 5** and **Preferred Alternative 6** could reduce the likelihood of such adverse economic impacts in the long-term, relative to **Alternative 4**, if the target is reduced, which would in turn allow effort to increase, in future years as a result of information from updated red snapper stock assessments. **Preferred Alternative 6** would most likely mitigate such indirect, adverse effects in the long-term since it specifies that the target will in fact be reduced to 67 percent in 2011 and down to 60 percent by 2032. Conversely, **Alternative 5** does not specify if or when a reduction in the target may be implemented or the magnitude of such a reduction.

6.5.7 Action 7: Consider establishing shrimp fishing restrictions to reduce effort to achieve a fishing mortality reduction target for juvenile red

snapper in the northern and western Gulf of Mexico established in Action 6

It should be noted that, for the purpose of evaluating economic impacts associated with alternatives considered under **Action 7**, the longest potential closures under **Alternatives 3 and 4** can be easily bracketed between January-April and October-November, respectively. However, as written, **Preferred Alternative 2**, which only requires the same starting date as the Texas closure, could potentially close statistical areas 10-21 for up to 364 days, i.e., from May 15 to May 14 of the following year. Thus, an evaluation of the maximum potential impacts under **Preferred Alternative 2** should be based on an unrealistic year-round closure. However, as a plausible example, the evaluation of maximum potential impacts under **Preferred Alternative 2** is based on the Texas closure, which customarily starts on May 15 and ends on July 15, approximately.

Alternative 1 would maintain the status quo. This alternative would not establish additional fishing restrictions for the Gulf shrimp fishery. This alternative would be preferred if **Alternative 1** was deemed preferable under **Action 6**. No direct or indirect adverse economic impacts on the Gulf shrimp industry are expected to result from this alternative.

Preferred Alternative 2 would potentially establish additional fishing restrictions for the Gulf shrimp fishery. Specifically, it would potentially require a seasonal closure within the 10 to 30-fathom zone off of Texas, Louisiana, Mississippi, and Alabama in the northern and western Gulf of Mexico (i.e. statistical areas 10-21) in conjunction with the start of the closure of the EEZ off of Texas. Under this alternative, NMFS and GMFMC would annually evaluate the level of effort and the associated levels of juvenile red snapper mortality and adjust the closure, as necessary, in accordance with the framework outlined in **Action 8**. In the short-term, this alternative would be most likely associated with **Alternative 4, Alternative 5,** and **Preferred Alternative 6** under **Action 6** but could also be consistent with **Alternatives 2 or 3** under **Action 6** in the long-term.

Alternative 3 would potentially establish additional fishing restrictions for the Gulf shrimp fishery. Specifically, it would potentially require a seasonal closure within the 10 to 30-fathom zone of statistical areas 10-21 in the Gulf of Mexico during the months of January through April. Under this alternative, NMFS and GMFMC would annually evaluate the level of effort and associated levels of juvenile red snapper mortality and adjust the closure, as necessary, in accordance with the framework outlined in **Action 8**. In the short-term, this alternative would be most likely associated with **Alternative 4, Alternative 5,** and **Preferred Alternative 6** under **Action 6** but could also be consistent with **Alternatives 2** and **3** under **Action 6** in the long-term.

Alternative 4 would potentially establish additional fishing restrictions for the Gulf shrimp fishery. Specifically, it would potentially require a seasonal closure within the 10 to 30-fathom zone of statistical areas 10-21 in the Gulf of Mexico during the months of October and November. Under this alternative, NMFS and GMFMC would annually evaluate the level of effort and associated juvenile red snapper mortality and adjust the closure, as necessary, in accordance with the framework outlined in **Action 8**. In the short-term, this alternative would most likely be associated with **Alternative 4, Alternative 5,** and **Preferred Alternative 6** under **Action 6** but could also be consistent with **Alternatives 2** and **3** under **Action 6** in the long-term.

The analysis of impacts associated with **Alternatives 2, 3,** and **4** will adhere to the following structure and be based on the following rationale. First, two sets of comparisons will be made. The first comparison will examine similarities and differences between the entities potentially impacted under these alternatives and the comparable universe of entities (as discussed in Section 3.5). The purpose of this set of comparisons is to determine whether there are important differences between the potentially impacted entities and the comparable universe of entities, and thus whether particular types of entities could be more or less impacted by each of the alternatives (i.e. all of the alternatives or a particular alternative will potentially impact a specific sub-component of the universe). The second comparison will be between the entities potentially impacted under each of these three alternatives. That is, this comparison looks at whether there are significant differences between the types of entities being potentially impacted under each of the alternatives. Thereafter, the impacts of the three alternatives will be compared on an aggregate basis, but also at the entity level to determine if potential impacts on particular types of entities significantly differ between the three alternatives.

Second, an analysis of the potential impacts of time/area closures can be based on a variety of assumptions. Ideally, an analysis of such measures would be based on the results of a dynamic, behaviorally based, equilibrium model, wherein vessels that could be directly or indirectly affected by each alternative would be allowed to alter their behavior either by changing the spatial and/or temporal nature of their fishing effort patterns or their decision to continue fishing (i.e. remain in or exit from the fishery), given currently existing constraints (e.g. other federal or state time/area closures and regulations, costs, shrimp prices, infrastructure availability, etc.). Such an analysis is not available at this time. However, a comparative analysis of the alternatives can still be conducted that will provide a reasonable approximation as to the likely magnitude of these impacts and, more importantly, a relative assessment of the impacts between the three alternatives (i.e. which alternative will most likely generate the greatest and which will most likely yield the least adverse economic impacts on the Gulf shrimp fishery).

The comparative impact analysis is based on a few critical assumptions. First, it is assumed that any of these alternatives are sufficient to meet the 74 percent reduction target for juvenile red snapper mortality. That is, the benefits of each alternative are assumed to be generally equivalent. Thus, the ultimate purpose of the analysis is to determine which alternative will potentially generate the least adverse economic impact on the Gulf shrimp industry since, as a result of the aforementioned assumption, that alternative will also generate the greatest net economic benefit to the nation. Second, the magnitude of the impacts is based on the maximum potential loss to each vessel as a result of being forced to discontinue operations in and during the entirety of the specified or assumed time and area subject to the closure. Potential indirect impacts to dealers, processors, and communities are based on the estimated impacts on vessels. For example, the estimate of potential impacts from **Alternative 3**, which at a maximum would close the 10 to 30-fathom zone in statistical areas 10-21 from January to April, is based on the landings and revenues that the impacted vessels previously procured from this area during this time. The estimates are based on the most recent and complete available information in this regard, which would be for the 2005 calendar year. Since the fishery is very close to achieving the 74 percent reduction target, it is acknowledged that, at least in the short-term, the absolute magnitude the impacts arising from any potential time/area closure will not be as large as the following estimates suggest. However, such impacts could accrue in the future should conditions change and cause effort to increase in the 10 to 30-fathom zone in statistical areas 10-21. More importantly, the analysis indicates which alternative is most likely to generate the greatest impacts on the largest number of entities. It is further acknowledged that vessels may in fact change their spatial and/or temporal fishing patterns in response to these potential closures, and that such adjustments could mitigate the impacts.

However, several important factors must be noted that would argue against the likelihood of such mitigation, particularly if the maximum time and area is closed under each alternative. First, some or all of these vessels' ability to adjust their fishing patterns is constrained by a variety of factors. For example, because of their size, small vessels will generally be precluded from fishing long distances from shore (i.e. beyond 30 fathoms) and some large vessels may be unable to operate in inshore or nearshore (i.e. inside 10 fathoms) waters. Given current fuel prices, the costs associated with fishing farther from shore or in waters off the west coast of Florida may also be a constraint for both small and large vessels. Also, for certain alternatives, other potential areas are already subject to closures during the specified time. For example, under **Preferred Alternative 2**, vessels could not shift to waters offshore of Texas since they are already closed during this time. Similarly, under **Alternative 3**, some or all of Texas' nearshore waters are closed during this time. Furthermore, if the impacted vessels are already operating on a full-time basis, then it will be difficult for them to temporally change their effort (i.e. they cannot shift their effort to different times because they are already operating at those alternative times). In addition, vessels may not be able to effectively (i.e. profitably) change the spatial/temporal nature of their effort patterns due to the seasonal availability of shrimp. That is, even if they are not operating on a full-time basis at present, the availability of shrimp in alternative times and areas may be insufficient to compensate for the loss of operating in their currently preferred areas/times. Further, in the past, it could be assumed that reductions in effort would not likely lead to reductions in landings and revenues because there was more than enough vessels and effort to harvest the available shrimp resource (i.e. MSY/OY, as currently defined). However, a report from the GMFMC Ad-Hoc Shrimp Effort Working Group indicates that the level of effort has fallen to a level significantly below what is needed to harvest the available stock of shrimp (Nance et al. 2006c). As such, further reductions in effort must lead to reductions in landings and therefore revenues to the fishery. And even if some or all of the impacted vessels do in fact simply redistribute their effort to different times and areas, it is likely that other vessels will already be operating in those areas/times. As such, in the areas/times that vessels could potentially shift to, competition for the available resource would intensify. As a result, catch per unit of effort (CPUE) would decrease from what it would have otherwise been in those times/areas, which in turn could potentially reverse recent increases in CPUE in the fishery and expand the impacts from the vessels that were operating in the times/areas subject to the closure to the vessels that were not operating in those times/areas. Such a result is objectionable on both efficiency and equity grounds. That is, vessels that are not significantly contributing to the problem of "excessive" juvenile red snapper mortality would be adversely affected by the potential closures. Not only would these entities consider such a result "unfair," but it would also create a perverse incentive for these vessels to move out of areas/times within which their effort does not currently contribute to the problem and potentially into areas/times within which their effort might contribute to the problem but are not subject to the closure.

Furthermore, according to economic theory, which presumes rational economic behavior, vessels' current fishing patterns must be assumed to maximize profit or other welfare measures given current constraints. That is, if other fishing patterns generated preferable outcomes with respect to profits or welfare, then vessels would already be engaging in those patterns. Thus, in turn, it must be concluded that any forced change to those patterns will reduce these entities' profits and/or welfare. For all of the aforementioned reasons, it is assumed that the losses and revenues foregone from the specific areas/times subject to the potential closures represent a reasonable approximation of the potential direct and indirect impacts on the affected entities.

Finally, it is assumed that many if not most of the vessels that continue to operate in the fishery under current economic conditions are likely operating "on the margin" (i.e. at low levels of economic profitability or at an economic loss). Therefore, losses in landings or revenues of a particular magnitude will potentially force vessels to exit the fishery (i.e. cease operations). Although exact numbers cannot be provided with certainty, relative probable outcomes between the three alternatives are offered (i.e. conclusions are provided as to which alternative is most likely to force the least and the most number of vessels and other entities to leave the industry).

6.5.7.1 Impacts on Vessels

(Note: Tables for this section are found in Section 15)

Based on information reported in Tables 6.5.7.1.1 through 6.5.7.1.3, the three closure alternatives would potentially affect vessels that, on average, have significantly higher Gulf shrimp landings and revenues than the average active vessel in the fishery (see Table 3.5.1.1.1). This finding suggests that all of these alternatives would tend to impact the more active (i.e. full-time) and more productive vessels in the Gulf shrimp fishery. The impacted vessels are likely a subset of the "economic core" of the fishery, as reflected by the percentage of Gulf shrimp landings and revenues that these vessels are responsible for producing. For example, the vessels potentially impacted under **Preferred Alternative 2** (assumed to be, at a maximum, a May 15 through July 15 closure in the 10 to 30-fathom zone of statistical areas 10-17) are responsible for generating around 50 percent of all Gulf shrimp landings and revenues that can be attributed to identifiable vessels. In addition, the average impacted vessel under all of these alternatives produces more than double the landings and revenues of the average active vessel in the fishery. In comparing the vessels impacted under the three alternatives, although the vessels impacted under **Preferred Alternative 2** are responsible for a higher proportion of landings and revenues in the fishery, the average landings per vessel is slightly less while average revenue per vessel is significantly less than under the other two alternatives. This result is partly reflective of the fact that shrimp are smaller in size, and thus in price as well, in the mid-May to mid-July time period relative to October and November and January through April.

In comparing the impacts of the three alternatives, in the aggregate, **Alternative 3** (January through April closure in the 10 to 30-fathom zone of statistical areas 10-21) would most likely generate the least adverse economic impacts on the harvesting sector of the Gulf shrimp industry. Specifically, at a maximum, the total loss of Gulf shrimp landings and revenues is estimated to be 2.60 million pounds (tails) and $9.49 million respectively. These figures compare to a maximum potential loss of 6.82 million pounds and $17.20 million in Gulf shrimp landings and revenues respectively under **Preferred Alternative 2** and 4.96 million pounds and $16.29 million in Gulf shrimp landings and revenues respectively under Alternative 4 (October through November closure in the 10 to 30-fathom zone of statistical areas 10-21). Thus, **Preferred**

Alternative 2 would potentially generate a higher loss in revenues and a significantly higher loss in landings. Again, this result is partly reflective of the fact that shrimp are relatively more abundant and smaller in size, and thus in price as well, in the mid-May to mid-July time period.

Similar results are seen with respect to the total number of vessels potentially impacted under each alternative. Specifically, **Alternative 3** would potentially impact the least number of vessels (446), with **Alternative 4** affecting slightly more vessels (485), while **Preferred Alternative 2** would potentially affect the greatest number of vessels by far (961). Given that **Preferred Alternative 2** would most likely close a smaller area for a smaller or similar period of time relative to **Alternatives 3 and 4**, this result is somewhat counterintuitive, except that it is reflective of the seasonal nature of the shrimp fishery, particularly the brown shrimp component of the fishery, and the fact that the waters off of Louisiana have become the most productive with respect to the volume of shrimp landings. Further, given that all of Texas' offshore waters are closed at this time, many offshore vessels from the western Gulf operate in Louisiana's offshore waters during this time.

On the individual vessel level, the average potential impacts per vessel are similar to those found in the aggregate. According to information in Tables 6.5.7.1.1 through 6.5.7.1.3, **Alternative 3** achieves the lowest loss per vessel of shrimp landings, both absolutely and in percentage terms, and the lowest percentage loss in shrimp revenues per vessel on average. The absolute loss in average shrimp revenue per vessel is lowest under **Preferred Alternative 2**. Conversely, Alternative 4 generates the largest average impact per vessel in all respects (i.e. in absolute and percentage terms for landings and revenues). However, under all three alternatives, the average percentage loss in revenue per vessel exceeds 10 percent, ranging from 12.9 percent under **Alternative 3** to 17.2 percent under **Alternative 4**. Under current economic conditions, even taking into account that the accompanying reduction in effort will reduce costs as well as revenues, such revenue reductions would be considered significant and sufficient to force many of the potentially impacted vessels out of business, particularly since these are average losses and thus many vessels' losses will be higher than the average (approximately 50 percent). For all three alternatives, it is also the case that there is a wide range of impacts across vessels, as reflected by the minimum and maximum impacts per vessel. That is, in each case, some vessels would be hardly affected at all while others could lose all of their Gulf shrimp landings and revenues (i.e. the former group is not dependent on the areas/times potentially subject to the closure while the latter group is completely dependent on landings and revenues from the areas/times subject to the potential closure).

In general then, **Alternative 3** appears to impose the least adverse impacts both in the aggregate and at the individual vessel level. The impacts under **Alternatives 2 and 4** are more difficult to compare. Specifically, although **Preferred Alternative 2** affects many more vessels than **Alternative 4**, the absolute loss of landings and revenue per vessel is significantly less and is also slightly less in percentage terms. What these findings indicate is that **Preferred Alternative 2** impacts more vessels but, as a result of spreading out the impacts over a larger number of vessels, the impacts per vessel are less on average. Conversely, **Alternative 4** may affect fewer vessels, but the impacts per vessel are much higher on average. This finding is a constant theme throughout the analysis and one that renders a comparative evaluation of the two alternatives difficult with respect to which is preferable on strictly economic grounds.

As noted in Section 3.5, not all vessels operating in the areas/times potentially subject to these closures are expected to qualify for federal Gulf shrimp moratorium permits, as per actions taken under GMFMC (2005b). Impacts specific to vessels expected to qualify for moratorium permits and their landings and revenue characteristics are presented in Tables 6.5.7.1.4 through 6.5.7.1.6. The characteristics of these potentially impacted vessels can be compared to the characteristics of all qualifying vessels (see Table 3.5.1.4.4). These comparisons and the impacts on qualified vessels are very similar to those noted for all of the impacted vessels, though a few additional findings and differences are important.

Specifically, it is still the case that, for all alternatives, the average landings and revenue per potentially impacted vessel are still significantly higher (between 36 percent and 52 percent) than for all active qualifying vessels, again reflecting the likelihood that the potentially impacted, qualifying vessels more frequently operate on a full-time basis relative to all active qualifying vessels on average and also represent a subset of the fishery's "economic core." This finding is reflected by the fact that nearly 100 percent of these vessels' revenues come from Gulf shrimp landings. In comparing the potentially impacted qualifying vessels under the three alternatives, in the aggregate, qualifying vessels would most likely face the greatest loss in landings under **Preferred Alternative 2**, the greatest loss in revenues under **Alternatives 2 and 4** (they are practically equal), with the lowest potential losses in landings and revenues occurring under **Alternative 3**.

At the vessel level, the average landings per vessel are nearly identical between the three alternatives, while average revenue per vessel is slightly higher under **Alternative 3** relative to **Alternatives 2 and 4**. With respect to **Preferred Alternative 2**, this finding differs from that noted for all impacted vessels. Specifically, the removal of non-qualifying vessels from the analysis causes the average landings and revenues per vessel to increase significantly under **Preferred Alternative 2**, suggesting that a higher percentage of non-qualifying vessels with relatively low levels of landings and revenues are impacted under preferred Alternative 2 relative to **Alternatives 3 and 4**. This fact is borne out by examining the number of qualified vessels impacted under each alternative and the total loss of landings and revenues to qualified vessels relative to all impacted vessels. In comparing Tables 6.5.7.1.4 through 6.5.7.1.6 with Tables 6.5.7.1.1 through 6.5.7.1.3, it can be seen that 241 of the impacted vessels under preferred **Alternative 2** are non-qualifiers, while only 29 and 41 of the impacted vessels under **Alternatives 3 and 4** respectively are non-qualifiers. Further, these non-qualifying vessels are responsible for relatively more of the lost landings and revenues under preferred **Alternative 2** (.90 million pounds and $1.52 million respectively) compared to **Alternatives 3** (.12 million pounds and $.38 million respectively) **and 4** (.20 million pounds and $.62 million respectively). This finding is suggestive of two conclusions: 1) non-qualifying vessels contribute less to the fishery than their qualifying counterparts (i.e. they are more likely to be part-time vessels) and 2) non-qualifying vessels appear to be more active in the May through July time period than either the October-November or January-April time periods.

Another outcome resulting from considering only qualifying vessels is that the average percentage of landings and revenues lost and the absolute amount of shrimp revenues lost per vessel are now nearly identical between **Alternatives 2 and 3**. However, it is still the case that **Alternative 3** achieves the lowest absolute loss of landings per vessel on average and **Alternative 4** still generates the highest loss of landings and revenues per vessel, absolutely and in percentage terms. The average percentage loss of revenues per vessel also continues to be in the 12-18 percent range under all three alternatives. Moreover, it is also still the case that **Alternative 3** potentially impacts the least number of qualifying vessels (417), with **Alternative 4** potentially impacting slightly more (444), and **Preferred Alternative 2** potentially impacting the greatest number of qualifying vessels by far (720). Therefore, it can still be concluded that **Alternative 3** would potentially have the least adverse economic impacts on qualifying vessels but it is subject to debate as to whether **Preferred Alternative 2 or 4** would potentially create the largest adverse economic impacts.

Also as noted in Section 3.5, the operations of different sized vessels (i.e. large versus small) can be very different, and thus so too can the impacts of potential management measures on those vessels. Further, as previously noted, the vessels impacted within each of these size groups can be different from the group of vessels in general.

Landings and revenue characteristics of and potential impacts on large qualifying vessels under the three alternatives are presented in Tables 6.5.7.1.7 through 6.5.7.1.9. These characteristics of the potentially impacted large qualifying vessels can be compared to the characteristics of all large qualifying vessels in Table 3.5.1.4.10. Again, as noted in the previous comparisons, the potentially impacted vessels have considerably higher (between 20 percent and 35 percent) levels of Gulf shrimp landings and revenues on average relative to all large qualifying vessels. The implications of this finding have already been duly noted.

However, in comparing the group of potentially impacted large qualifying vessels under the three alternatives, those large vessels impacted under **Alternative 4** have slightly lower levels of shrimp landings and revenues compared to those impacted under **Alternatives 2 and 3**, which is contrary to observations for all impacted vessels and all impacted qualifying vessels. However, the other findings with respect to potential impacts under the three alternatives are basically the same for large qualifying vessels as for all qualifying vessels. This result is to be expected since large vessels comprise the vast majority of potentially impacted qualifying vessels under each alternative (90 percent, 93 percent and 97 percent under **Alternatives 2, 3, and 4** respectively). In the aggregate, large qualifying vessels face the greatest loss in landings under **Preferred Alternative 2** but the greatest loss in revenues under **Alternative 4** (though only marginally higher than under **Preferred Alternative 2**), with the lowest losses in landings and revenues occurring under **Alternative 3**. Further, the average percentage of landings and revenues lost and the absolute amount of shrimp revenues lost per vessel are nearly identical between **Alternatives 2 and 3**, **Alternative 3** achieves the lowest absolute loss of landings per vessel on average, and **Alternative 4** generates the highest loss of landings and revenues per vessel, absolutely and in percentage terms. As before, the average percentage loss in revenues per vessel is in the relatively high range of 12-18 percent. Further, **Alternative 3** impacts the least number of large qualifying vessels (388), with **Alternative 4** impacting slightly more (432), and **Preferred Alternative 2** impacting the greatest number of large qualifying vessels by far (649). Thus, **Alternative 3** would potentially generate the least adverse economic impacts for large qualifying vessels, but it is unclear whether **Preferred Alternative 2**or **4** would generate the largest adverse economic impacts.

With respect to potentially impacted small qualifying vessels, their landings and revenue characteristics and potential impacts under the three alternatives are presented in Tables

6.5.7.1.10 through 6.5.7.1.12. These characteristics of the potentially impacted small qualifying vessels can be compared to the characteristics of all small qualifying vessels in Table 3.5.1.4.16. Again, as noted in the previous comparisons, the impacted vessels have considerably higher levels of Gulf shrimp landings and revenues on average relative to all small qualifying vessels. The implications of this finding have already been duly noted, but are even more pronounced in this case because the impacted small qualifying vessels' landings and revenues are on average 60 percent to approximately double that of all small qualifying vessels, which suggests that these vessels are very likely economic "highliners" within their particular group.

Further, comparisons of the group of potentially impacted small qualifying vessels under the three alternatives yield some different results than for the potentially impacted large qualifying vessels. For example, average landings per impacted vessel are now highest and approximately equal under **Alternatives 3 and 4**, while average revenue per impacted vessel is clearly highest under **Alternative 4**.[30] With respect to impacts, in the aggregate, small qualifying vessels potentially face the largest loss in both landings and revenues under **Preferred Alternative 2**, with the lowest loss in landings occurring under **Alternative 4** and the lowest loss in revenues occurring under **Alternative 3**. In addition, the highest impacts in terms of average lost landings and revenues per vessel are highest both absolutely and in percentage terms under **Preferred Alternative 2** for small qualifying vessels rather than **Alternative 4**. Further, the average losses per vessel are considerably lower both absolutely and in percentage terms for small vessels relative to their larger counterparts. The percentage of lost revenue per vessel is still relatively high, around 10 percent, under both **Alternatives 2 and 4**, but a much more modest 4.3 percent under **Alternative 3**. With respect to the number of impacted small qualifying vessels, as with large qualifying vessels, the greatest number of impacted vessels is under **Preferred Alternative 2**. However, the smallest number of impacted vessels is under Alternative 4 rather than **Alternative 3**. So, while conclusions for all qualifying vessels and large qualifying vessels were more difficult to render, for small qualifying vessels, it is clear that **Preferred Alternative 2** generates the highest level of adverse economic impacts. However, it is still the case that **Alternative 3** generally creates the least adverse economic impacts, with Alternative 4 being in between but much closer to the impacts created under **Alternative 3** than **Preferred Alternative 2**.

To this point, comparisons between potentially impacted and all vessels within a particular group and between groups of vessels impacted under each of the alternatives has only looked at differences and similarities in landings and revenues. However, vessels can be categorized and analyzed according to their physical characteristics as well. Further, these findings may be directly related to the findings regarding landings and revenues both in terms of the potentially impacted vessels' characteristics and the magnitude of the potential impacts generated under the three alternatives.

To this end, the first comparison is between the physical characteristics of all potentially impacted vessels, as seen in Tables 6.5.7.1.13 through 6.5.7.1.15 and Tables 6.5.7.1.22 through 6.5.7.1.24, as opposed to all active qualifying vessels, as reflected in Tables 3.5.1.4.5 and 3.5.1.4.6. Relative to all active qualifying vessels, the vessels potentially impacted under the

[30] It must acknowledged that the estimates for impacted small qualifying vessels under alternative 4 are based on a relatively small sample size and thus their accuracy is somewhat more questionable relative to the estimates for other groups of vessels.

three alternatives are generally newer, larger, more powerful, and use more gear and crew on average. A much higher percentage of these potentially impacted vessels also tend to have steel hulls and on-board freezers relative to all qualifying vessels. This is particularly true for the qualifying vessels impacted under **Alternatives 2 and 3**. Consistent with previous findings, this suggests that the potentially impacted vessels generally have more invested in their operations, likely represent the "economic" core of the fishery, and thus proportionately contribute more of the industry's economic impact to the nation. They also reflect the characteristics necessary for a vessel to regularly operate in the 10 to 30-fathom zone in the northern and western Gulf of Mexico. As between the three alternatives, the group of qualifying vessels potentially impacted under **Alternative 4** is slightly older, less powerful, and smaller with respect to their fuel and hold capacities relative to the vessels impacted under **Alternatives 2 and 3**. This finding suggests that vessels operating in the months of October and November are probably operating in the shallower and not so distant waters from shore within the 10 to 30-fathom zone, likely off of Texas. Also, a higher percentage of the vessels impacted under **Preferred Alternative 2** do not have on-board freezers relative to those impacted under **Alternatives 3 and 4**. This finding indicates that proportionately fewer vessels operating between mid-May to mid-July in the 10 to 30-fathom zone off of Louisiana, Mississippi, and Alabama require on-board freezing equipment, relative to those operating in this zone during October/November and January through April, which may in turn reflect that at least some vessels can take relatively shorter but still very productive trips at this time of the year, most likely in the shallower, less distant waters within that zone in the northern Gulf.

The second comparison is between the physical characteristics of all potentially impacted large vessels, as seen in Tables 6.5.7.1.16 through 6.5.7.1.18 and Tables 6.5.7.1.25 through 6.5.7.1.27, as opposed to all active large qualifying vessels, as reflected in Tables 3.5.1.4.11 and 3.5.1.4.12. Similar to before, relative to all active large qualifying vessels, the large vessels potentially impacted under the three alternatives are generally newer, larger, more powerful, and use more gear and crew on average. However, the differences are less noticeable in this case, and minor to non-existent with respect to **Alternative 4**. That is, the physical characteristics of large vessels potentially impacted under **Alternative 4** are very similar on average to the characteristics of all active large qualifying vessels. Thus, in turn, particularly under **Preferred Alternative 2**, the potentially impacted large vessels are newer and larger than those impacted under **Alternative 4**, implications of which have already been discussed. Also as before, a higher percentage of the impacted large vessels tend to have steel hulls and on-board freezers relative to all active large qualifying vessels. However, again, the differences are not as prominent as was the case with the comparisons involving all qualifying vessels. And, as before, a higher percentage of the large vessels impacted under **Preferred Alternative 2** do not have on-board freezers relative to those impacted under **Alternatives 3 and 4**, implications of which have also already been discussed.

The final comparison is between the physical characteristics of all potentially impacted small vessels, as seen in Tables 6.5.7.1.19 through 6.5.7.1.21 and Tables 6.5.7.1.28 through 6.5.7.1.30, as opposed to all active small qualifying vessels, as reflected in Tables 3.5.1.4.17 and 3.5.1.4.18. The results are similar to those for all potentially impacted and all potentially impacted large vessels. Specifically, relative to all active small qualifying vessels, the small vessels potentially impacted under the three alternatives are larger, more powerful, and use more gear and crew on average. However, they are also slightly older, possibly reflecting these vessel owners' length of experience in the fishery. Further, a significantly higher percentage of these impacted vessels also tend to have steel hulls and on-board freezers relative to all active small qualifying vessels. In fact, with respect to on-board freezers, the distribution for impacted small vessels (>90 percent have them) is almost exactly the opposite as for all active small qualifying vessels (>90 percent do not have them). As between the three alternatives, the small vessels potentially impacted under **Alternative 4** are generally larger (except with respect to hold capacity), more powerful, and use more gear and crew than those impacted under **Alternatives 2 and 3**, though they are also slightly older. No significant differences exist between the groups of small vessels impacted under the three alternatives with respect to the presence of on-board freezers, though a lower percentage of those impacted have steel hulls under **Preferred Alternative 2** relative to **Alternatives 3 and 4**.

6.5.7.2 Indirect Impacts on Dealers

If vessels are expected to potentially lose landings and revenues under **Alternatives 2, 3, and 4**, then it can also be expected the dealers that purchase shrimp from these vessels will also see a potential reduction in their purchases and sales of shrimp. Specifically, the dealers that purchase and then sell shrimp from the potentially impacted vessels will be indirectly impacted under each of the closure alternatives. In the aggregate, the losses in the volume and value of shrimp will be the same for dealers as for vessels. As such, the aggregate losses reported for all potentially impacted vessels in absolute terms will be the same for dealers. Thus, these results are not repeated here except to note that potential losses in the volume and sales of shrimp for dealers will be the least under **Alternative 3**, potential losses in volume are greatest under **Preferred Alternative 2**, and potential losses in shrimp sales are approximately equal under **Alternatives 2 and 4**.

The critical results in this case are the potential losses in shrimp volume and sales per dealer, both in absolute and percentage terms. These losses are reported in Tables 6.5.7.2.1 through 6.5.7.2.3. The key findings in these tables are as follows. First, similar to the impacts on vessels, the largest number of dealers is impacted under **Preferred Alternative 2**. However, in this case, the smallest number of dealers is impacted under **Alternative 4** rather than **Alternative 3**. On the other hand, as was generally the case for vessels, the average loss in the volume and sales of shrimp is clearly the least under **Alternative 3**, both in absolute and percentage terms. Further, in absolute terms, the average loss in the volume and sales of shrimp is clearly greatest under **Alternative 4**, while the average loss in the volume and sales of shrimp is slightly greater under **Preferred Alternative 2**. Also similar to the impacts on vessels, the minimum impact per dealer on average differs little under the three alternatives, while the maximum impact per dealer is greatest under **Alternative 4** in absolute terms but is also the least in percentage terms. So, while **Alternative 3** would appear to generate the least adverse economic impacts on dealers, whether **Preferred Alternative 2 or Alternative 4** generates the greatest adverse economic is less clear. As previously, the aggregate level impacts are similar under these two alternatives. However, these impacts are spread across more entities under **Preferred Alternative 2** than under **Alternative 4**. So, while **Alternative 4** affects fewer dealers, those dealers that are impacted face larger losses on average than under **Preferred Alternative 2**, at least in absolute terms. The main difference in this case though is that, in percentage terms, the loss in volume and sales of shrimp per dealer are higher under **Preferred Alternative 2**, which suggests that the dealers impacted under **Preferred Alternative 2** are relatively more dependent on purchases and sales of shrimp from the mid-May to mid-July time period than their counterparts that are affected under **Alternative 4**. Under all three alternatives, the average percentage loss in shrimp volume and sales per dealer ranges between 7 percent and 9 percent. While these percentage losses per entity are significantly lower than those experienced at the vessel level, they would still likely be high enough to force some shrimp dealers out of business. The results suggest that it is likely more dealers would be forced out of business under **Preferred Alternative 2** than under **Alternative 4**. These findings may be enough to conclude that the potential adverse economic impacts on the dealer sector would be greatest under **Preferred Alternative 2** rather than **Alternative 4**.

Table 6.5.7.2.1 Statistics for Dealer Impacts Under January - April Closure

	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Sales	Percentage of Shrimp Revenue Lost
Number of Impacted Dealers	89	89	89	89
Minimum Impact per Dealer	19	0.0	$75	0.0
Maximum Impact per Dealer	308,169	100	$1,069,509	100
Average Impact per Dealer	25,194	6.8	106,639	7.6
Standard Deviation	58,171	15.0	$224,696	15.5

Table 6.5.7.2.2 Statistics for Dealer Impacts Under May 15 - July 15 Closure

	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Sales	Percentage of Shrimp Revenue Lost
Number of Impacted Dealers	105	105	105	105
Minimum Impact per Dealer	55	0.0	$199	0.0
Maximum Impact per Dealer	429,824	95.9	$1,477,794	94.5
Average Impact per Dealer	64,940	8.7	$163,849	9.0
Standard Deviation	101,065	12.1	$262,421	12.5

Table 6.5.7.2.3 Statistics for Dealer Impacts Under October - November Closure

	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Sales	Percentage of Shrimp Revenue Lost
Number of Impacted Dealers	59	59	59	59
Minimum Impact per Dealer	97	0	$180	0
Maximum Impact per Dealer	743,978	41.4	$2,647,774	43.8
Average Impact per Dealer	84,092	7.6	$276,088	7.9
Standard Deviation	155,964	9.4	$526,083	9.4

6.5.7.3 Indirect Impacts on Communities

This section focuses on potential indirect impacts to communities in general and compares those impacts under the three potential closure alternatives. A discussion of potential impacts specific to each of the affected communities is presented in Section 5.6.3. General results regarding potential indirect impacts on communities under the three alternatives are presented in Tables 6.5.7.3.1 through 6.5.7.3.3.

As was the case for dealer, the aggregate level potential impacts on communities in terms of lost shrimp volume and revenue are the same as was reported for vessels, and thus those results are not repeated here except to note that they are the least under **Alternative 3**, the loss of volume is greatest under **Preferred Alternative 2** and the loss of revenues is about the same under **Alternatives 2 and 4**.

As would be expected, the relative potential impacts per community under **Alternatives 2, 3, and 4** are very similar to the relative impacts per dealer. Specifically, **Preferred Alternative 2** affects the largest number of communities (slightly more than **Alternative 3**), while **Alternative 4** affects the fewest number of communities. The minimum impacts per community are basically the same across the three alternatives. The maximum impacts per community are generally highest under **Alternative 4**, with the exception of the maximum percentage loss in shrimp landings, which is greatest under **Preferred Alternative 2**, and the maximum percentage loss in shrimp revenues, which, somewhat contrary to other results, is greatest under **Alternative 3**.

With the minor exception of the number of dealers impacted per community, the average losses and impacts per community are clearly the least under **Alternative 3**. With respect to the average loss of shrimp landings and revenues in absolute terms, the impacts per community are greatest under **Alternative 4**. However, with respect to the average losses in landings and revenues in percentage terms, as well as the average number of impacted dealers, vessels, and qualifying vessels per community, the impacts are greatest under **Preferred Alternative 2**. This result suggests that potential adverse economic impacts on communities would be the least under **Alternative 3** and likely the greatest under **Preferred Alternative 2**.

Table 6.5.7.3.1. Community Impacts Under January – April Closure

City	State	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Percentage of Shrimp Revenue Lost	Number of Impacted Dealers	Total Number of Impacted Vessels	Number of Qualifying Vessels Impacted
ABBEVILLE	LA	50,287	0.7	$127,704	0.7	4	13	12
ARANSAS PASS	TX	77,901	5.8	$307,741	7.6	3	18	15
BAYOU LA BATRE	AL	231,561	3.2	$949,655	4.3	7	39	38
BELLE CHASSE	LA	6,105	0.7	$11,501	0.6	1	1	1
BILOXI	MS	368,499	8.7	$1,289,422	10.5	3	19	19
BON SECOUR	AL	29,226	1.8	$132,010	2.1	3	6	5
BOOTHVILLE	LA	6,272	0.3	$16,411	0.4	1	5	5
BROWNSVILLE	TX	242,762	3.3	$984,395	3.7	1	56	55
BURAS	LA	65	1.8	$100	1.4	1	1	0
CAMERON	LA	15,303	1.7	$12,870	1.0	5	11	9
CHAUVIN	LA	25,468	0.3	$22,492	0.2	3	10	7
CUT OFF	LA	8,463	0.3	$23,714	0.4	2	4	4
DAUPHIN ISLAND	AL	3,332	8.7	$10,763	10.3	1	2	2
DELCAMBRE	LA	35,958	1.9	$22,346	0.7	3	8	8
DULAC	LA	132,321	1.3	$245,300	1.0	5	33	26
EMPIRE	LA	15,026	0.5	$16,259	0.3	3	6	6
FREEPORT	TX	146,826	7.2	$605,869	9.6	2	31	31
FT MYERS BEACH	FL	696	0.0	$2,435	0.0	1	2	2
FULTON	TX	3,824	2.4	$17,679	4.9	1	***	***
GALVESTON	TX	30,479	2.0	$122,275	2.6	2	11	9
GOLDEN MEADOW	LA	87,591	1.5	$387,249	3.0	3	11	10
GRAND CHENIER	LA	209	0.8	$96	0.3	1	1	1
GRAND ISLE	LA	500	0.0	$975	0.0	1	2	2
KAPLAN	LA	660	2.3	$2,166	2.3	2	2	1
KEY WEST	FL	2,512	0.1	$8,702	0.2	1	1	1
LAFITTE	LA	5,371	0.1	$5,777	0.1	3	5	3
LOCKPORT	LA	5,187	0.5	$11,709	0.5	1	2	1
MATAGORDA	TX	14,900	26.3	$75,957	38.7	1	1	1
PALACIOS	TX	887,258	10.1	$3,483,162	12.3	6	95	94
PASCAGOULA	MS	2,840	1.6	$10,858	2.6	1	1	1
PIERRE PART	LA	370	10.2	$1,140	11.0	1	1	1
PORT ARTHUR	TX	81,028	0.8	$236,928	0.7	5	23	22
PORT BOLIVAR	TX	1,584	0.0	$3,020	0.0	1	1	1
PORT ISABEL	TX	69,948	1.6	$313,691	2.0	6	31	31
PORT LAVACA	TX	5,120	1.4	$18,352	2.3	1	2	2
THEODORE	AL	191	.1	$518	.1	1	1	1
VENICE	LA	2,583	0.1	$9,604	0.2	1	2	2
VINTON	LA	65	0.3	$75	0.4	1	1	1

Table 6.5.7.3.2. Community Impacts Under May 15 – July 15 Closure

City	State	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Percentage of Shrimp Revenue Lost	Number of Impacted Dealers	Total Number of Impacted Vessels	Number of Qualifying Vessels Impacted
ABBEVILLE	LA	724,399	9.9	$1,597,075	8.1	4	84	68
ADDIS	LA	612	1.8	$2,734	2.3	1	1	1
AMELIA	LA	519	4.4	$880	30.6	1	1	1
ARANSAS PASS	TX	20,004	1.5	$89,848	2.2	2	8	6
BALDWIN	LA	666	10.2	$2,563	11.4	1	1	1
BAYOU LA BATRE	AL	578,312	8.0	$1,817,426	8.3	9	86	82
BELLE CHASSE	LA	367,869	39.2	$537,319	30.2	1	64	14
BILOXI	MS	326,063	7.7	965,380	7.9	3	12	12
BON SECOUR	AL	95,459	5.7	$346,997	5.6	4	18	15
BOOTHVILLE	LA	290,519	14.6	$690,963	16.3	1	34	34
BROWNSVILLE	TX	429,824	5.8	$1,477,794	5.6	1	65	63
BURAS	LA	183	4.9	$162	2.2	1	1	0
CAMERON	LA	81,602	9.2	$114,706	8.5	7	40	18
CHAUVIN	LA	222,929	3.2	$309,044	2.5	2	22	14
CODEN	AL	1,644	.7	$7,858	.9	2	3	2
CUT OFF	LA	231,728	9.2	$468,502	7.0	2	34	26
DAUPHIN ISLAND	AL	3,983	10.4	$12,801	.9	1	4	2
DELCAMBRE	LA	66,580	3.5	$126,571	3.9	4	19	17
DULAC	LA	396,436	3.8	$853,798	3.6	5	74	54
EMPIRE	LA	467,542	16.9	$679,966	14.5	5	102	27
ERATH	LA	169	4.1	$393	3.5	1	1	1
FREEPORT	TX	117,336	5.7	$301,016	4.8	2	31	31
GALVESTON	TX	59,221	3.9	$193,328	4.1	2	7	6
GOLDEN MEADOW	LA	412,272	7.1	$910,995	7.0	4	40	33
GRAND ISLE	LA	18,857	0.3	$37,111	0.4	2	6	4
GULF SHORES	AL	56	.3	$99	.2	1	1	1
HACKBERRY	LA	8,078	1.2	$14,170	1.7	1	5	2
IRVINGTON	AL	6,392	1.8	$15,084	1.5	1	2	2
LAFITTE	LA	39,452	0.8	$83,307	0.9	3	18	7
LAKE ARTHUR	LA	634	5.5	$2,037	4.9	1	1	0
LOCKPORT	LA	58,353	5.5	$113,443	5.2	1	4	3
MATAGORDA	TX	1,069	1.9	$4,811	2.4	1	1	1
MONTEGUT	LA	1,367	0.1	$3,278	0.1	1	4	1
NEW ORLEANS	LA	8,236	3.8	$26,452	5.7	1	1	1
PALACIOS	TX	722,320	8.2	$2,601,231	9.2	7	69	68
PASCAGOULA	MS	5,372	3.0	$16,409	3.9	2	3	3
PENSACOLA	FL	12,904	15.8	$46,892	20.6	1	1	1
PORT ARTHUR	TX	762,101	7.4	$1,778,875	5.2	5	104	98
PORT BOLIVAR	TX	32,339	0.9	$78,463	0.7	2	6	6
PORT ISABEL	TX	240,665	5.5	$867,755	5.4	5	39	39
SULPHUR	LA	191	6.6	$388	12.1	1	1	0
THEODORE	AL	362	.1	$993	.1	1	1	0
THERIOT	LA	516	0.0	$1,038	0.0	1	1	0
VENICE	LA	3,575	0.1	$4,222	0.1	1	1	1

Table 6.5.7.3.3. Community Impacts Under October – November Closure

City	State	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Percentage of Shrimp Revenue Lost	Number of Impacted Dealers	Number of Impacted Vessels	Number of Qualifying Vessels Impacted
ABBEVILLE	LA	64,639	0.9	$207,080	1.1	3	15	11
BAYOU LA BATRE	AL	316,409	4.4	$995,142	4.5	6	32	29
BILOXI	MS	343,002	8.1	$1,137,964	9.3	1	11	11
BON SECOUR	AL	34,363	2.1	$133,265	2.1	3	5	5
BOOTHVILLE	LA	11,318	0.6	$23,531	0.6	1	2	2
BROWNSVILLE	TX	743,978	10.1	$2,647,774	10.1	1	82	77
CAMERON	LA	130	0.0	$600	0.0	1	1	0
CHAUVIN	LA	5,069	0.1	$11,088	0.1	1	5	3
CODEN	AL	5,065	2.0	$24,960	2.9	1	1	1
CRYSTAL BEACH	TX	24,101	11.5	$69,512	12.0	1	5	4
CUT OFF	LA	49,251	2.0	$139,181	2.1	1	9	8
DELCAMBRE	LA	3,121	0.2	$5,350	0.2	1	3	1
DULAC	LA	98,478	0.9	$276,457	1.2	5	29	23
FREEPORT	TX	462,814	22.6	$1,451,480	23.1	2	51	50
FT MYERS BEACH	FL	52,613	1.6	$229,264	2.0	3	12	12
GALVESTON	TX	47,380	3.1	$139,292	3.0	1	6	6
GOLDEN MEADOW	LA	38,655	0.7	$100,829	0.8	2	10	6
IRVINGTON	AL	16,017	4.5	36,415	3.6	1	2	2
JENNINGS	LA	669	14.7	$1,547	15.5	1	1	0
KEY WEST	FL	447	0.0	$1,654	0.0	1	1	1
LAFITTE	LA	24,249	0.5	$58,892	0.6	3	12	6
LOCKPORT	LA	26,519	2.5	$65,443	3.0	1	7	6
LOXLEY	AL	1,284	30.0	$4,963	28.5	1	1	1
MOBILE	AL	195	.4	$390	.3	1	1	0
ORANGE BEACH	AL	244	6.9	$1,072	6.7	1	1	1
PALACIOS	TX	1,981,120	22.6	$6,363,197	22.5	6	110	108
PORT ARTHUR	TX	110,359	1.1	$434,691	1.3	2	12	11
PORT BOLIVAR	TX	77,121	2.1	$217,136	2.0	1	10	10
PORT ISABEL	TX	392,759	9.0	$1,407,002	8.8	4	54	54
PORT LAVACA	TX	30,055	8.0	$104,004	13.1	2	3	3

Indirect Impacts on Processors

Potential indirect impacts on processors under the three closure alternatives are the most difficult to assess from available secondary data sources. The reason for this difficulty is that, while current data collection programs indicate which dealers purchase shrimp from particular vessels, they do not track the shipping patterns of domestically harvested shrimp after the initial point of purchase.[31] Potential impacts on specific processors based on their geographic location can probably be made as well, but these are specifically discussed within the community impacts assessment in Section 5.6.3. Nonetheless, some general conclusions can be made based on the assessment of potential impacts on dealers and communities, since processors have direct links to dealers and are commonly an important component of communities with ties to the Gulf shrimp industry.

Three points previously made in Section 3.5 are relevant to a general assessment of the potential impacts on processors. First, some dealers also operate as processors. As such, at least to some extent, the pattern of impacts on dealers will reflect the pattern of impacts on processors. Second, the economic viability of shrimp processors is generally dependent on the volume of shrimp processed. As previously discussed, this is even more true today than in the past as processors have become fewer in number but larger in size (i.e. volume per firm) out of economic necessity. Therefore, reductions in the volume of shrimp, absolutely and relatively, constitute the most important source of adverse economic impacts on the processing sector. Third, and related, contrary to the situation a decade or so ago, the remaining shrimp processors are fairly dependent on domestically harvested shrimp and, for various economic reasons, imported shrimp are becoming a less viable substitute. Thus, all potential losses imposed on the harvesting and dealer sectors are assumed to be experienced in the processing sector as well.

Based on these facts, and given the impact assessments on vessels, dealers, and communities, it is concluded that **Alternative 3** would most likely generate the least adverse economic impacts on the processing sector. Although the situation is not as clear when comparing impacts under **Alternatives 2 and 4**, it is also concluded that the potential economic impacts on the processing sector are at least slightly greater under **Preferred Alternative 2** than **Alternative 4**. Based on 2004 production statistics, the losses in shrimp production to the processing sector would range from approximately 1 percent under **Alternative 3** to nearly 3 percent under **Preferred Alternative 2**. Given the reduction in landings that occurred in the harvesting sector in 2005, these percentages are probably slightly higher in current terms. The latter may constitute a reduction of sufficient magnitude to cause additional contraction in the processing sector.

6.5.7.4 General Conclusions Regarding Action 7

If no bycatch reduction target for juvenile red snapper mortality is specified (Alternative 1) or the 50 percent bycatch reduction target in juvenile red snapper mortality is considered sufficient **(Preferred Alternative 2)** and either is selected as the preferred alternative under Action 6, then Alternative 1 under Action 7, the no action alternative, would generate the greatest net economic benefit to the nation. The economic analysis of potential impacts on the harvesting sector and

[31] An exception to this statement is when the dealer is also a processor, in which case links between impacted vessels and particular processors can be established. However, this situation is the exception rather than the norm which precludes a complete assessment of the relationships between particular vessels and processors.

potential indirect impacts on dealers, processors, and communities indicate that, of the three time/area closure alternatives considered under Action 7, **Alternative 3** (January through April closure in the 10 to 30-fathom zone within statistical areas 10-21) would generate the least adverse economic impacts on the Gulf shrimp industry and thus is presumed to create the highest net economic benefit to the nation assuming that a 74 percent reduction in juvenile red snapper mortality is determined to be necessary and is thus the bycatch reduction target selected under **Action 6**. A determination of whether **Preferred Alternative 2** (May 15 to July 15 closure in the 10 to 30-fathom zone of statistical areas 10-17) or **Alternative 4** (October through November closure in the 10 to 30-fathom zone within statistical areas 10-21) creates the largest adverse economic impacts on the Gulf shrimp industry and thus the highest net economic benefit to the nation is less clear, again given the specification of the bycatch reduction target noted above. However, because all offshore waters from Texas are closed during the time specified for closure under **Preferred Alternative 2**, and those waters are open under **Alternative 4**, vessels operating in the northern and western Gulf of Mexico have a relatively greater ability to mitigate the adverse economic impacts under **Alternative 4** compared to **Preferred Alternative 2**.

Moreover, a key finding in the analysis is that **Preferred Alternative 2** would most likely impact more entities than **Alternative 4**. And, in both cases, the potential magnitude of these impacts is sufficiently large to force some entities to leave the industry, particularly in the harvesting sector, but also in the dealer sector and possibly the processing sector as well. Therefore, it is likely that the greatest number of entities would be forced to leave the industry under **Preferred Alternative 2**. Under all three alternatives, any losses in revenue would generate multiplier effects, both in terms of output/income and employment, throughout the local, regional, and national economies. Although a single multiplier is generally applied to such revenue reductions to determine the overall impacts on output/income and employment, and the revenue reductions under **Preferred Alternatives 2 and Alternative 4** within the harvesting sector are basically equivalent, potential impacts are highly dependent on the extent to which firms within and linked to the harvesting sector are not just forced to reduce their level of operations, but to cease operations. Given the likelihood that **Preferred Alternative 2** would potentially cause more firms to exit the Gulf shrimp industry than **Alternative 4**, the bulk of the evidence suggests that **Preferred Alternative 2** would potentially generate the greatest adverse economic impacts to the Gulf shrimp industry and thus the least net economic benefits to the nation.

6.5.8 Action 8: Framework procedure to adjust shrimp fishing effort in the northern and western Gulf of Mexico

Alternative 1 would maintain the status quo. This alternative would not establish a framework procedure to adjust shrimp fishing effort in the northern and western Gulf of Mexico, and would therefore be the preferred alternative if **Alternative 1** is selected under **Actions 6 and 7**. Since the action of establishing a framework procedure is basically administrative in nature, this alternative would not generate any direct, adverse economic impacts on the Gulf shrimp industry. This action's primary purpose is to improve NMFS' and GMFMC's flexibility with respect to adjusting remedial measures (i.e. **Alternatives 2, 3, or 4**) potentially implemented under **Action 7**. That is, less time would be needed to implement such adjustments. However, adjustments to those measures would work in favor of or against the Gulf shrimp industry depending on whether they spatially and/or temporally expand or scale back those restrictions. If the adjustments expand the restrictions, then the ability to make adjustments more readily would result in adverse, indirect impacts on the Gulf shrimp industry. Conversely, if the adjustments curb those restrictions, then the ability to make adjustments more readily would indirectly generate benefits for the Gulf shrimp industry. At this time, it is not possible to know with certainty whether the adjustments would enhance or curb those restrictions. However, if recent downward trends in effort continue, increasing the probability that restrictions potentially implemented under **Alternatives 2, 3, or 4** for **Action 7** would be scaled back in the future, then it is likely that this alternative would result in adverse, indirect impacts on the Gulf shrimp industry.

Preferred Alternative 2 would establish a framework procedure to adjust shrimp fishing effort in the northern and western Gulf of Mexico. Since the action of establishing a framework procedure is basically administrative in nature, this alternative would not generate any direct, adverse economic impacts on the Gulf shrimp industry. This action's primary purpose is to improve NMFS' flexibility with respect to adjusting remedial measures (i.e. **Alternatives 2, 3, or 4**) potentially implemented under **Action 7**. That is, less time would be needed to implement such adjustments. However, adjustments to those measures would work in favor of or against the Gulf shrimp industry depending on whether they spatially and/or temporally expand or scale back those restrictions. If the adjustments expand the restrictions, then the ability to make adjustments more readily would result in adverse, indirect impacts on the Gulf shrimp industry. Conversely, if the adjustments curb those restrictions, then the ability to make adjustments more readily would indirectly generate positive benefits to the Gulf shrimp industry. At this time, it is not possible to know with certainty whether the adjustments would enhance or curb those restrictions. However, if recent downward trends in effort continue, increasing the probability that restrictions potentially implemented under **Alternatives 2, 3, or 4** for **Action 7** would be scaled back in the future, then it is likely that this alternative would indirectly generate benefits to the Gulf shrimp industry.

Three options are being considered under **Preferred Alternative 2**. Under **Option a or Option b**, SEFSC would conduct analyses of effort in Statistical Sub areas 10-21 and develop an annual report of effort and bycatch mortality relative to the benchmark (74 percent reduction). With Option a, the report would be provided to the Council for its review and consideration of regulatory actions to implement a closure conforming with the guidelines established by Action 7, if needed, in the following year. **Option b** would assign authority to the RA of the SERO, NMFS to determine the area and duration of a closure, if needed, for the coming year within the guidelines established by Action 7. Under **Option c**, the Council would appoint a Shrimp Effort Assessment Team (SEAT) of scientists that would review the SEFSC's analyses of effort and develop a report to the Council. The Council in turn would review the SEAT report and determine the need for and the location/duration of any closure in conformance with the guidelines established by Action 7. If a closure is determined to be needed, **Option a** would provide the most expedient means of implementation in that the SEFSC's report would be submitted to the RA who in turn would implement the closure through a similar procedure as has been used to implement the Texas Closure in the past. **Option c** would provide the least expedient means of implementing a closure in that the SEFSC's report would have to be reviewed by the SEAT and then the Council before regulatory action could be initiated**. Option b** would provide a middle of the road approach with regard to the expediency of implementing a closure. However, none of these options are expected to result in any additional direct or indirect economic impacts to the Gulf shrimp industry outside of those already discussed.

6.6 Private and Public Costs

The preparation, implementation, enforcement, and monitoring of this or any federal action involves the expenditure of public and private resources that can be expressed as costs associated with the regulations. Due to its administrative nature, direct costs are not associated with this action. Costs associated with this specific action will include:

Council costs of document preparation, meetings, and information dissemination	$175,000
NMFS administrative costs of document preparation, Meetings and review	$100,000
Law enforcement costs	$0
TOTAL	$275,000

The Council and Federal costs of document preparation are based on staff time, travel, printing, and any other relevant items where funds were expended directly for this specific action. There are no permit requirements proposed in this amendment. To the extent that there are no quota closures proposed in this amendment or other regulatory measures, no additional enforcement activity is anticipated. In addition, under a fixed budget, any additional enforcement activity due to the adoption of this amendment would mean a redirection of resources to enforce the new measures.

6.7 Determination of a Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in a rule that may: (1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of the recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in E.O. 12866.

The measures considered in this proposed action are intended to address SEDAR 7 (2005) assessment recommendations to further reduce directed and bycatch fishing mortality rates on the red snapper stock. Consistent with the Court Opinion issued on March 12, 2007, reductions in red snapper fishing mortality rates that would result from this joint amendment are designed to improve the likelihood of success of the red snapper rebuilding plan.

In the commercial red snapper sector, direct short term adverse economic impacts are expected to result from the proposed reduction in TAC and associated commercial red snapper quota.

Minor positive economic impacts are expected to accrue to the proposed reduction in the commercial red snapper minimum size limit. In the recreational red snapper sector, direct short term adverse economic impacts are expected to result from the proposed TAC reduction and associated quota reduction, bag limit, size limit, and, season length adjustments. Lessening the severity of recreational sector harvest restrictions as a result of assumed storm-induced effort reductions may reduce the short term adverse economic impacts of quota reduction, but may lead to more severe longer term harvest restrictions with increased adverse economic impacts if conservation goals are not met. The proposed elimination of the captain and crew red snapper bag limit may result in minor direct adverse economic impacts to the affected individuals, but is expected to result in a net gain in economic benefits to the fishery sector by extending the open fishing season. Minor short term adverse economic impacts are expected to accrue to the proposed commercial red snapper gear restrictions. However, the resultant reduction in bycatch mortality is expected to aid recovery of the resource, with accompanying increased economic benefits to the fishery. Although future fishery evaluation subject to the proposed shrimp fishery bycatch mortality reduction benchmark may precipitate action that results in direct adverse economic impacts on the commercial shrimp sector, the proposed actions associated with the commercial shrimp fishery are administrative in nature and would not be expected to result in any direct adverse economic impacts. Quantitative analyses of the expected impacts of the various proposed alternatives are described within the RIR and Environmental Consequences sections of this amendment. In summary, the estimated maximum cumulative economic impact of these measures is well under the $100 million threshold. Therefore, the proposed action would not be expected to substantially impact the economy, a sector of the economy, productivity, competition or jobs.

Measures in this action do not adversely affect the environment, public health or safety, or state, local, or tribal governments or communities. Additionally, they do not interfere or create inconsistencies with any action of another agency, including state fishing agencies.

No effects on the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof have been identified. Measures in the proposed Amendment represent normal management options or practices and, therefore, do not raise novel legal or policy issues.

Since the proposed action will not meet any of the significance conditions listed above, it is determined that the proposed action, if implemented, would not constitute a "significant regulatory action."

7.0 REGULATORY FLEXIBILITY ACT ANALYSIS

7.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct an Initial Regulatory Flexibility Analysis (IRFA) for each proposed rule. The IRFA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. An IRFA is conducted to primarily determine whether the preferred alternative would have a "significant economic impact on a substantial number of small entities." In addition to analyses conducted for the RIR, the IRFA provides: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for, the preferred alternative; (3) a description and, where feasible, an estimate of the number of small entities to which the preferred alternative will apply; (4) a description of the projected reporting, record-keeping, and other compliance requirements of the preferred alternative, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and (5) an identification, to the extent practicable, of all relevant Federal rules, which may duplicate, overlap, or conflict with the preferred alternative; and (6) a description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.

In addition to the information provided in this section, additional information on the expected economic impacts of the proposed action are included in Sections 5.0 and 6.0 and is included herein by reference.

7.2 Description of the Reasons Why Action by the Agency is Being Considered

The purpose and need for the actions recommended in this joint amendment are set forth in Section 1.2. In general, problems and issues include the overfished condition of the red snapper stock, the unsustainable red snapper mortality imputed to the directed fishery, and, the sizeable incidental take of juvenile red snapper attributed to the shrimp fishery. This joint amendment aims to address SEDAR 7 (2005) assessment recommendations to further reduce directed and bycatch fishing mortality rates on the red snapper stock. Consistent with the Court Opinion issued on March 12, 2007, reductions in red snapper fishing mortality rates that would result from this joint amendment are also designed to improve the likelihood of success of the red snapper rebuilding plan.

7.3 Statement of the Objectives of, and Legal Basis for, the Proposed Rule

The specific objectives of the proposed actions are found in Section 1.2 of this document, and this section is incorporated here by reference. The objectives are basically the same as the purpose as stated above, and the legal basis for the rule is the M-SFCMA, particularly Sections 303 (a)(3) and 303 (a)(10), as well as regulations under 50 CFR 600.310.

7.4 Description and Estimate of the Number of Small Entities to which the Proposed Rule Will Apply

This proposed action is expected to impact several types of entities, including red snapper commercial fishers and for-hire operators, and reef fish dealers and processors participating in the red snapper trade. Additional entities are encompassed within the scope of the action, specifically shrimp fishermen, and associated dealers and processors, but while certain actions apply to the shrimp sector, the proposed alternatives would not result in direct impacts to the shrimp sector. Nevertheless, these shrimp sector entities will be included in the following discussion.

The SBA has established size criteria for all major industry sectors in the U.S. including fish harvesters, for-hire operations, fish processors, and fish dealers. A business involved in fish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $4.0 million (NAICS code 114111, finfish fishing) for all its affiliated operations worldwide. For for-hire vessels, the other qualifiers apply and the annual receipts threshold is $6.5 million (NAICS code 713990, recreational industries). For seafood processor and dealers, the SBA uses an employee threshold rather than a receipts threshold, or 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide for a seafood processor and 100 or fewer persons for a seafood dealer.

Prior to the January 2007 implementation of the red snapper individual fishing quota program (IFQ) , 136 entities held Class 1 licenses that allowed a commercial vessel trip limit of up to 2,000 pounds of red snapper and 628 entities held Class 2 licenses that allowed a trip limit of up to 200 pounds of red snapper. Between 2002 and 2004, the top 50 red snapper vessels in terms of landings harvested 2.77 mp of red snapper, on average, or 64 percent of the industry total (Waters 2006). Vessels ranked 51 to 131 harvested 1.29 mp, on average, or 30 percent of the industry total for the same period. In total, the top 131 red snapper vessels accounted for approximately 94 percent of the total industry red snapper landings. Red snapper are mainly harvested by fishermen using vertical-line gear. These fishermen accounted for approximately 90 percent of commercial red snapper Gulf harvests, on average, between 2002 and 2004. Additional details on landings, revenues, and effort are provided in Section 3.5 and in Waters (2006) and are incorporated herein by reference.

Routine collection of cost and earnings data for Gulf commercial finfish vessels has only recently been initiated (mid-2005) and is not currently available. Operating costs for the commercial red snapper fishery must, therefore, be derived from a general survey of reef fish vessels conducted in 1994 (Waters 1996). Average annual gross receipts (2004 dollars) and net income per vessel derived from this survey are as follows:

	Gross Income	Net Income
High-volume vessels, vertical lines:		
Northern Gulf:	$110,070	$28,466
Eastern Gulf:	$ 67,979	$23,822
Low-volume vessels, vertical lines:		
Northern Gulf:	$ 24,095	$ 6,801
Eastern Gulf:	$ 24,588	$ 4,479
High-volume vessels, bottom longlines:		
Both areas:	$116,989	$25,452
Low-volume vessels, bottom longlines:		
Both areas:	$ 87,635	$14,978
High-volume vessels, fish traps:	$ 93,426	$19,409
Low-volume vessels, fish traps:	$ 86,039	$21,025

Some fleet activity is known to exist in the commercial red snapper fishery and in the commercial finfish fisheries in general, but the extent of such activity is unknown. The maximum number of reef fish permits reported owned by the same person/entity is 6 permits. Additional permits (and the revenues associated with those permits) may be linked to an entity through affiliation rules, but such affiliation links cannot be made using existing data. Further, a definitive determination of whether any commercial entities would be considered large entities cannot be made using average income information. However, based on the size and value of the commercial red snapper fishery (an average of 4.336 million pounds and $11.652 million ex-vessel revenue per year, 2002-2004), the number of participants in the fishery (136 Class 1 licenses and 628 Class 2 licenses), the summary statistics provided above, and the permit data showing the maximum number of permits a person/entity owns, it is determined, for the purpose of this assessment, that all commercial reef fish harvest entities that would be affected by this action are small entities.

The current fleet permitted to operate in the Gulf reef fish for hire sector is estimated to be 1,625 vessels. Fleet behavior also exists in this sector, with at least one entity reported to hold 12 permits. The bulk of the fleet, however, consists of single permit operations.

The for-hire fleet is comprised of charterboats, which charge a fee on a vessel basis, and headboats, which charge a fee on an individual angler (head) basis. The average charterboat is estimated to generate $76,960 in annual revenues and $36,758 in annual profits, whereas the appropriate values for the average headboat are $404,172 and $338,209, respectively (Holland et al. 1999; Sutton et al. 1999). It should be noted that the calculation of costs does not include fixed and other non-operating expenses, which tend to be higher for headboats. On average, both charterboats and headboats operate at about 50 percent of their passenger capacity per trip.

Based on the average revenue figures, it is determined, for the purpose of this assessment, that all for-hire operations that would be affected by this action are small entities.

The measures in this action would also be expected to affect fish dealers, particularly those that receive red snapper from harvesting vessels. A federal permit is required for a fish dealer to receive reef fish from commercial vessels and there are 227 dealers currently permitted to buy and sell reef fish species. All reef fish processors would be included in this total since all processors must be dealers. Based on mail address data, most of these dealers are located in Florida (146), with 29 in Louisiana, 18 in Texas, 14 in Alabama, 5 in Mississippi, and 15 dealers are located outside the Gulf states. In addition, as part of the commercial reef fish logbook program, reporting vessels identify the dealers who receive fish landed by these vessels. Commercial reef fish vessels with federal permits are required to sell their harvest only to permitted dealers. Based on vessel logbook records for 1997-2002, there were, on average, 154 reef fish dealers actively buying and selling red snapper. These dealers were distributed around the Gulf as follows: 7 in Alabama, 96 in Florida, 22 in Louisiana, 7 in Mississippi, and 22 in Texas. Florida dealers purchased, on average, approximately $1.8 million (ex-vessel value) of red snapper, followed by Louisiana ($1.4 million), Texas ($1.3 million), Mississippi ($174,000), and Alabama ($88,000). These dealers may hold permits for multiple fisheries and it is not possible to determine what percentage of their total business comes from red snapper fishery.

Average employment information per reef fish dealer is unknown. Although dealers and processors are not synonymous entities, Keithly and Martin (1997), reported total employment for reef fish processors in the Southeast at approximately 700 individuals, both part and full time. While all processors must be dealers, a dealer need not be a processor. Further, processing is a much more labor-intensive exercise than dealing. Therefore, given the employment estimate for the processing sector (700 persons) and the total number of dealers operating in the red snapper fishery (154), it is assumed that the average number of employees per dealer and processor would be unlikely to surpass the SBA employment benchmark and, for the purpose of this analysis, it is determined that all dealers that would be affected by this action are small entities.

Although it is unknown how many eligible shrimp permit holders will apply for moratorium permits and, thus, would be potentially affected by this action, 2,666 vessels would qualify for the shrimp permit and are assumed to constitute the potential affected universe of shrimp vessels. The average annual gross revenue (all harvest species) per qualifying vessel in 2005 was approximately $116,000, while the comparable figure for active qualifying vessel is approximately $152,000. In the same year, the maximum annual gross revenue from shrimp by a vessel was approximately $757,000 for both all qualifying and active qualifying vessels, whereas the figure for all harvest species was approximately $1.89 million by an inactive qualifier and $757,000 for an active qualifier, indicating the inactive qualifier found activity in other fisheries more lucrative, and the most active qualifier operated exclusively in the shrimp fishery. It should be noted that while performance differences exist, and are described in Sections 3.5.1.2.1 and 3.5.1.2.2, these differences will not affect the assessment of maximum performance and subsequent determination of whether vessels constitute large or small entities. As with the other sectors, fleet activity is known to exist in the commercial shrimp fishery, but the magnitude of such cannot be determined. Given these findings, for the purpose of this analysis, it is determined that all shrimp vessels that would be affected by this action are small entities.

In 2005, 609 dealers were identified operating in the commercial shrimp fishery. Employment information for this sector is not available. In 2004, 60 processors in the shrimp fishery were identified, employing approximately 3,400 persons, or an average of 56 employees per entity. Similar to the finfish sector, shrimp processing is more labor intensive than dealing, so average employment in the shrimp dealer sector is assumed to be less than that in the processing sector. Since the average employment per entity does not exceed the SBA threshold, it is determined, for this analysis, that all shrimp dealers and processors that could be affected by this action are small entities.

While updated cost information is not available, the most recent projection of performance in the commercial shrimp fishery indicated that the average vessel, across all size categories, experienced a -33% rate of return and that economic losses would continue until 2012. Thus, almost any but the most minor additional financial burden would be expected to generate a significant adverse impact on affected vessels and potentially hasten additional exit from the fishery.

7.5 Description of the Projected Reporting, Record-Keeping and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities which will be Subject to the Requirement and the Type of Professional Skills Necessary for the Preparation of the Report or Records

Management measures considered in this joint amendment do not affect the reporting or record-keeping requirements for shrimp vessels or commercial and recreational red snapper fishermen. This proposed action does not require additional records or report preparation.

7.6 Identification of All Relevant Federal Rules which May Duplicate, Overlap or Conflict with the Proposed Rule

No duplicative, overlapping, or conflicting Federal rules have been identified. Section 8.0 discusses AOther Applicable Law@, but none are considered to be duplicative, overlapping, or in conflict with those that would implement the proposed regulations.

7.7 Substantial Number of Small Entities Criterion

Management measures considered in this joint amendment are expected to affect all vessels that operate in the commercial red snapper fishery, all vessels that have a Federal reef fish for-hire permit, and all dealers and processors that handle product from these fisheries. Although this proposed action contains an action that pertains to the commercial shrimp fishery, the action is not expected to impose any direct adverse impact on the fishery or associated entities. All affected entities have been determined, for the purpose of this analysis, to be small entities. Therefore, it is determined that the proposed action will affect a substantial number of small entities.

7.8 Significant Economic Impact Criterion

The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities? All individual and entities affected by the proposed action are small entities. Hence, the issue of disproportionality does not apply in this case.

Profitability: Do the regulations significantly reduce profit for a substantial number of small entities?

Several alternatives included in this joint amendment would, if implemented, affect the profitability of small entities. Management measures that would result in sizeable impacts on the profitability of affected small entities include reductions in total allowable catch, associated recreational season length, minimum size and bag limit adjustments, and, commercial size limit adjustments. Gear modification measures and for-hire captain and crew bag limit adjustments are expected to only result in marginal effects on the profitability of small entities.

Red snapper TAC reductions (**Action 1**), which would be translated into recreational and commercial quota decreases, are expected to reduce profits in the for-hire and commercial sectors. In the for-hire sector, declines in profits, approximated by net revenue decreases, are due to effort reductions associated with management scenarios consistent with a 7.0 MP, 5.0 MP, or 3.0 MP TAC (corresponding to a 3.43 MP, 2.45 MP, or 1.47 MP recreational quotas, respectively). Expected reductions in red snapper target effort are larger than the increases in effort targeting other fish species. Therefore, net effort changes associated with proposed management measures are negative. In the charter boat sector, estimated declines in net revenues, hence in profitability, range from zero for the status quo alternative to about $0.87 million under the most onerous management scenario with a 3.0 million pound TAC (Sub-option 4(d)). For the headboat sector, maximum net revenue losses are estimated at 1.2 million (Sub-option 4(a)(ii)). Under the proposed 5.0 million pound TAC (Preferred sub-option 3(a)(i)), estimated annual net revenue losses to the for-hire sector approximate $1.1 million. Due to difference in activity levels between vessels participating in the red snapper for-hire fishery, it not possible to accurately estimate the extent to which individual for-hire operations will be affected by the proposed TAC reduction. However, a simple average suggests that, for the 1,625 vessels active in the for-hire sector, average annual net revenue loss would approximate $680 per vessel. This simple arithmetic mean does not provide information on losses that may be incurred by a specific for-hire operation. It is expected that, depending on the geographic location of their operation, level of activity, reliance on red snapper trips, reduced diversity of species available, and, preferences of their core clientele, some vessels would be impacted more than others. Quantifying the number of vessels that might face greater economic losses is not possible with available data. Obviously, the fewer the number of vessels included in this core, the greater the average impact per vessel. As a proxy, if expected economic impacts were borne by a group including 10 to 25 percent of the fleet, average losses in net revenues per vessel would be expected to range from approximately $2,700 to $6,800.

For the commercial red snapper sector, TACs of 7.0, 5.0, and 3.0 million pounds correspond to commercial quotas of 3.57 mp, 2.55 mp, and, 1.53 mp, respectively. Estimated changes in profits, as measured by changes in net returns to owners, captain and crew members result from revenue losses associated with lower snapper harvests. Net revenues losses due to commercial quota reductions would be mitigated by the implementation of measures lowering or eliminating the commercial size limit **(Action 4)**. Under a 7.0 mp TAC, estimated net revenue losses in the commercial red snapper sector are estimated at $6 million, approximately. If TAC were further lowered to 5.0 mp, resulting losses in net returns to owners, captain and crew in the commercial sector would be in excess of $11 million. Under a 3.0 mp TAC, net revenue losses of $17.4 million are expected. Losses in net revenues to owners, captain and crew were estimated assuming that the commercial red snapper fishery was operating under an individual fishing program (IFQ). It was further assumed that the commercial red snapper fleet was composed of homogeneous vessels. Under the status quo, i.e., a 9.12 MP TAC, for the smallest (35 ft) and largest (65 ft) vessel length considered, the fleet would include 95 and 39 vessels, respectively. For the 35ft and 65 ft vessel categories, average annual net revenue per vessel was estimated at $274,000 and $667,000, respectively. Annual net revenue losses anticipated from the proposed TAC of 5.0 MP are estimated at $11.5 million, approximately. For the 35ft and 65 ft vessel classes, average short term losses per vessel are estimated at $182,000 and $443,000, respectively. It is worth noting that, in the long run, the implementation of the IFQ program is expected to foster the consolidation of the fleet, thereby substantially improving revenues of remaining vessels. It is estimated that, under a 5.0 MP TAC, the fleet would be composed of 22 65-foot or 52 35-foot vessels. Corresponding average net revenues per vessel were estimated at $278,000 and $665,000, respectively.

TAC reductions considered in this joint amendment are also expected to adversely impact dealers and processors involved in the red snapper trade. Although substantial decreases in revenues collected from domestic red snapper are anticipated, the lack of firm-level economic data, e.g., gross revenues and profit data, precludes from quantifying the expected losses. In addition, to mitigate the adverse economic impacts that would result from the proposed 45 percent decrease in TAC, dealers and processors may increase their reliance on imported snapper and their use of other reef fish species as substitutes.

Preventing captain and crew from retaining a red snapper bag limit while on charter **(Action 3)** is not expected to affect the profitability of for-hire operations because the sale of recreational reef fish landings is already prohibited. Gear-related measures considered under **Action 5** are expected to result in marginal impacts on the profitability of small entities. Reasons for their limited effect on profits include the widespread current use of circle hooks, their competitive pricing, and the availability of affordable instruments recommended for proper catch and release (dehooking devices and venting tools).

7.9 Description of Significant Alternatives to the Proposed Rule and Discussion of how the Alternatives Attempt to Minimize Economic Impacts on Small Businesses

Four alternatives, including the status quo, were considered for the action to set TAC in the red snapper fishery. Three of the alternatives include multiple options and sub-options to manage the recreational fishery under the respective TACs. The first alternative, the status quo, would not be consistent with assumptions related to expected reductions in directed and bycatch mortality rates and would not, as indicated by the March 12, 2007 Court Opinion, be associated with a sufficient, i.e., more than 50 percent, probability of success of the red snapper rebuilding plan. The status quo alternative, if implemented, would result in drastic reductions in subsequent years to allow the resource to continue on the designated recovery path.

The second alternative to the proposed TAC would have reduced the red snapper TAC to 7.0 MP. This alternative has the potential of generating, depending upon the sub-option selected, lower short term adverse economic impacts than the proposed 5.0 MP TAC. However, a 7.0 MP TAC is neither consistent with the current mortality reduction assumptions nor is it in accordance with the findings of the recent Court Opinion. As the status quo, this alternative would require greater TAC reduction in subsequent years, with greater adverse economic impacts than the proposed action.

The third alternative to the proposed TAC would have reduced the red snapper TAC to 3.0 MP. This alternative would have reduced the TAC greater than necessary to end overfishing and would be expected to result in an overly restrictive management approach and unwarranted additional adverse economic impacts.

Three alternatives, including the status quo, were considered for the action addressing post-hurricane effort reduction. Although consistent with a precautionary approach to management, the status quo which is the first alternative to the proposed action, could potentially establish stricter than required management measures thereby unnecessarily limiting short term economic benefits. A 10 percent reduction in post hurricane effort and landings in the red snapper fishery, which would be assumed under the proposed action, would potentially yield additional short term benefits without resulting in adverse long term economic impacts if expected effort declines occur. The likelihood of observing anticipated effort declines is enhanced by recent upward trends in fuel prices and overall adverse economic conditions in the fishery. The second alternative to the proposed action would assume a 25 percent reduction in post hurricane effort. This alternative, which would result in sizeable short term economic benefits due to an extended fishing season, is expected to jeopardize red snapper rebuilding and to result in substantial long term negative economic impacts.

Two alternatives, including the status quo, were considered for the captain and crew bag limit action. The first alternative, the status quo, would be expected to decrease the ability of meeting harvest reduction targets and would have required more restrictive measures on recreational anglers, increasing the adverse economic impacts on this sector. In the long run, this alternative would be expected to result in increased adverse impacts relative to the proposed action.

Three alternatives, including the status quo, were considered for the commercial red snapper minimum size limit. The first alternative to the proposed action, the status quo, would be expected to result in continued unnecessary bycatch mortality and would not, therefore, meet the Council's objectives. Establishing a 13-inch minimum size limit in the commercial sector, as would be accomplished by the proposed action, would be expected to result in increased economic benefits to the fishery and associated industries due to anticipated increases in operational efficiency of commercial vessels and to a potential price premium for smaller fish. The third alternative would eliminate the commercial minimum size limit. Since no commercial market is known to exist for red snapper smaller than 12 inches, economic impacts resulting from this alternative are expected to be comparable to those of the proposed action.

Three alternatives, including the status quo, were considered for the gear requirement action. The proposed action would require the use of non-stainless steel circle hooks when using natural baits, and require the use of venting tools and dehooking devices from all participants in the reef fish fisheries of the Gulf of Mexico. By reducing bycatch and bycatch mortality in the red snapper and reef fish fisheries, the proposed action would contribute to improving the likelihood of success of the red snapper rebuilding plan and is expected to result in long term economic benefits.

The first alternative to the proposed action would not impose any new gear requirements on fishermen and would not, in the short term, result in any direct adverse economic impacts. However, this alternative does not contribute to improving the likelihood of success of the red snapper rebuilding plan. Relative to the proposed action, this alternative could, in the long run, result in more severe restrictions on fishery participants, thus resulting in greater adverse economic impacts.

The second alternative to the proposed action would specify minimum hook size when participating in some EEZ fisheries. Compared to the proposed action, this alternative would be less effective in reducing bycatch and bycatch mortality. In the long run, it would be expected to be associated with smaller economic benefits than the proposed action.

Six alternatives, including the status quo, were considered for the bycatch reduction target in the commercial shrimp fishery. The status quo would not have established a bycatch reduction target, would not ensure consistent reductions in bycatch fishing mortality on juvenile red snapper in the shrimp fishery, and would not be consistent with SEDAR (2005) assessment recommendations to further reduce bycatch fishing mortality rates on the red snapper stock. The proposed action, which would establish a target reduction of shrimp trawl bycatch mortality on red snapper 74 percent less than the benchmark years of 2001-2003, is consistent with the TAC selected in Action 1 and with an increased probability of success of the red snapper rebuilding plan. The proposed action, which also clearly outlines the future progression of the bycatch mortality reduction target, would be an administrative action with no expected direct adverse economic effects.

The second and third alternatives to the proposed bycatch reduction target would establish lower reduction targets than the proposed action. As the proposed action, these alternatives are not expected to result in direct adverse economic impacts. However, the lower targets do not contribute to increasing the likelihood of success of the red snapper rebuilding plan and could be expected to require further effort reductions, resulting in more severe management measures in the long run. The fourth alternative to the proposed action would, as the proposed action, establish a 74 percent reduction in shrimp trawl bycatch mortality on red snapper. Similarly, the fifth alternative to the proposed action would establish a 74 percent reduction in shrimp trawl bycatch mortality on red snapper but would also explicitly link future adjustments to the bycatch reduction target to red snapper stock assessment updates.

Four alternatives, including the status quo, were considered for the action to establish fishing restrictions for the EEZ shrimp fishery in the Gulf of Mexico. The first alternative to the proposed action, the status quo, would not establish fishing restrictions for the Gulf shrimp fishery. The status quo would not result in direct adverse economic impacts because restrictions would not be imposed on the shrimp fishery. However, if status quo effort reductions in the fishery are not sufficient to achieve target goals, this alternative may result in more severe future restrictions, and hence potentially greater adverse economic impacts than the adoption of effort restrictions at this time.

The proposed action would, if necessary, establish a seasonal closure beginning on the same start date as the closure of the EEZ off Texas in the 10 to 30-fathom zone of selected areas within statistical zones 10-21 in the Gulf of Mexico. This measure, which would ensure that target reductions in shrimp trawl bycatch mortality are met, is consistent with the TAC selected in Action 1 and would contribute to increasing the likelihood of success of the red snapper rebuilding plan. The long term economic benefits associated with the proposed action are expected to outweigh the short term adverse economic impacts that would result from fishing effort restrictions.

The second and third alternatives to the proposed action would also establish warranted seasonal closures in the 10 to 30-fathom zone of selected areas within statistical zones 10-21 in the Gulf of Mexico but would consider alternative time frames for the closures. Compared to those expected from the proposed action, smaller long term economic benefits expected to result from these alternatives. Greater positive impacts associated with the proposed action are attributable to the specified starting date of a potential closure, which would coincide with the movement of age 1 snapper from shrimp grounds to larger structures.

Two alternatives, including the status quo, were considered for the action to establish a framework procedure to adjust effort in the commercial shrimp fishery. The second alternative would establish a framework procedure. The proposed action, which would allow the Regional Administrator to implement closures based upon annual shrimp effort assessments conducted by the SEFSC, is expected to be the quickest and hence the most efficient approach to establishing recommended closures. In addition to the proposed action, Alternative 2 includes two other options. These additional options would establish less expedient means of implementing recommended closures. Direct short-term or long-term adverse economic impacts would not be expected to result from alternatives included in this action because the establishment of a framework procedure to adjust effort in the commercial shrimp fishery is an administrative action.

8.0 OTHER APPLICABLE LAW

The Magnuson-Stevens Act (16 U.S.C. 1801 et seq.) provides the authority for U.S. fishery management. However, fishery management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems within which those fisheries are conducted. This EIS is an integrated document that combines analyses necessary for the NEPA, the RFA, and Executive Order 12866: Regulatory Planning and Review.

NEPA requires all federal actions, such as the formulation of fishery management plans, to be evaluated for potential environmental and human environment impacts, and for these impacts to be assessed and reported to the public. NEPA requires federal agencies to evaluate a range of alternatives. For this amendment, the Council conducted an EIS (see TOC for EIS), which includes: 1) A detailed written statement on the environmental impact(s) of the proposed action; 2) a description of adverse environmental effects that cannot be avoided; 3) alternatives to the proposed action, 4) the relationship between short-term uses of man's environment and the maintenance and enhancement of long term productivity, and 5) any irreversible or irretrievable commitments of resources should the proposed actions be implemented (Sec. 102 (2)(c) of the NEPA).

The Small Business Act, as amended, is administered by the SBA and requires NMFS to make an assessment of how regulations will affect small businesses. The RFA requires federal agencies to assess the impacts of regulatory actions implemented through notice and comment rulemaking procedures on small businesses, small organizations, and small governmental entities, with the goal of minimizing adverse impacts of burdensome regulations and record-keeping requirements on those entities. These analyses, which describe the type and number of small businesses affected, are provided in Section 9 and will be published in the *Federal Register* in full or in summary for public comment and submitted to the chief counsel for advocacy of the SBA.

To comply with E.O. 12866, NMFS prepares a RIR for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. These analyses can be found in Section 6 of this amendment.

Other major laws affecting federal fishery management decision-making are summarized below.

8.1 Administrative Procedures Act

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

8.2 Coastal Zone Management Act

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

The proposed changes in federal regulations regarding implementation of an IFQ program for the GOM red snapper fishery will make no changes in federal regulations that are inconsistent with the objectives of either existing or proposed state regulations. Consequently, NMFS has determined this plan amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi, and Texas to the maximum extent possible. This determination would be submitted to the responsible state agencies under Section 307 of the Coastal Zone Management Act administering approved Coastal Zone Management programs for these states.

8.3 Data Quality Act

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

Specifically, the Act directs the Office of Management and Budget (OMB) to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and disseminate agency-specific standards to: (1) Ensure information quality and develop a pre-dissemination review process; (2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and (3) report periodically to OMB on the number and nature of complaints received. Pursuant to Section 515 of Public Law 106-554, this information document will undergo a pre-dissemination review by the Southeast Regional Office, Sustainable Fisheries Division.

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

8.4 Endangered Species Act

The Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. Section 1531 et seq.) requires federal agencies use their authorities to conserve endangered and threatened species. They must ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of those species or the habitat designated as critical to their survival and recovery. The ESA requires NMFS, when proposing a fishery action that "may affect" critical habitat or endangered or threatened species, to consult with the appropriate administrative agency (itself for most marine species, the US Fish and Wildlife Service for all remaining species) to determine the potential impacts of the proposed action. Consultations are concluded informally when proposed actions "may affect but are not likely to adversely affect" endangered or threatened species or designated critical habitat. Formal consultations, including a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" endangered or threatened species or adversely modify designated critical habitat.

Biological opinions use the best available commercial and scientific data to evaluate the effects of a proposed action on threatened or endangered species. If a biological opinion finds the proposed action is not likely to jeopardize the continued existence of threatened or endangered species, an incidental take statement (ITS) is issued, specifying the impact, i.e., the amount or extent, of such incidental taking on threatened or endangered species. The ITS includes reasonable and prudent measures (RPM), which are non-discretionary actions, necessary to minimize the impact of incidental take. Terms and conditions are also included specifying requirements that implement the RPMs. If a biological opinion finds that the proposed action is likely to jeopardize the continued existence of threatened or endangered species, the consulting agency is required to suggest reasonable and prudent alternatives (RPA). RPAs are economically and technology feasible alternatives to the proposed action, that would allow that activity to occur, without jeopardizing threatened or endangered species.

A formal consultation for the GOM reef fish fishery was completed in 2005 and concluded the reef fish fishery 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 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. The Council addressed these measures in Reef Fish Amendment 18A. Other listed species in the GOM were determined not likely to be adversely affected.

Two biological opinions are in effect for the shrimp fishery. On December 2, 2002, NMFS completed a biological opinion on shrimp trawling in the southeastern United States, under proposed revisions to sea turtle conservation regulations at that time and as managed by the FMPs for shrimp in the South Atlantic and Gulf of Mexico on species listed under the ESA. The opinion concluded that the continued operation of shrimping in the Southeast is not likely to jeopardize the continued existence of any listed species. On January 13, 2006, NMFS completed a biological opinion on the continued authorization of shrimp trawling under the Gulf of Mexico Shrimp FMP and its effects on the smalltooth sawfish. NMFS listed the smalltooth sawfish as endangered on April 1, 2003. NMFS concluded that the continued is not likely to jeopardize the continued existence of smalltooth sawfish. Incidental take statements were issued for each fishery specifying the amount and extent of anticipated take, along with reasonable and prudent measures deemed necessary and appropriate to minimize the impact of the takes.

Reinitiation of a formal consultation is required if discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of the taking specified in the incidental take statement (ITS) is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). An analysis of all reinitiation triggers in 50 CFR 402.16 is in process and section 7 consultation will be reinitiated if determined necessary.

8.5 Executive Orders

8.5.1 E.O. 12630: Takings

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

8.5.2 E.O. 12866: Regulatory Planning and Review

Executive Order 12866: Regulatory Planning and Review, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a RIR for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society of proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the RFA. A regulation is significant if it a) has an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments and communities; b) creates a serious inconsistency or otherwise interfere with an action taken or planned by another agency; c) materially alters the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or d) raises novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order. Although this action will not meet the economic significance threshold of criteria (a), this action is determined to be a significant regulatory action due to the controversial issues associated with IFQs in general.

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

This Executive Order 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. Impacts of commercial and recreational fishing on subsistence fishing are a concern in fisheries management; however, there are no such implications from the action proposed in this amendment.

8.5.4 E.O. 12962: Recreational Fisheries

This Executive Order requires federal agencies, in cooperation with States and Tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of federally-funded, permitted, or authorized actions on aquatic systems and evaluating the effects of federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects. Additionally, it establishes a seven member National Recreational Fisheries Coordination Council responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among federal agencies involved in conserving or managing recreational fisheries. The Council also is responsible for developing, in cooperation with federal agencies, States and Tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda. Finally, the Order requires NMFS and the U.S. Fish and Wildlife Service to develop a joint agency policy for administering the ESA. There are no recreational fishing issues addressed by the actions in this amendment.

8.5.5 E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted by law, ensure actions that they authorize, fund or carry out do not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters). There are no implications to coral reefs by the actions proposed in this amendment.

Regulations are already in place to limit or reduce habitat impacts within the Flower Garden Banks National Marine Sanctuary. Additionally, NMFS approved and implemented Generic Amendment 3 for EFH, which established additional HAPCs and gear restrictions to protect corals throughout the Gulf.

8.5.6 E.O. 13132: Federalism

The Executive Order on Federalism requires agencies in formulating and implementing policies, to be guided by the fundamental Federalism principles. The Order serves to guarantee the division of governmental responsibilities between the national government and the states. Federalism is rooted in the belief issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people. This Order is relevant to FMPs and amendments given the overlapping authorities of NMFS, the States, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate state, tribes and local entities (international also). No Federalism issues have been identified relative to the proposed actions. Therefore, consultation with state officials under this Executive Order is not necessary.

8.5.7 E.O. 13158: Marine Protected Areas

This Executive Order requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area. There are several MPAs, HAPCs, and gear-restricted areas in the northeastern and northwestern GOM, where the commercial red snapper fishery occurs (see Section 3.3). Measures in this amendment do not have any area specific measures relative to MPAs or HAPCs, and so should not affect this habitat. Measures in Action 7 could close areas in the Gulf from shrimping if necessary for limited time periods. However, these are areas shrimping is currently allowed in.

8.6 Marine Mammal Protection Act

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

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

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction, development and implementation of take-reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries, and studies of pinniped-fishery interactions. Under section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery. The categorization of a fishery in the LOF determines whether participants in that fishery may be required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements.

The GOM reef fish and shrimp fisheries are both listed as a Category III fisheries as required by the MMPA (69 FR 40407, August 8, 2004). Regulations governing Category III fisheries are specified at 50 CFR 229.5.

8.7 Paperwork Reduction Act

The Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure that the public is not overburdened with information requests, that the federal government's information collection procedures are efficient, and that federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NMFS to obtain approval from the OMB before requesting most types of fishery information from the public. The proposed action would not change current requirements for collecting information.

8.8 Essential Fish Habitat

The amended Magnuson-Stevens Act included new EFH requirements, and as such, each existing, and any new, FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH. In 1999, a coalition of several environmental groups brought suit challenging the agency's approval of the EFH FMP amendments prepared by the Gulf of Mexico, Caribbean, New England, North Pacific, and Pacific Fishery Management Councils (American Oceans Campaign et al. v. Daley et al., Civil Action No. 99-982(GK)(D.D.C. September 14, 2000). The court found the agency's decisions on the EFH amendments were in accordance with the Magnuson-Stevens Act, but held that the EAs on the amendments were in violation of the NEPA and ordered NMFS to complete new, more thorough NEPA analyses for each EFH amendment in question.

Consequently, NMFS entered into a Joint Stipulation with the plaintiff environmental organizations that called for each affected Council to complete EISs rather than EAs for the action of minimizing adverse effects of fishing to the extent practicable on EFH. (See AOC v. Evans/Daley et al., Civil No. 99-982 (GK)(D.D.C. December 5, 2001). However, because the court did not limit its criticism of the EAs to only efforts to minimize adverse fishing effects on EFH, it was decided that the scope of these EISs should address all required EFH components as described in Section 303 (a)(7) of the M-SFCMA.

To address these requirements the Council prepared, under separate action, an EIS to analyze within each fishery a range of potential alternatives to: (1) Describe and identify EFH for the fishery; (2) identify other actions to encourage the conservation and enhancement of such EFH; and (3) identify measures to minimize to the extent practicable the adverse effects of fishing on such EFH. To comply with the guidelines articulated in the EFH Final Rule to implement the EFH provisions of the M-SFCMA (see 50 CFR Part 600, Subpart J) the Council prepared EFH Amendment 3, which was approved by NMFS and a final rule published in December 2005.

The Council and NMFS have determined there are no adverse effects to EFH in this amendment as discussed in the Environmental Consequences section (Section 5).

8.9 Small Business Act

The Small Business Act of 1953, as amended, Section 8(a), 15 U.S.C. 634(b)(6), 636(j), 637(a) and (d); Public Laws 95-507 and 99-661, Section 1207; and Public Laws 100-656 and 101-37 are administered by the SBA. The objectives of the act are to foster business ownership by individuals who are both socially and economically disadvantaged; and to promote the competitive viability of such firms by providing business development assistance including, but not limited to, management and technical assistance, access to capital and other forms of financial assistance, business training and counseling, and access to sole source and limited competition federal contract opportunities, to help the firms to achieve competitive viability. Because most businesses associated with fishing are considered small businesses, NMFS, in implementing regulations, must make an assessment of how those regulations will affect small businesses. Implications to small businesses are discussed in the RIR herein (Section 6).

8.10 Migratory Bird Treaty Act

Under the Migratory Bird Treaty Act (MBTA), it is unlawful to pursue, hunt, take, capture, kill, possess, trade, or transport any migratory bird, or any part, nest, or egg of a migratory bird, included in treaties between the United States and Great Britain, Mexico, Japan, or the former Union of Soviet Socialists Republics, except as permitted by regulations issued by the Department of the Interior. Violations of the MBTA carry criminal penalties; any equipment and means of transportation used in activities in violation of the MBTA may be seized by the United States government and, upon conviction, must be forfeited to it. To date, the MBTA has been applied to the territory of the United States and coastal waters extending three miles from shore. The actions proposed in this amendment would have no implications to the MBTA because fishing for reef fish species does not impact migratory birds.

8.11 National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended, the Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. The National Marine Sanctuary Program is administered by the Sanctuaries and Reserves Division of NOAA. The Act provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary Program currently includes 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. A complete listing of the current sanctuaries and information about their location, size, characteristics, and affected fisheries can be found at http://www.sanctuaries.nos.noaa.gov/oms/oms.html. The action proposed in this amendment would have no impact to any national marine sanctuaries because it should not change current fishing practices in either the shrimp or reef fish fisheries.

9.0 LIST OF PREPARERS

Name	Expertise	Responsibility	Agency
Steven Atran	Biologist	Review	GMFMC
Dr. Assane Diagne	Economist	Economic analyses/red snapper and shrimp actions	GMFMC
Heather Blough	Biologist	Purpose and need/Review	SERO
Dr. Steve Branstetter	Biologist	Shrimp actions/Review	SERO
Dr. David Carter	Economist	Economic analyses	SEFSC
David Dale	Biologist	EFH review	SERO
Dr. Stephen Holiman	Economist	Economic analyses/Red snapper actions/Review	SERO
Peter Hood	Biologist	Red snapper actions/CEA	SERO
Dr. Palma Ingles	Anthropologist	Social analyses/red snapper and shrimp actions	SERO
David Keys	NEPA Specialist	Review	SERO
Dr. Richard Leard	Biologist	Document coordinator/Shrimp actions	GMFMC
Jennifer Lee	Biologist	Protected resources review	SERO
Dave McKinney	Law Enforcement	Review	OLE
Dr. Jim Nance	Biologist	Scientific analyses	SEFSC
Dr. Clay Porch	Biologist	Scientific analyses	SEFSC
Jason Rueter	Biologist	Red snapper actions	SERO
Phil Steele	Biologist	Review	SERO
Andrew Strelcheck	Biologist	Scientific analyses/Red snapper actions	SERO
Dr. Michael Travis	Economist	Economic analyses/Shrimp actions	SERO
Dr. Jim Waters	Economist	Economic analyses	SEFSC

10.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE AMENDMENT/SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ARE SENT

Gulf of Mexico Fishery Management Council

Law Enforcement Advisory Panel
Red Snapper Advisory Panel
Shrimp Advisory Panel
Standing Scientific and Statistical Committee (SSC) and Special Reef Fish

Other Agencies, Organizations, or Persons

Alabama Cooperative Extension Service
Alabama Department of Conservation and Natural Resources, Marine Resources Division
Florida Fish and Wildlife Conservation Commission
Florida Sea Grant
Louisiana Cooperative Extension Service
Louisiana Department of Wildlife and Fisheries
Mississippi Cooperative Extension Service
Mississippi Department of Marine Resources
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Silver Spring Office
National Marine Fisheries Service Law Enforcement
Texas Cooperative Extension Service
Texas Parks and Wildlife Department
United States Fish and Wildlife Service
United States Coast Guard

11.0 PUBLIC HEARING LOCATIONS AND DATES

Monday, May 14, 2007
Holiday Inn Brownsville
3777 N. Expressway
Brownsville, TX 78520
956-547-1500

Tuesday, May 15, 2007
Four Points Sheraton New Orleans Airport
6401 Veterans Memorial Blvd.
Metairie, LA 70003
504-885-5700

Tuesday, May 15, 2007
Plantation Suites
1909 Hwy 361
Port Aransas, TX 78373
361-749-3866

Wednesday, May 16, 2007
Chauvin Parish Recreation Center
215 Angel St.
Chauvin, LA 70345
985-594-2020

Wednesday, May 16, 2007
Palacios Rec Center
2401 Perryman Ave
Palacios, TX 77465
361-972-2387

Thursday, May 17, 2007
LSU Agricultural Center
1105 W. Port St.
Abbeville, LA 70510
337-898-4335

Thursday, May 17, 2007
San Luis Resort
5222 Seawall Boulevard
Galveston, TX 77550
409-744-1500

Monday, May 21, 2007
Embassy Suites Hotel
570 Scenic Gulf Drive
Destin, FL 32550
850-337-7000

Monday, May 21, 2007
Clarion Hotel
12635 S. Cleveland Ave.
Ft. Myers, FL 33907
239-936-0931

Tuesday, May 22, 2007
Quorum Hotel
700 N. Westshore Blvd.
Tampa, FL 33609
813-289-8200

Tuesday, May 22, 2007
Foley Community Center
407 E. Laurel Ave.
Foley, AL 36535
251-943-1545

Wednesday, May 23, 2007
Riverview Plaza Hotel
64 S. Water St.
Mobile, AL 36602
251-438-4000

Thursday, May 24, 2007
Donal Snyder Parks & Rec Center
2520 Pass Road
Biloxi, MS 39531
228-435-6281

12.0 REFERENCES

Antozzi, W. O. Personal Communication. NOAA, NMFS, SEFSC, 75 Virgina Beach Drive, Miami, Florida 33149.

Ault, J. S., S. G. Smith, G. A. Diaz, and E. Franklin. 2003. Florida hogfish fishery stock assessment. University of Miami, Rosenstiel School of Marine Science, Contract No. 7701 617573 for Florida Marine Research Institute, St. Petersburg, FL. 45 pp.

Barnes, P. W. and J. P. Thomas (eds). 2005. Benthic habitats and the effects of fishing. American Fisheries Society Symposium 41. 890 pp.

Barnette, M. C. 2001. A review of the fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Tech. Memo. NMFS-SEFSC-449. National Marine Fisheries Service, 263 13th Avenue, South St. Petersburg, Florida 33701. 62 pp.

Bortone, S. A., R. N. Besser, and C. R. McNeil. 1997. The importance of Silas Stearns (1859-1888) and the Pensacola red snapper fishery to North American ichthyology. In: Collection Building: In: Ichthyology and Herpetology. Theodore W. Pietsch and William D. Anderson (editors). Lawrence, Kansas. American Society of Ichthyologists and Herpetologists, 1997, ASIH Special Publication No. 3, 459-467.

Branstetter, S. 1997. Bycatch and its reduction in the Gulf of Mexico and South Atlantic Shrimp Fisheries. Final report of the Gulf and South Atlantic Fisheries Foundation, Inc. (NOAA Award NA57FF0285). various pages.

Browder, J. A. 1983. A simulation model of a nearshore marine ecosystem of the north-central Gulf of Mexico. In: K. Turgaon (editor). Marine Ecosystem Modeling, Proceedings of a Workshop held April 6-8, 1982, Frederick, Maryland. NOAA-USDOC, Washington, D.C.

Burns, K. M. (personal communication). Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, Florida 34236.

Burns, K. M., and C. E. Porch. (personal communication). Effects of venting swim bladders on fish suffering barotraumas. Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, Florida 34236.

Burns, K. M., N. F. Parnell, R. R. Wilson. 2004. Partitioning release mortality in the undersized red snapper bycatch: Comparison of depth vs. hooking effects. Final Report MARFIN Grant No. NA97FF0349 36 pp.

Burns, K. M., C. C. Koenig, and F. C. Coleman. 2002. Evaluation of multiple factors involved in release mortality of undersized red grouper, gag, red snapper, and vermilion snapper. Mote Marine Laboratory Technical Report No. 814. (MARFIN grant #NA87FF0421). 53 pp.

Camber, C. I. 1955. A survey of the red snapper fishery in the Gulf of Mexico, with special reference to the Campeche Banks. Florida Board of Conservation, Technical Series No. 12. 63 pp.

Carter, D.W. 2003. Gulf of Mexico Red Snapper Rebuilding Plan: Economic Analysis of the Recreational Sector. NOAA, NMFS, SEFSC, 75 Virgina Beach Drive, Miami, Florida 33149.

Carter, D.W. and D. Letson. 2006. Effort Response, Harvest, Climate, and the Economy in the Gulf of Mexico Recreational Red Snapper Fishery. NOAA, NMFS, SEFSC, 75 Virgina Beach Drive, Miami, Florida 33149.

Carter, D. W. Personal Communication. NOAA, NMFS, SEFSC, 75 Virgina Beach Drive, Miami, Florida 33149.

Cass-Calay, S. L. and M. Bahnick. 2002. Status of the yellowedge grouper fishery in the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virgina Beach Drive, Miami, Florida 33149. Contribution SFD 02/03 – 172. 67 pp.

CEQ. 1997 Considering cumulative effects under the National Environmental Policy Act. Council on Environmental Policy, Executive Office of the President. 64 pp. + appendices. Available at http://ceq.eh.doe.gov/nepa/ccenepa/ccenepa.htm.

Chester, A. 2007. Letter from Alex Chester to Robin Riechers (dated March 7, 2007) providing updated rebuilding projections for red snapper. NOAA, NMFS, SERO, 263 13th Avenue,South, St. Petersburg, Florida 33701. 1 p. + attachment

Chester. W. 2001. Full box! One hundred years of fishing and boat building history in Bay County. Fire in the Water Publishing Company., Southport, Florida. 314 pp.

Clapp, R. B., R. C. Banks, D. Morgan-Jacobs, and W. A. Hoffman. 1982. Marine birds of the southeastern United States and Gulf of Mexico. U.S. Dept. of Interior, Fish and Wildlife Service, Office of Biological Services, Washington D.C. FWS/OBS-82/01. 3 vols.

Collins, M. R., J. C. McGovern, G.R. Sedberry, J. S. Meister, and R. Pardieck. 1999. Swim bladder deflation in black sea bass and vermilion snapper: Potential for increasing postrelease survival. North American Journal of Fisheries Management 19:828-832.

Cooke, S. J. and C. D. Suski. 2004. Are circle hooks an effective tool for conserving marine and freshwater recreational catch-and-release fisheries? Aquatic Conservation: Marine and Freshwater Ecosystems 14: 299-326

Cowan, J. H., Jr, M. Woods, W. Patterson, III, and D. Nieland. 2002. Otolith microchemistry (and reproductive biology) portion - Stock structure of red snapper in the northern Gulf of Mexico: Is their management as a single stock justified based on spatial and temporal patterns of genetic variation, otolith microchemistry, and growth rates. MARFIN Grant No. NA87FF0425.

Crabtree, R. E. 2006. Letter from Roy Crabtree to Robin Riechers (dated December 13, 2006) providing updated rebuilding projections for red snapper. NOAA, NMFS, SERO, 263 13th Avenue,South, St. Petersburg, Florida 33701. 7 pp.

Davis, R. W. and G. S. Fargion, eds. 1996. Distribution and abundance of cetaceans in the north-central and western Gulf of Mexico: final report. Vol. II: Technical Report. OCS Study MMS 96-0027. Prepared by the Texas Institute of Oceanography and NMFS. U.S. Dept. of the Interior, MMS, Gulf of Mexico OCS Region, New Orleans, LA. 357 pp.

Diamond, S., M. D. Campbell, and Q. Dokken. 2004. Estimating discard rate and release mortality of red snapper in Texas fisheries. MARFIN Grant No. NA17FF2012. Diaz, G.A. 2004. Red snapper landings by the U.S. recreational fishery in the Gulf of Mexico 1982-2002 (TXPW, MRFSS, and Headboat catch data) SEDAR 7 Data Workshop Report 58. 17 pp.

Diggles, B. K. and I. Ernst. 1997. Hooking mortality of two species of shallow-water reef fish caught by recreational angling methods. Marine Freshwater Research: 48, 479-483.

Dorf, B. A. 2003. Red snapper discards in Texas coastal waters – a fishery dependent onboard survey of recreational headboat discards and landings. American Fisheries Society Symposium 36: 155-166.

Dorf, B. 2000. Red snapper discards in Texas coastal waters - a fishery dependent onboard pilot survey of recreational headboat discards and landings. Report prepared for Gulf & South Atlantic Fisheries Foundation, No 70-06-21807/11165, 5401 West Kennedy Boulevard, Suite 740, Tampa, Florida 33609.

Eklund, A. M. 1994. (editor) Status of the stocks of Nassau grouper, *Epinephelus striatus*, and jewfish, *E. itajara*- Final Report. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contrib. No. MIA-94/95-15. 170 pp.

Ferguson, R. A. and Tufts, B. C. 1992. Physiological effects of brief air exposure in exhaustively exercised rainbow trout (*Oncorhynchus mykiss*): implications for “catch and release” fisheries. Canadian Journal of Fisheries and Aquatic Science 49: 1157-1162.

Fischer, A. J., M. S. Baker, Jr., and C. A. Wilson. 2004. Red snapper (*Lutjanus campechanus*) demographic structure in the northern Gulf of Mexico based on spatial patterns in growth rates and morphometrics. Fishery Bulletin. 102: 593-603.

Fitzhugh, G. R., M. S. Duncan, L. A. Collins, W. T. Walling, and D. W. Oliver. 2004. Characterization of red snapper (*Lutjanus campechanus*) reproduction: for the 2004 Gulf of Mexico SEDAR. NOAA, NMFS, SEFSC, 3500 Delwood Beach Road, Panama City, Florida 32409. Contribution 04-01. 29 pp + addendum.

Florida Sea Grant. 2005. Venting: A guide to releasing reef fish with ruptured swim bladders. Florida Seagrant, University of Florida, Gainesville, Florida. 2 pp.

Foster, D. 2005. Funnel BRD Performance. Report for the Gulf of Mexico Fishery Management Council. Harvesting Systems and Engineering Division, NOAA, NFMS, SEFSC, 3209 Frederick Street, Pascagoula, Mississippi 39567. 16 pp.

Funk, R. D. 1998. Economic impacts of license limitation and buyback on the Texas Bay shrimp fishery. Ph.D. Dissertation, Department of Agricultural Economics, Texas A&M University, College Station, Texas 77843, December 1998, 97 pp.

Gallaway, B. J. and J. G. Cole. 1999. Reduction of juvenile red snapper bycatch in the U.S. Gulf of Mexico shrimp trawl fishery. North American Journal of Fisheries Management 19:342-355.

Gallaway, B. J., J. C. Cole, R. Meyer, and P. Roscigno. 1999. Delineation of essential habitat for juvenile red snapper in the northwest Gulf of Mexico. Transactions of the American Fisheries Society 128, 713-726.

Gallaway, B. J., M. Longnecker, J. G. Cole, and R. M. Meyer. 1998. Estimates of shrimp trawl bycatch of red snapper, *Lutjanus campechanus*, in the Gulf of Mexico, p. 817-839. In: Fishery stock assessment models, F. Funk, T. J. Quinn II, J. Heifetz, J. N. Ianelli, J. E. Powers, J. F. Schweigert, P. J. Sullivan, and C.-I. Zhang (editors). Alaska Sea Grant College Program Report, No. AK-SG-98-01. Univ. of Alaska, Fairbanks, AK.

Gentner, B. 2004. Estimating target species substitution in the face of changing recreational fishing policies. IIFET 2004 Japan Proceedings.

Gitschlag, G. R. and M. L. Renaud. 1994. Field experiments on survival rates of caged and released red snapper. North American Journal of Fisheries Management 14: 131-136.

Gledhill, C. T., and W. B. Driggers. 2006. Hook related size selectivity of fishes commonly caught on experimental bottom longline gear in the northern Gulf of Mexico. NOAA, NMFS, SEFSC, 3209 Frederick Street, Pascagoula, Mississippi 39567. 8 pp.

Gore, R. H. 1992. The Gulf of Mexico: a treasury of resources in the American Mediterranean. Pineapple Press, Inc., Sarasota, Florida. 384 pp.

GMFMC. 2006. Amendment 26 to the Gulf of Mexico Reef Fish Fishery Management Plan to establish a red snapper individual fishing quota program. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607.

GMFMC. 2005a. Generic Amendment 3 for addressing EFH requirements, HAPCs , and adverse effects of fishing in the following FMPs of the Gulf: Shrimp, Red Drum, Reef Fish, Stone Crab, Coral and Coral Reefs in the Gulf and Spiny Lobster and the Coastal Migratory Pelagic resources of the Gulf and South Atlantic. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607.

GMFMC. 2005b. Amendment 13 to the fishery management plan for the shrimp fishery of the Gulf of Mexico, U.S. waters, with environmental assessment, regulatory impact review, initial regulatory flexibility analysis, and social impact assessment. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 220 pp. with appendices

GMFMC. 2005c. Final Amendment to the FMPs for: Reef Fish (Amendment 25) and Coastal Migratory Pelagics (Amendment 17) for extending the charter vessel/headboat permit moratorium. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 80 pp. with appendices.

GMFMC. 2005d. Regulatory amendment to the Reef Fish Fishery Management Plan to set recreational management measures for grouper starting in 2006. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 126 pp.

GMFMC. 2004a. Amendment 22 to the fishery management plan for the reef fish fishery of the Gulf of Mexico, U.S. waters, with supplemental environmental impact statement, regulatory impact review, initial regulatory flexibility analysis, and social impact assessment. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607.

GMFMC. 2004b. Final Amendment 23 to the Reef Fish Fishery Management Plan to set vermilion snapper Sustainable Fisheries Act targets and thresholds and to establish a plan to end overfishing and rebuild the stock. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 202 pp.

GMFMC. 2004c. Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the following fishery management plans of the Gulf of Mexico (Gulf): Shrimp Fishery of the Gulf of Mexico, Red Drum Fishery of the Gulf of Mexico, Reef Fish Fishery of the Gulf of Mexico, Stone Crab Fishery of the Gulf of Mexico, Coral and Coral Reef Fishery of the Gulf of Mexico, Spiny Lobster Fishery of the Gulf of Mexico and South Atlantic, Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 118 pp.

GMFMC. 2001. Amendment 11 to the fishery management plan for the shrimp fishery of the Gulf of Mexico, U.S. waters with environmental assessment, regulatory impact review, and regulatory flexibility act analysis. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 41 pp. + appendix

GMFMC. 2000. Regulatory amendment to the reef fish fishery management plan to set total allowable catch and management measures for red snapper for the 2000 and 2001 seasons. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 56 pp.

GMFMC. 1997. Amendment 9 to the Fishery Management Plan for the Shrimp Fishery of the Gulf, Including a Final Supplemental Environmental Impact Statement and Regulatory Impact Review and Social Impact Assessment. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 153 pp.

GMFMC. 1995. Regulatory amendment to the reef fish fishery management plan to set red snapper total allowable catch, includes environmental assessment and regulatory impact review. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. 49 pp.

GMFMC. 1989. Amendment 1 to the fishery management plan for the reef fish fishery of the Gulf of Mexico, U.S. waters, with supplemental environmental impact statement, regulatory impact review, initial regulatory flexibility analysis, and social impact assessment. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607.

GMFMC. 1981. Fishery management plan for the reef fish fishery of the Gulf of Mexico and environmental impact statement. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607.

GMFMC and SAFMC. 1982. Environmental impact statement and fishery management plan for Coral and Coral Reef resources of the Gulf of Mexico and South Atlantic. Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607.

Goodyear, C. P. 1992. Red snapper in the U.S. waters of the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: MIA 91/92-70. 156 pp +app.

Goodyear, C. P. 1995. Red snapper in U.S. waters of the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149**.** Contribution: MIA 95/96-05. 171 pp.

Goodyear, C. P. and P. Phares. 1990. Status of red snapper stocks of the Gulf of Mexico - report for 1990. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. 72 pp.

Green, L. M. and P. Campbell. 2005. Trends in Finfish Landings of Sport-Boat Anglers in Texas Marine Waters, May 1974-May 2003. Texas Parks and Wildlife Department, Management Data Series No. 234.

Haab, T. C., J. C. Whitehead, and T. McConnell. 2001. The economic value of marine recreational fishing in the southeast United States, 1997 southeast economic data analysis. Final report for contract no. 40WCNF802079, NOAA, NMFS, SERO, 263 13th Avenue, South, St. Petersburg, Florida 33701.

Hamilton, A. N., Jr. 2000. Gear impacts on essential fish habitat in the Southeastern Region. NOAA, NMFS, SEFSC, 3209 Frederick Street, Pascagoula, Mississippi 39567. 45 pp.

Haby, M. G., R. J. Miget, L. L Falconer, and G. L Graham. 2003. A review of current conditions in the Texas shrimp industry, an examination of contributing factors, and suggestions for remaining competitive in the global shrimp market. Texas Cooperative Extension Sea Grant College Program, TAMU-SG-03-701, January 2003, 26 pp.

Harrington, D. Personal communication. University of Georgia. Athens, Georgia (deceased).

Harrison, P. 1983. Seabirds: an identification guide. Houghton Mifflin Company, Boston, MA. Field Notes 48: 976-978.

Henwood, T., W. Ingram and M. Grace. 2006. Shark/snapper/grouper longline surveys. NOAA, NMFS, SEFSC, 3209 Frederick Street, Pascagoula, Mississippi 39567. 22 pp.

Holiman, S. G. 2000. Summary report of the methods and descriptive statistics for the 1997-98 southeast region marine recreational economics survey. SERO-ECON-00-11, NOAA, NMFS, SERO, 263 13th Avenue, South, St. Petersburg, Florida 33701.

Holiman, S. G. 1999. Economic summary of the Gulf of Mexico reef fish recreational fishery. SERO-ECON-00-02, NOAA, NMFS, SERO, 263 13th Avenue, South, St. Petersburg, Florida 33701.

Holland, S. M., A. J. Fedler and J. W. Milon. 1999. The operations and economics of the charter and Head Boat Fleets of the Eastern Gulf of Mexico and South Atlantic Coasts. Report for NMFS, MARFIN program grant number NA77FF0553.

Horst, J. Unknown date. Circle Hook Magic. Louisiana Sea Grant. http://www.seagrantfish.lsu.edu/resources/factsheets/circlehook.htm

Idyll, C. P. 1963. The shrimp fishery. Pages 160-182. In: M.E. Stansby (editor), Industrial fishery technology. Reinhold Publishing Co., New York. 393 pp.

Impact Assessment, Inc. (IAI). 2005a. Identifying communities associated with the fishing industry in Florida. La Jolla, CA. Volumes 1.

Impact Assessment, Inc. (IAI). 2005b. Identifying communities associated with the fishing industry in Texas. La Jolla, CA. Volumes 1.

Impact Assessment, Inc. (IAI). 2005c. Identifying communities associated with the fishing industry in Louisiana. La Jolla, CA. Volumes 1-3. 646 p.

Impact Assessment Inc. 2007. Preliminary assessment of the impacts of Hurricane Katrina on Gulf of Mexico coastal fishing communities. Prepared for the U.S. Department of Commerce, NMFS, Southeast Regional Office, 263 13th Ave. South, St. Petersburg, Florida 33701. Contract number WC 133F-06-CN-0003, 289 pp.

Ingles, P. Personal Communication. NOAA, NMFS, SERO, 263 13th Avenue, South, St. Petersburg, Florida 33701.

Kaimmer, S. M. and R. J. Trumble. 1997. Survival of Pacific halibut released from longlines: hooking location and release methods. Pages 101-105 *in* Proceedings of fisheries bycatch: consequences and management. Alaska Sea Grant Report 97-02, Fairbanks, Alaska.

Kazmierczak, R. F., W. R. Keithly, and D. Hamady. 2003. Consolidated data and its potential effect on effort calculations in the Gulf of Mexico shrimp fishery. In: Proceedings of the 56th Gulf and Caribbean Fisheries Institute Meeting, Tortola, Virgin Islands. In press.

Keithly, W. R., D. Hamady, R. F. Kazmierczak, and M. D. Travis. 2006. The Impacts of Imports, Particularly Farm-Raised Product, on the Southeast U.S. Shrimp Processing Sector. Report to the Gulf and South Atlantic Fisheries Foundation, 5401 West Kennedy Boulevard, Suite 740, Tampa, Florida. 50 pp.

Keithly, W. R., D. Hamady, R. F. Kazmierczak, and M. D. Travis. 2005. An economic analysis of the Southeast U.S. shrimp processing industry, responses to an increasing import base. In: Reconciling Fisheries with Conservation: The Challenge of Managing Aquatic Ecosystems. In press.

Keithly, W. R. and T. Martin. 1997. Southeastern finfish processing activities of federally managed species, particularly reef fish, and potential impacts of regulation. Final Report to National Marine Fisheries Service (S-K # NA47FD0290), NOAA, NMFS, SERO, 263 13th Avenue, South, St. Petersburg, Florida 33701. 107 pp. + Appendix.

Klima, E. F. and R. S. Ford. 1970. Gear and techniques employed in the Gulf of Mexico shrimp fishery. Conference on the Canadian Shrimp Fishery. 26 pp

Legault, C. M., and A. M. Eklund. 1998. Generation times for Nassau grouper and jewfish with comments on M/K ratios (revised). NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD-97/98-10A. 5 pp.

Martinez, E. X., J. M. Nance, and R. J. Zimmermann. 1996. A model for the assessment of ecological interaction among living marine resources in the Gulf of Mexico: Implications for bycatch management and shrimp production. Report for the Gulf of Mexico Fishery Management Council. NOAA, NMFS, SEFSC, 4700 Avenue U, Galveston, Texas 77551. 19 pp.

McCawley, J. R. 2003. Diet and prey demand of red snapper, *Lutjanus campechanus*, on Alabama artificial reefs. Thesis. University of South Alabama, Mobile, Alabama. 206 pp.

Muoneke, M. I. and W. M. Childress. 1994. Hooking mortality: a review for recreational fisheries. Rev. Fish. Sci. 2, 123–56.

Muller, R. G., M. D. Murphy, J. de Silva, and L. R. Barbieri. 2003. Final Report Submitted to the National Marine Fisheries Service, the Gulf of Mexico Fishery Management Council, and the South Atlantic Fishery Management Council as part of the Southeast Data, Assessment, and Review (SEDAR) III. Florida Fish and Wildlife Conservation Commission, FWC-FMRI Report: IHR 2003-10. Florida Fish and Wildlife Research Institute, 100 Eighth Avenue, Southeast, St. Petersburg, Florida 33701. 217 pp. + 2 appendices.

Nance, J. M. Personal Communication. NOAA, NMFS, SEFSC, 4700 Avenue U, Galveston, Texas 77551.

Nance, J. M. 2006a. Review of the status and health of shrimp stocks for 2005. Report for the Gulf of Mexico Fishery Management Council. NOAA, NMFS, SEFSC, Galveston Laboratory, 4700Avenue U, Galveston, Texas 77551-5997. 6 pp.

Nance, J. M. 2006b. Stock assessment report 2005 Gulf of Mexico shrimp fishery. Report for the Gulf of Mexico Fishery Management Council. NOAA, NMFS, SEFSC, Galveston Laboratory, 4700Avenue U, Galveston, Texas 77551-5997. 18 pp.

Nance, J., W. Keithly, Jr., C. Caillouet, Jr., J. Cole, W. Gaidry, B. Gallaway, W. Griffin, R. Hart, and M. Travis. 2006. Estimation of effort, Maximum Sustainable Yield, and Maximum Economic Yield in the shrimp fishery of the Gulf of Mexico. Report of the Ad Hoc Shrimp Effort Working Group to the Gulf of Mexico Fishery Management Council, 85 p.

National Hurricane Center. Date unknown. http://www.nhc.noaa.gov/

Nelson, D. M. (Ed.). 1992. Distribution and abundance of fishes and invertebrates in Gulf of Mexico Estuaries, Volume I: data summaries. ELMR Report No. 10. NOAA/NOS Strategic Environmental Assessments Division, Rockville, Maryland. 273 pp.

Nichols, S. 1984. Updated assessments of brown, white and pink shrimp in the U.S. Gulf of Mexico. Paper presented at the Workshop on Stock Assessment. Miami, Florida, May 1984.

NMFS. 2006a. Endangered Species Act section 7 consultation on the continued authorization of shrimp trawling as managed under the Fishery Management Plan (FMP) for the shrimp fishery of the Gulf of Mexico (effects on smalltooth sawfish). Biological Opinion. January 13, 2006. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 23 pp.

NMFS. 2006b. Status report on the continental United States distinct population segment of the goliath grouper (*Epinephelus itajara*). NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 49 pp.

NMFS. 2006c. Annual report to Congress on the status of U.S. fisheries - 2005. U.S. Department of Commerce, NOAA, NMFS, Silver Spring, MD. 20 pp.

NMFS. 2005b. The continued authorization of reef fish fishing under the Gulf of Mexico Reef Fish Fishery Management Plan and proposed Amendment 23. Protected Resources Division, NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 115 pp. + 2 appendices

NMFS. 2005c. Endangered Species Act – Section 7 Consultation Biological Opinion. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 115 pp. + app.

NMFS. 2004a. Secretarial Amendment 1 to the Reef Fish Fishery Management Plan to set a 10-year rebuilding plan for red grouper, with associated impacts on gag and other groupers. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 262 pp.

NMFS. 2004b. Fisheries of the United States, 2003. Current Fisheries Statistics No. 2003. National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics Division. Silver Spring, Maryland 124 p.

NMFS. 2003a. Supplemental economic analysis for Amendment 10 to the Fishery Management Plan for the Shrimp Fishery of the Gulf, U.S. Waters. National Marine Fisheries Service, Southeast Regional Office, 263 13th Avenue, South, St. Petersburg, Florida 33701. 28 pp.

NMFS. 2003b. Fisheries of the United States, 2002. Current Fisheries Statistics No. 2002. National Marine Fisheries Service, Office of Science and Technology, Fisheries Statistics Division. Silver Spring, Maryland 126 p.

NMFS. 2002a. Status of red grouper in United States waters of the Gulf of Mexico during 1986-2001, revised. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution No. SFD-01/02-175rev. 65 pp.

NMFS 2002b. Endangered Species Act section 7 consultation on shrimp trawling in the southeastern United States, under the sea turtle conservation regulations an as managed by the fishery management plans for shrimp in the South Atlantic and Gulf of Mexico. Biological Opinion. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. December 2, 2002. 95 pp.

NMFS. 2002c. Regulatory Impact Review and Regulatory Flexibility Act Analysis for Making Technical Changes to TEDs to Enhance Turtle Protection in the Southeastern United States Under Sea Turtle Conservation Regulations. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 55 pp.

NMFS. 1998. Report to Congress: Southeastern United States Shrimp Trawl Bycatch Program; October 1998. various pages.

NMFS. 1997. Bycatch in the Southeast Shrimp Trawl Fishery. A Data Summary Report SFA Task N-10.03. various pages.

NMFS. 1996. Southeast Spotlight Article: Economic interactions between the shrimp and red snapper fisheries in the U.S. Gulf of Mexico. In: Economic Status of U.S. Fisheries 1996. p. 104-107

NMFS. 1995. Cooperative Research Program Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries. A report to Congress. US DOC, NOAA. 68 pp.

NRC. 2006. Review of recreational fisheries survey methods. National Research Council of the National Academies. The National Academies Press, Washington, DC. 185 pp.

NRC. 1999. Sharing the fish: Toward a national policy on individual fishing quotas. National Research Council. National Academy Press, Washington, DC. 422 pp.

Parker, R. O. 1985. Survival of released red snapper. Progress report to South Atlantic and Gulf of Mexico Fishery Management Councils. Charleston, South Carolina and Tampa, Florida.

Patterson, W. F. III. 1999. Aspects of the population ecology of red snapper, *Lutjanus campechanus*, in an artificial reef area off Alabama. Ph.D dissertation. University of South Alabama, Mobile, Alabama.

Patterson, W. F., C. A. Wilson, S. J. Bentley, J. H. Cowan, T. Henwood, Y. C. Allen, T. A. Dufrene. 2005. Delineating juvenile red snapper habitat on the northern Gulf of Mexico continental shelf. American Fisheries Society Symposium 41:277-288.

Patterson, W. F. III, J. C. Watterson, R. L. Shipp, and J. H. Cowan, Jr. 2001. Movement of tagged red snapper in the northern Gulf of Mexico. Transactions of the American Fisheries Society 130: 533-545.

Pattillo, M. E., T. E. Czapla, D. M. Nelson, and M. E. Monaco. 1997. Distribution and abundance of fishes and invertebrates in Gulf of Mexico estuaries. Volume II: species life history summaries. ELMR Report No. 11. NOAA/NOS Strategic Environmental Assessment Division, Sliver Spring, Maryland. 377 pp.

Phares, P. L. Personal Communication. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149.

Poffenberger, J. and K. J. McCarthy. 2004. Estimates of red snapper discards by vessels with federal permits in the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD 2004-023. 13 pp.

Porch, C. E. Personal Communication. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149.

Porch, C. E. 2005. Projected effects of changes in minimum size regulations on the future status of the red snapper (*Lutjanus campechanus*) fishery in the U. S. Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD-2005-009. 7 pp.

Porch, C. E. 2004. An age-structured assessment model for red snapper that allows for multiple stocks, fleets, and habitats. NOAA, NMFS, SEFSC, Contribution: SFD-2004-027. 20 pp.

Porch, C. E., A. M. Eklund and G. P. Scott. 2003. An assessment of rebuilding times for goliath grouper. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD 2003-0018. 25 pp.

Porch, C. E. and S. L. Cass-Calay. 2001. Status of the vermilion snapper fishery in the Gulf of Mexico. Assessment 5.0. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD-01/02-129. 42 pp. + Figures.

Poulakis, G. R. and J. C. Seitz. 2004. Recent occurrence of the smalltooth sawfish, *Pristis pectinata* (Elasmobranchiomorphi: Pristidae), in Florida Bay and the Florida Keys, with comments on sawfish ecology. Florida Scientist 67(27): 27-35.

Powers, J. and R. Shipp. Personal Communication. Powers - School of Coast and Environment, Louisiana State University, Baton Rouge, Louisiana 70803. Shipp – Department of Marine Sciences, University of South Alabama, Mobile, Alabama 36688.

Render, J. H., and C. A. Wilson. 1993. Hook-and-line mortality of caught and released red snapper around oil and gas platform structural habitat. Bulletin of Marine Science 55:1106-1111.

Render, J. H. and C. A. Wilson. 1993. Mortality rate and movement of hook-and-line caught and released red snapper. Final report for cooperative agreement #NA90AAHMF762 Marine Fisheries Initiative (MARFIN) Program. Coastal Fisheries Institute, Center for Coastal, Energy, and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana. LSU-CFI-93-8.

Rummer, J. L., and W. A. Bennett. 2005. Physiological effects of swimbladder expansion and catastrophic decompression on red snapper. Transactions of the American Fisheries Society 134:1457-1470.

Schirripa, M. J. and C. M. Legault. 1999. Status of the red snapper fishery in the Gulf of Mexico: Updated through 1998. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD-99/00-75. 86 pp +appendices

Schirripa, M. J. and C. M. Legault. 1997. Status of red snapper in U.S. waters of the Gulf of Mexico: Updated through 1996. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. MIA 97/98-05.

SEA (Strategic Environmental Assessment Division, NOS). 1998. Product overview: Products and services for the identification of essential fish habitat in the Gulf of Mexico. NOS, Silver Spring, Maryland; NOAA Fisheries, Galveston, Texas; and GMFMC, Tampa, Florida (available at http//biogeo.nos.noaa.gov/projects/efh/gom-efh/)

SEDAR 3. 2003. SEDAR Peer Review of yellowtail snapper assessment, with comments on goliath grouper. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina.12 pp+ appendices.

SEDAR 6. 2003a. The hogfish in Florida: Assessment review and advisory report. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina. 12 pp.

SEDAR 6. 2004b. The goliath grouper in southern Florida: Assessment review and advisory report. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina. 15 pp.

SEDAR 7. 2005. Stock assessment report of SEDAR 7 Gulf of Mexico Red Snapper. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina. 480 pp.

SEDAR 9. 2006a. SEDAR 9 Gulf of Mexico vermilion snapper assessment report 3. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina. 231 pp.

SEDAR 9. 2006b. SEDAR 9 Gulf of Mexico gray triggerfish assessment report. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina.

SEDAR 9. 2006c. SEDAR 9 Gulf of Mexico greater amberjack assessment report. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina.

SEDAR 10. 2006. SEDAR 10 review workshop assessment advisory report Gulf of Mexico gag grouper. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina. 13 pp.

SERO. 2006a. Red snapper captain and crew bag limit analyses. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 2 pp.

SERO. 2006b. Red snapper yield-per-recruit analyses. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 13 pp.

SERO. 2006c. Evaluation of reduced minimum size limits for the recreational red snapper fishery. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 16 pp.

SERO. 2006d. Estimated reduction in red snapper harvest for various core recreational fishing seasons with weekend openings before or after the core season. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 15 pp.

SERO. 2007. Additional red snapper rebuilding projections that end overfishing in 2009. Handout provided to Gulf Council at January 2007 meeting. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. 1 p.

Sheridan, P., and J. Doerr. 2005. Short-term effects of the cessation of shrimp trawling on Texas benthic habitats. American Fisheries Society Symposium 41:571-578.

Sheridan, P. F., D. L. Trimm, and B. M. Baker, 1984. Reproduction and food habits of seven species of Northern Gulf of Mexico fishes. Contributions in Marine Science 27: 175-204.

Shipp, R. L. Personal Communication. Department of Marine Sciences, University of South Alabama, Mobile, Alabama 36688.

Shipp, R. L. 2001. The snapper fishery in the Gulf of Mexico, a historical perspective, and management implications. PowerPoint presentation to the Gulf of Mexico Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. January 2001.

Simpfendorfer, C. A. and T. R. Wiley, 2004. Determination of the distribution of Florida's remnant sawfish population, and identification of areas critical to their conservation. Mote Marine Laboratory Technical Report, July 2, 2004. 37 pp.

Strelcheck, A. Personal Communication. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701.

Sullivan, P. J., A. M. Parma, and W. G. Clark. 1999. The Pacific halibut stock assessment of 1997. International Pacific Halibut Commission. Scientific Report 79, Seattle, Washington. 84 pp.

Sutton, S. G., R. B. Ditton, J. R. Stoll, and J. W. Milon. 1999. A cross-sectional study and longitudinal perspective on the social and economic characteristics of the charter and party boat fishing industry of Alabama, Mississippi, Louisiana, and Texas. Report by the Human Dimensions of Recreational Fisheries Research Laboratory, Texas A&M University, MARFIN program grant number NA77FF0551.

Thompson, N. 2005. Memorandum (dated September 20, 2005) from Nancy Thompson to Julie Morris summarizing red snapper rebuilding projections. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. 15 pp.

Travis, M. D. and W. L. Griffin. 2004. Update on the economic status of the Gulf of Mexico commercial shrimp fishery. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. SERO-ECON-04-01. 10 pp.

Travis, M. D. and W. L. Griffin. 2003. Economic analysis of the Texas Closure for 2003. Presentation to the Gulf Fishery Management Council, 2203 North Lois Avenue, Suite 1100, Tampa, Florida 33607. January 13, 2003.

Trumble, R. J., S. M. Kaimmer, and G. H. Williams. 2000. Estimation of discard mortality rates for Pacific halibut bycatch in groundfish longline fisheries. North American Journal of Fisheries Management 20:931-939.

Turner, S. C. 2005. Alternative estimates of the yield of red snapper from the Gulf of Mexico recreational fishery. SEDAR 7 Review Workshop Report 8. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. 3 pp.

Turner, S. C., C. E. Porch, D. Heinemann, G. P. Scott, and M. Ortiz. 2001. Status of the gag stocks of the Gulf of Mexico: assessment 3.0. August 2001. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD-01/02-134. 32 pp., 25 pp. tables, 85 pp. figures.

Turner, S. C., N. J. Cummings, and C .P. Porch. 2000. Stock assessment of Gulf of Mexico greater amberjack using data through 1998. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. SFD-99/00-100. 27 pp.

Turtle Expert Work Group. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Department of Commerce. NOAA Technical Memorandum, NMFS-SEFSC-444, 115 pp.

Valle, M., C. Legault and M. Ortiz. 2001. A stock assessment for gray triggerfish, *Balistes capriscus*, in the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Contribution: SFD-01/02-124. 50pp + appendices.

Van Voorhees, D. Personal Communication. NOAA, NMFS, 1315 East-West Highway, Silver Spring, Maryland 20910.

Walker, B. M., R. F. Zales II, and B. W. Rockstall. 2006. Charter fleet in peril: losses to the Gulf of Mexico charter fleet from hurricane storms during 2005. National Association of Charterboat Operators. 208 pp.

Ward, J. M., T. Ozuna, and W. Griffin. 1995. Cost and revenues in the Gulf of Mexico shrimp fishery. NOAA Technical Memorandum NMFS-SEFSC-371. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. 76 pp.

Warner, K. 1979. Mortality of landlocked Atlantic salmon hooked on four types of fishing gear at the hatchery. Progressive Fish Culturist 41: 99–102.

Waters, J. R. Personal Communication. NOAA, NMFS, SEFSC, 101 Pivers Island Road, Beaufort, North Carolina 28516-9722.

Waters, J. R. 2006. Economic descriptions of the commercial red snapper fishery in the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Working Paper Series SEFSC-SSRG-10. 26 pp.

Waters, J. R. 2003. Review of the U. S. Commercial Red Snapper Fishery in the Gulf of Mexico. NOAA, NMFS, SEFSC, 75 Virginia Beach Drive, Miami, Florida 33149. Working Paper Series SEFSC-SSRG-02. 11 pp.

Waters, J. R. 2001. Quota management in the commercial red snapper fishery. Marine Resource Economics 16:65-78.

Waters, J. R. 1996. An economic survey of commercial reef fish vessels in the U.S. Gulf of Mexico. NOAA, NMFS, SEFSC, 101 Piver's Island Road, Beaufort, NC 28516. 63 pp+ tables, figures, and appendices.

Weninger, Q. and J. R. Waters. 2003. The economic benefits of management reform in the northern Gulf of Mexico reef fish fishery. Journal of Environmental Economics and Management 46(2): 207-230.

Wilson, C. A., and D. L. Nieland. 2001. Age and growth of red snapper, *Lutjanus campechanus*, from the northern Gulf of Mexico off Louisiana. Fishery Bulletin 99:653-664.

Wilson, C. A., D. L. Nieland, A. J. Fischer, and M. S. Baker, Jr. 2004. Red snapper *Lutjanus campechanus* in the northern Gulf of Mexico: Age and size composition of the commercial harvest and mortality of regulatory discards. NOAA, NMFS, SERO, 263 13th Ave. South, St. Petersburg, Florida 33701. MARFIN grant #NA17FF2007. 55 pp.

Workman, I. K., and D. J. Foster. 1994. Occurrence and behavior of juvenile red snapper, *Lutjanus campechanus*, on commercial shrimp fishing grounds in the northern Gulf of Mexico. Marine Fisheries Review 56(2):9-11.

13.0 INDEX

14.0 GLOSSARY

B. Biomass, measured in terms of spawning capacity (weight) or other appropriate units of production.

B_{MSY}. Long-term average biomass that would be achieved if fishing at a constant fishing mortality rate equal to FMSY.

Biological Reference Point. Benchmarks against which the abundance of the stock or the fishing mortality rate can be measured, in order to determine its status. BRPs can be categorized as limits or targets, depending on their intended use.

Catch 1) the act of catching a fish. 2) All fish that a fisher catches by any of the gear being used. Catch includes fish which are released, used for bait, or cut off after being fought. Other terms describe the eventual disposition of the catch.

Circle Hook. A non-offset hook with the point turned perpendicularly back to the shank.

Control Rule. Describes a plan for pre-agreed management actions as a function of variables related to the status of the stock. For example, a control rule can specify how F or yield should vary with B. In the NSGs, the MSY control rule is used to determine the limit fishing mortality, MFMT. Control rules are also known as "decision rules" or "harvest control laws" in some of the scientific literature.

Dehooker. Device used to facilitate the removal of hooks from fish or other sea life.

Discards. Discards are those fish in the catch that are released at sea. Discards can be the result of regulations (out of season or too small), economics (the target of a fishery but which are not retained because they are of an undesirable size, sex, or quality, or for other economic reasons), or catch-and-release fishing (targeting a fish for sport but not intending to keep). Discards would be equal to **Catch** if a fisher were only catch-and-release fishing and every fish is released alive.

F. Instantaneous fishing mortality rate. Measures the effective fishing intensity for a given partial recruitment pattern.

F_{MSY}. Fishing mortality rate, which, if applied constantly, would result in MSY.

Harvest Harvest includes all fish that are kept for any purpose. This includes **Landings** plus that portion of the catch retained for some other purpose such as bait. Harvest would be equal to **Catch** if no fish were **Discarded**.

J-hook. A usually barbed hook with the point turned upward or slightly back toward the shank.

Landings Landings are those fish that are brought to shore and kept by the fisher for some purpose such as eating, mounting, giving to friends or selling. Landings would be equal to **Catch** if every fish caught is landed.

Limit Reference Points. Benchmarks used to indicate when harvests should be constrained substantially so that the stock remains within safe biological limits. The probability of exceeding the limits should be low. In much of the NSGs, limits are referred to as thresholds. In much of the international literature (e.g., FAO documents), "thresholds" are used as buffer points that signal when a limit is being approached.

M. Instantaneous natural mortality rate. It includes mortality caused by factors such as disease, starvation, and predation; not from fishing.

MFMT (maximum fishing mortality threshold). Status determination criteria (SDC) for determining if OVERFISHING is occurring. It will usually be equivalent to the F corresponding to the MSY control rule.

MSST (minimum stock size threshold). The greater of: (a) 1/2BMSY, or (b) the minimum stock size at which rebuilding to BMSY will occur within 10 years of fishing at the MFMT. MSST should be measured in terms of spawning biomass or other appropriate measures of productive capacity.

MSY (maximum sustainable yield). The largest long-term average yield (harvest) that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. Any estimate of MSY depends on the population dynamics of the stock, the characteristics of the fisheries, e.g., gear selectivity, and the control rule used. In much of the traditional fisheries literature, MSY is estimated with a control rule in which F is independent of stock size. In the language of NSGs, estimates of MSY will change depending on the shape of the control rule, but BMSY and FMSY pertain only to a constant-F control rule.

NSGs (national standard guidelines). Advisory guidelines developed by NOAA Fisheries, based on the National Standards of the Magnuson-Stevens Fishery Conservation and Management Act.

Overfished. MSST related. A stock or stock complex is considered overfished when its size falls below the MSST. According to the NSGs, an overfished stock or stock complex is one "whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding." A rebuilding plan is required for stocks that are overfished.

Overfishing. MFMT related. Occurs if the MFMT is exceeded for 1 year or more. According to the NSGs, "overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of the stock or stock complex to produce MSY on a continuing basis."

OY (optimum yield). The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. MSY constitutes a "ceiling" for OY. OY may be lower than MSY, depending on relevant economic, social, or ecological factors. In the case of an overfished fishery, OY should provide for rebuilding to BMSY.

Reference Points. Values of parameters, e.g. B_{MSY}, F_{MSY}, $F_{0.1}$, that are useful benchmarks for guiding management decisions. Biological reference points are typically limits that should not be exceeded with significant probability, e.g. MSST, or targets for management, e.g. OY.

SDC (status determination criteria). MFMT related. Objective and measurable criteria used to determine if a stock is being overfished or is in an overfished state according to NSGs.

SPR (1). Spawning output per recruit. Amount of per-capita spawning biomass (or other appropriate measure of reproductive output) obtained at a given value of F, conditional on values of partial recruitment, growth, maturity (and/or fecundity) and natural mortality.

(2). Spawning potential ratio. The expected lifetime spawning output per recruit relative to the spawning output that would be realized in the absence of fishing, often expressed as a percentage. References to this second definition are associated with a percentage (%) sign.

Venting tool. A sharpened, hollow tube used to vent swim bladder gases from a fishes body cavity after being brought up from depth.

15.0 TABLES FROM SECTION 6.5.7.1

Table 6.5.7.1.1 Landings, Revenue, and Impacts Statistics for All Impacted Vessels Under January - April Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Percentage of Shrimp Revenue Lost
Number of Vessels	446	446	446	446	446	446
Minimum	313	681	19	0	75	0
Maximum	7,062,364	$15,038,002	54,939	1	$174,955	1
Total	38,319,516	$112,057,682	2,598,291*	N/A	$9,490,920*	N/A
Mean	85,918	$251,250	5,825	11.9	$21,280	12.9
Standard Deviation	334,252	$716,311	6,090	17.1	$22,728	17.7

*Lost landings and revenues that could not be attributed to specific vessels are 37,028 pounds and $132,300 respectively.

Table 6.5.7.1.2 Landings, Revenue, and Impacts Statistics for All Impacted Vessels Under May 15 - July 15 Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Percentage of Shrimp Revenue Lost
Number of Vessels	961	961	961	961	961	961
Minimum	115	$111	39	0	$60	0
Maximum	7,062,364	$15,038,002	76,577	100	$186,874	100
Total	65,220,886	$181,990,527	6,818,710*	N/A	$17,204,177*	N/A
Mean	67,868	$189,376	7,095	15.5	$17,902	14.1
Standard Deviation	230,178	$500,050	7,463	16.1	$20,575	15.2

*Lost landings and revenues that could not be attributed to specific vessels are 76,577 pounds and $186,874 respectively.

Table 6.5.7.1.3 Landings, Revenue, and Impacts Statistics for All Impacted Vessels Under October - November Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Percentage of Shrimp Revenue Lost
Number of Vessels	485	485	485	485	485	485
Minimum	511	$1,121	65	0	$162	0
Maximum	7,062,364	$15,038,002	58,535	100	$195,120	100
Total	39,782,657	$116,157,966	4,961,424*	N/A	$16,289,175*	N/A
Mean	82,026	$239,501	10,230	17.0	$33,586	17.2
Standard Deviation	320,328	$684,252	9,778	14.2	$32,590	14.1

*Lost landings and revenues that could not be attributed to specific vessels are 58,535 pounds and $195,120 respectively.

Table 6.5.7.1.4 Landings, Revenue, and Impacts Statistics for All Impacted Qualifying Vessels Under January - April Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Pe of R
Number of Vessels	417	417	417	417	417	417	417	417	417	417	417	417	
Minimum	313	$681	$0	$0	$0	$0	$681	$717	47.9	19	0.0	$75	
Maximum	288,202	$757,104	$0	$0	$0	$22,211	$757,104	$757,104	100.0	54,939	100.0	$174,955	
Total	30,134,185	$94,280,383	$0	$0	$0	$74,423	$94,280,383	$94,354,806	N/A	2,483,589	N/A	$9,105,329	
Mean	72,264	$226,092	$0	$0	$0	$178	$226,092	$226,271	99.8	5,956	11.5	$21,835	
Standard Deviation	46,033	$143,326	$0	$0	$0	$1,352	$143,326	$143,310	2.6	5,998	15.8	$22,351	

Table 6.5.7.1.5 Landings, Revenue, and Impacts Statistics for All Impacted Qualifying Vessels Under May 15 - July 15 Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue
Number of Vessels	720	720	720	720	720	720	720	720	720	720	720	720
Minimum	1,069	$4,811	$0	$0	$0	$0	$4,811	$4,811	23.5	43	0.1	$96
Maximum	306,389	$757,104	$0	$216,599	$12,735	$42,809	$757,104	$757,104	100.0	42,045	100.0	$124,443
Total	52,013,176	$154,680,370	$0	$665,753	$25,369	$182,537	$155,346,123	$155,554,028	N/A	5,915,796	N/A	$15,678,383
Mean	72,241	$214,834	$0	$925	$35	$254	$215,759	$216,047	99.3	8,216	13.3	$21,776
Standard Deviation	43,340	$137,411	$0	$12,028	$551	$2,319	$137,277	$137,125	6.0	7,486	12.3	$20,960

Table 6.5.7.1.6 Landings, Revenue, and Impacts Statistics for All Impacted Qualifying Vessels Under October - November Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	P c
Number of Vessels	444	444	444	444	444	444	444	444	444	444	444	444	
Minimum	511	$1,121	$0	$0	$0	$0	$1,121	$1,121	55.8	65	0.1	$175	
Maximum	306,389	$653,671	$0	$16,411	$0	$39,754	$653,671	$654,235	100.0	56,572	100.0	$187,561	
Total	31,120,053	$97,231,100	$0	$25,020	$0	$97,388	$97,256,120	$97,353,507	N/A	4,764,390	N/A	$15,669,534	
Mean	70,090	$218,989	$0	$56	$0	$219	$219,045	$219,265	99.8	10,731	17.5	$35,292	
Standard Deviation	41,439	$119,417	$0	$840	$0	$2,326	$119,379	$119,361	2.8	9,587	13.7	$31,944	

Table 6.5.7.1.7 Landings, Revenue, and Impacts Statistics for All Impacted Large Qualifying Vessels Under January – April Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Pe of R
Number of Vessels	388	388	388	388	388	388	388	388	388	388	388	388	
Minimum	753	$2,297	$0	$0	$0	$0	$2,297	$2,297	95.5	19	0.0	$131	
Maximum	288,202	$757,104	$0	$0	$0	$9,553	$757,104	$757,104	100.0	54,939	100.0	$174,955	
Total	28,668,394	$92,009,247	$0	$0	$0	$51,458	$92,009,247	$92,060,705	N/A	2,423,884	N/A	$9,048,492	
Mean	73,888	$237,137	$0	$0	$0	$133	$237,137	$237,270	99.9	6,247	12.0	$23,321	
Standard Deviation	45,672	$141,297	$0	$0	$0	$840	$141,297	$141,348	0.3	6,067	16.2	$22,467	

Table 6.5.7.1.8 Landings, Revenue, and Impacts Statistics for All Impacted Large Qualifying Vessels Under May 15 - July 15 Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue
Number of Vessels	649	649	649	649	649	649	649	649	649	649	649	649
Minimum	1,069	$4,811	$0	$0	$0	$0	$4,811	$4,811	23.5	43	0.1	$120
Maximum	306,389	$757,104	$0	$216,599	$12,735	$24,277	$757,104	$757,104	100.0	42,045	100.0	$124,443
Total	49,205,721	$149,865,061	$0	$665,753	$25,369	$85,065	$150,530,814	$150,641,247	N/A	5,658,471	N/A	$15,264,517
Mean	75,818	$230,917	$0	$1,026	$39	$131	$231,943	$232,113	99.4	8,719	13.4	$23,520
Standard Deviation	42,851	$134,261	$0	$12,666	$581	$1,152	$133,985	$133,973	5.5	7,639	12.5	$21,288

Table 6.5.7.1.9 Landings, Revenue, and Impacts Statistics for All Impacted Large Qualifying Vessels Under October - November Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue
Number of Vessels	432	432	432	432	432	432	432	432	432	432	432	432
Minimum	1,681	$3,916	$0	$0	$0	$0	$3,916	$3,916	55.8	90	0.1	$298
Maximum	306,389	$653,671	$0	$16,411	$0	$26,341	$653,671	$654,235	100.0	56,572	100.0	$187,561
Total	30,522,523	$96,162,303	$0	$25,020	$0	$56,969	$96,187,323	$96,244,291	N/A	4,737,190	N/A	$15,605,365
Mean	70,654	$222,598	$0	$58	$0	$132	$222,656	$222,788	99.8	10,966	17.7	$36,124
Standard Deviation	41,319	$118,627	$0	$852	$0	$1,388	$118,587	$118,665	2.2	9,608	13.8	$31,975

Table 6.5.7.1.10 Landings, Revenue, and Impacts Statistics for All Impacted Small Qualifying Vessels Under January - April Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Perc of S Re
Number of Vessels	29	29	29	29	29	29	29	29	29	29	29	29	
Minimum	313	$681	$0	$0	$0	$0	$681	$717	47.9	32	0.1	$75	
Maximum	196,942	$300,383	$0	$0	$0	$22,211	$300,383	$300,942	100.0	11,444	19.3	$11,175	
Total	1,465,791	$2,271,136	$0	$0	$0	$22,965	$2,271,136	$2,294,101	N/A	59,705	N/A	$56,837	
Mean	50,545	$78,315	$0	$0	$0	$792	$78,315	$79,107	98.0	2,059	6.2	$1,960	
Standard Deviation	46,114	$70,349	$0	$0	$0	$4,121	$70,349	$69,883	9.7	2,981	6.4	$2,462	

Table 6.5.7.1.11 Landings, Revenue, and Impacts Statistics for All Impacted Small Qualifying Vessels Under May 15 - July 15 Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Perc of S Re
Number of Vessels	71	71	71	71	71	71	71	71	71	71	71	71	
Minimum	4,064	$8,040	$0	$0	$0	$0	$8,040	$8,059	47.9	54	0.2	$96	
Maximum	196,942	$300,383	$0	$0	$0	$42,809	$300,383	$300,942	100.0	15,039	51.0	$23,421	
Total	2,807,455	$4,815,309	$0	$0	$0	$97,472	$4,815,309	$4,912,781	N/A	257,325	N/A	$413,866	
Mean	39,542	$67,821	$0	$0	$0	$1,373	$67,821	$69,194	97.8	3,624	12.2	$5,829	
Standard Deviation	33,045	$52,480	$0	$0	$0	$6,444	$52,480	$52,115	9.7	3,428	10.8	$5,581	

Table 6.5.7.1.12 Landings, Revenue, and Impacts Statistics for All Impacted Small Qualifying Vessels Under October - November Closure

	Gulf Food Shrimp Landings	Gulf Food Shrimp Revenues	Gulf Bait Shrimp Revenues	S. Atlantic Shrimp Revenues	East Coast Non-Shrimp Revenues	Gulf Non-Shrimp Revenues	Total Shrimp Revenues	Total Revenues	Percentage of Revenue from Gulf Food Shrimp	Loss of Shrimp Landings	Percentage of Shrimp Landings Lost	Loss of Shrimp Revenue	Perc of S Re L
Number of Vessels	12	12	12	12	12	12	12	12	12	12	12	12	
Minimum	511	$1,121	$0	$0	$0	$0	$1,121	$1,121	63.7	65	0.1	$175	
Maximum	140,295	$230,628	$0	$0	$0	$39,754	$230,628	$231,121	100.0	6,119	23.5	$17,058	
Total	597,530	$1,068,797	$0	$0	$0	$40,419	$1,068,797	$1,109,216	N/A	27,200	N/A	$64,169	
Mean	49,794	$89,066	$0	$0	$0	$3,368	$89,066	$92,435	96.9	2,267	8.4	$5,347	
Standard Deviation	42,416	$63,206	$0	$0	$0	$11,459	$63,206	$63,224	10.5	2,064	7.8	$5,576	

Table 6.5.7.1.13 Physical Characteristics and Selected Statistics for All Impacted Qualifying Vessels Under January - April Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	392	392	392	417	417	417	415	417	226
Minimum	1	2	8	3	31	165	300	14	0.5
Maximum	5	4	86	61	130.6	3,412	55,000	235	107
Total	1,418.0	1,488.7	22,693.6	7,514.0	31,165.7	248,670.0	7,447,904.0	52,219.0	4,464.8
Mean	3.6	3.8	57.9	18.0	74.7	596.3	17,946.8	125.2	19.8
Standard Deviation	0.6	0.6	13.0	11.8	10.5	336.7	9,683.5	38.1	13.8

Table 6.5.7.1.14 Physical Characteristics and Selected Statistics for All Impacted Qualifying Vessels Under May 15 - July 15 Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	673	673	673	720	720	720	719	714	357
Minimum	2	2	8	3	38	8	400	15	1
Maximum	7	4	87	68	131	3,412	80,000	235	240
Total	2,390.2	2,493.1	38,089.0	12,453.0	53,542.8	431,406.0	12,318,810.0	88,358.0	7,360.4
Mean	3.6	3.7	56.6	17.3	74.4	599.2	17,133.3	123.8	20.6
Standard Deviation	0.7	0.7	15.5	11.2	11.6	316.9	11,070.3	41.7	17.9

Table 6.5.7.1.15 Physical Characteristics and Selected Statistics for All Impacted Qualifying Vessels Under October - November Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	428	428	428	444	444	444	443	442	245
Minimum	1	1	17	3	39	195	750	31	1.5
Maximum	5	4	86	56	130.6	3,408	80,000	213	91
Total	1,569.7	1,654.1	25,053.1	9,062.0	32,843.8	246,657.0	7,416,825.0	54,682.0	4,383.8
Mean	3.7	3.9	58.5	20.4	74.0	555.5	16,742.3	123.7	17.9
Standard Deviation	0.5	0.5	10.2	12.0	8.9	279.8	8,692.5	30.1	10.8

Table 6.5.7.1.16 Physical Characteristics and Selected Statistics for All Impacted Large Qualifying Vessels Under January - April Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	364	364	364	388	388	388	386	388	211
Minimum	1	2	17	3	60	240	1,000	40	0.75
Maximum	5	4	86	51	130.6	3,412	55,000	235	107
Total	1,349.5	1,413.7	21,868.6	6,694.0	29,698.3	237,505.0	7,363,794.0	51,005.0	4,321.8
Mean	3.7	3.9	60.1	17.3	76.5	612.1	19,077.2	131.5	20.5
Standard Deviation	0.5	0.4	10.0	11.4	8.3	339.2	9,070.0	31.4	13.8

Table 6.5.7.1.17 Physical Characteristics and Selected Statistics for All Impacted Large Qualifying Vessels Under May 15 - July 15 Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	611	611	611	649	649	649	648	649	317
Minimum	2	2	10	3	59.6	8	1,000	47	1
Maximum	7	4	87	51	130.6	3,412	80,000	235	240
Total	2,236.8	2,338.3	36,412.5	10,581.0	49,980.0	407,554.0	12,142,050.0	85,512.0	6,932.9
Mean	3.7	3.8	59.6	16.3	77.0	628.0	18,737.7	131.8	21.9
Standard Deviation	0.6	0.5	11.8	10.6	8.6	315.6	10,469.6	34.3	18.5

Table 6.5.7.1.18 Physical Characteristics and Selected Statistics for All Impacted Large Qualifying Vessels Under October - November Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	419	419	419	432	432	432	431	432	239
Minimum	1	1	17	3	59.9	195	1,000	46	1.5
Maximum	5	4	86	52	130.6	3,408	80,000	213	91
Total	1,543.7	1,626.1	24,670.1	8,714.0	32,227.9	241,120.0	7,378,175.0	54,138.0	4,334.6
Mean	3.7	3.9	58.9	20.2	74.6	558.1	17,118.7	125.3	18.1
Standard Deviation	0.5	0.5	9.6	11.9	8.1	279.1	8,500.4	28.2	10.8

Table 6.5.7.1.19 Physical Characteristics and Selected Statistics for All Impacted Small Qualifying Vessels Under January - April Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	28	28	28	29	29	29	29	29	15
Minimum	2	2	8	5	31	165	300	14	0.5
Maximum	3	4	53	61	58	871	7,800	80	36
Total	68.5	75.0	825.0	820.0	1,467.4	11,165.0	84,110.0	1,214.0	143.0
Mean	2.4	2.7	29.5	28.3	50.6	385.0	2,900.3	41.9	9.5
Standard Deviation	0.5	0.9	13.7	11.5	5.9	210.5	1,794.1	13.7	8.2

Table 6.5.7.1.20 Physical Characteristics and Selected Statistics for All Impacted Small Qualifying Vessels Under May 15 - July 15 Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	62	62	62	71	71	71	71	65	40
Minimum	2	2	8	5	38	115	400	15	1.5
Maximum	4	4	80	68	59.3	1,271	7,800	130	41
Total	153.3	154.8	1,676.5	1,872.0	3,562.8	23,852.0	176,760.0	2,846.0	427.5
Mean	2.5	2.5	27.0	26.4	50.2	335.9	2,489.6	43.8	10.7
Standard Deviation	0.5	0.8	15.9	12.6	6.0	177.3	1,598.5	18.0	7.7

Table 6.5.7.1.21 Physical Characteristics and Selected Statistics for All Impacted Small Qualifying Vessels Under October - November Closure

	Crew Size	Number of Nets	Net Size (feet)	Vessel Age	Length (feet)	Horsepower	Fuel Capacity (gallons)	Gross Tons	Hold Capacity (tons)
Number of vessels	9	9	9	12	12	12	12	10	6
Minimum	2	2	17	10	39	220	750	31	4.25
Maximum	4	4	80	56	59.2	1,271	10,000	130	10
Total	26.0	28.0	383.0	348.0	615.9	5,537.0	38,650.0	544.0	49.3
Mean	2.9	3.1	42.6	29.0	51.3	461.4	3,220.8	54.4	8.2
Standard Deviation	0.8	1.1	18.9	13.5	6.4	303.5	2,552.5	28.9	2.5

Table 6.5.7.1.22 Distribution of Additional Physical Characteristics for All Impacted Qualifying Vessels Under January - April Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	95.2	Freezer	74.8	Otter Trawl	100.0
Wood	3.1	Ice	25.2		
Fiberglass	1.7				

Table 6.5.7.1.23 Distribution of Additional Physical Characteristics for All Impacted Qualifying Vessels Under May 15 - July 15 Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	92.6	Freezer	67.5	Otter Trawl	100.0
Wood	4.0	Ice	32.5		
Fiberglass	3.1				
Other	.3				

Table 6.5.7.1.24 Distribution of Additional Physical Characteristics for All Impacted Qualifying Vessels Under October - November Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	92.6	Freezer	77.7	Otter Trawl	100.0
Wood	3.8	Ice	22.3		
Fiberglass	3.6				

Table 6.5.7.1.25 Distribution of Additional Physical Characteristics for All Impacted Large Qualifying Vessels Under January - April Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	97.2	Freezer	79.9	Otter Trawl	100.0
Wood	1.5	Ice	20.1		
Fiberglass	1.3				

Table 6.5.7.1.26 Distribution of Additional Physical Characteristics for All Impacted Large Qualifying Vessels Under May 15 - July 15 Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	96.3	Freezer	74.0	Otter Trawl	100.0
Fiberglass	2.0	Ice	26.0		
Wood	1.5				
Other	.2				

Table 6.5.7.1.27 Distribution of Additional Physical Characteristics for All Impacted Large Qualifying Vessels Under October - November Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	93.3	Freezer	79.6	Otter Trawl	100.0
Wood	3.5	Ice	20.4		
Fiberglass	3.2				

Table 6.5.7.1.28 Distribution of Additional Physical Characteristics for All Impacted Small Qualifying Vessels Under January - April Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	69.0	Freezer	93.1	Otter Trawl	100.0
Wood	24.0	Ice	6.9		
Fiberglass	6.9				

Table 6.5.7.1.29 Distribution of Additional Physical Characteristics for All Impacted Small Qualifying Vessels Under May 15 - July 15 Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	59.2	Freezer	91.5	Otter Trawl	100.0
Wood	26.8	Ice	8.5		
Fiberglass	12.7				
Other	1.3				

Table 6.5.7.1.30 Distribution of Additional Physical Characteristics for All Impacted Small Qualifying Vessels Under October - November Closure

Hull Type	Percent	Refrigeration	Percent	Gear	Percent
Steel	66.7	Freezer	91.7	Otter Trawl	100.0
Fiberglass	16.7	Ice	8.3		
Wood	16.7				

APPENDIX A: SCOPING INFORMATION AND ALTERNATIVES CONSIDERED BUT REJECTED

The Gulf of Mexico Fishery Management Council (Council) held ten scoping meetings in January 2006 to solicit input on the scope and content of Amendment 27 to the Reef Fish FMP/Amendment 14 to the Shrimp FMP and its associated draft supplemental environmental impact statement (DSEIS) (71 FR 1519). The notice of intent to prepare a DSEIS was published in the *Federal Register* on October 4, 2005 (70 FR 57859). Additionally, the Council accepted comments submitted in writing and through public testimony provided during scheduled Council meetings.

The Amendment 27/14 Public Hearing Draft and associated DSEIS evaluates and addresses many of the alternatives and comments offered by the public in response to the Council's options paper distributed in June 2006. This appendix describes additional alternatives considered but eliminated from more detailed study in the Public Hearing Draft/DSEIS. The reasonableness of each is discussed in the context of its feasibility and the purpose and need for action. Additional discussion of these alternatives and issues is available in the 2005 and 2006 meeting minutes of the Joint Reef Fish-Shrimp Committee and Full Council, which can be accessed at http://www.gulfcouncil.org.

The 45-day comment period on the Amendment 27/14 Public Hearing Draft/DSEIS will be noticed in the *Federal Register*, as well as the dates and locations of public hearings on the amendment, which are currently scheduled to occur in late September and mid October. A copy of the 'Dear Reviewer' letter containing details on how to submit comments on the DSEIS, and this DSEIS can be found on the SERO Web page (http://sero.nmfs.noaa.gov/). Written comments on this document may also be mailed to Mr. Wayne Swingle and Dr. Roy Crabtree at the following addresses:

Wayne Swingle, Executive Director
Gulf of Mexico Fishery Management Council
2203 N Lois Avenue, Suite 1100
Tampa, FL 33607

Dr. Roy Crabtree, Regional Administrator
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue S
St. Petersburg, FL 33701

Alternatives Considered During The Scoping Process, But Eliminated From Detailed Study In The Amendment

Directed Red Snapper Fishery

1. **Prevent the commercial red snapper fishery from monopolizing the red snapper resource due to disparities in fishing seasons or other regulations. Specific alternatives proposed/considered include:**
   - **Establish consistent commercial and recreational seasons.**
   - **Establish consistent commercial and recreational minimum size limits.**
   - **Apply commercial depth restrictions to all or select commercial gear types.**

   Discussion: A number of recreational fishermen have expressed their concern that differing regulatory alternatives being evaluated for the commercial and recreational sectors will exacerbate user conflicts in the fishery. Consequently, they have requested the Council either establish consistent commercial and recreational seasons and minimum size limits, or move the commercial fishery offshore. The differing management regimes, objectives, and effects of the two fisheries make it unreasonable to attempt to apply the same regulations to both.

   The IFQ program proposed in Amendment 26 to the Reef Fish FMP, and currently under Secretarial review, will control commercial harvest, thereby eliminating the need for seasonal closures in the commercial red snapper fishery. However, although access to the for-hire fishery is limited, the number of participants harvesting the recreational allocation is too high to allow for a year round fishery. Additionally, as detailed in the Public Hearing Draft/DSEIS, the effects of alternative minimum size limits for each sector differ because the discard mortality rates of and number of fish released by each sector differ. Reducing or eliminating the commercial minimum size limit would reduce the overall fishing mortality rate of that sector and allow the stock to recovery slightly faster, whereas reducing or eliminating the recreational minimum size limit would slow stock recovery. This occurs because most fish released by the commercial fishery die, rather than contribute to the quota, whereas a larger fraction of fish released by the recreational fishery survive to spawn and/or be recaptured at a larger size.

   The proposed IFQ program is expected to further reduce user conflicts by dispersing the commercial fishery, both temporally and spatially. Moving the commercial fishery offshore to attempt to reduce potential user conflicts would reduce the flexibility and efficiency of commercial fishermen under the IFQ program, and would likely increase the discard mortality rate of that fishery on red snapper and other species, like vermilion snapper, because survival rates decrease in deeper waters.

2. **Consider alternative allocation formats.**

   Discussion: Some recreational fishermen have requested the Council consider altering the way the total allowable catch quota is currently allocated between the commercial and recreational sectors. The range of management actions the Council is considering in Amendment 27/14 is intended to address excessive fishing mortality rates across all fisheries in response to the findings of the recent red snapper stock assessment. Consequently, such an action could be considered in a future amendment, but does not fall within the scope of this amendment.

3. **Eliminate the minimum size limit in the recreational fishery.**

   <u>Discussion</u>: Eliminating the recreational minimum size limit is considered unreasonable because Porch (2005) indicates such an action would significantly slow the recovery rate of the red snapper stock.

4. **Allow recreational anglers to retain the first four or five fish they capture.**

   <u>Discussion</u>: Preliminary analysis indicated this regulation would increase total recreational fishing mortality Gulf-wide and across all modes.

5. **Create a recreational red snapper fishery advisory panel to develop a long-term plan and evaluate alternatives, such as: licenses; tag and/or stamp programs; charter IFQ; and community-based angling clubs.**

   <u>Discussion</u>: This action is beyond the scope of this amendment, the purpose of which is to address SEDAR recommendations related to bringing the projected red snapper recovery rate back in line with the rebuilding plan approved in Amendment 22. However, activities are ongoing at the national level to improve data collection and reporting in recreational fisheries. The U.S. Congress is currently considering establishing a national recreational licensing program through Magnuson-Stevens Act reauthorization. Additionally, NMFS is working to improve MRFSS in response to a recent National Research Council review. The Council may choose to establish an advisory panel to consider the effects of these activities and discuss the feasibility of implementing a community-based or dedicated access type program for the recreational fishery if there is sufficient interest.

6. **Establish a recreational pilot program to reduce the effects of derby management. The specific alternative proposed/considered is:**
   - **TX proposal that would allow fishing last 15 days of each month.**

   <u>Discussion</u>: This proposal was modified to request the Council consider weekend opening options. These options are described and evaluated in Section 2.

7. **Improve the enforcement of existing longline boundaries.**

   <u>Discussion</u>: The vessel monitoring system requirement proposed in Amendment 18A to the Reef Fish FMP and, again, in Amendment 26 to the Reef Fish FMP is expected to improve enforcement of existing longline boundaries, as well as other commercial reef fish fishery regulations.

8. **Implement gear restrictions to reduce bycatch. Specific alternatives proposed/considered include:**
   - **Specify only allowable commercial gear types are vertical hook and line and spearfishing.**
   - **Limit the number of hooks used on commercial vertical line gear to:**
     - **15 hooks.**
     - **10 hooks.**

– **5 hooks.**

<u>Discussion</u>: The biological benefits of eliminating longline vessels from the fishery are questionable because vertical hook and line gear accounts for over 95 percent of annual red snapper landings, and such an action would force longline vessels who qualify for IFQ shares based on their catch history to discard red snapper taken incidental to other fishery operations at depths where the discard mortality rate is very high. Preliminary analyses indicated the minimum size limit and gear restriction alternatives evaluated by the Council in Sections 5.1 and 5.4, respectively, would be substantially more effective in reducing or eliminating regulatory discards than would limiting the number of hooks used on commercial vertical line gear, and more economical. Both these rejected alternatives would reduce efficiency under the IFQ program.

9. Establish marine protected areas and/or time-area closures.

<u>Discussion</u>: Several people have requested the Council consider establishing marine protected areas or time-area closures to further reduce bycatch in the directed red snapper fishery. The Council has restricted or prohibited fishing within a number of areas in the Gulf of Mexico, including the Alabama Special Management Zone, a reef fish longline and buoy gear restricted area, the Tortugas Marine Reserves, the Florida Middle Grounds Habitat Area of Particular Concern (HAPC), the West and East Flower Garden Banks HAPC, the reef fish stressed area, and the Madison-Swanson and Steamboat Lumps marine reserves. The effectiveness of closing additional areas for the purpose of reducing red snapper bycatch in the directed fishery is questionable given the broad distribution of the red snapper stock, the effects of closed areas on effort shifting, and the multispecies nature of the Gulf of Mexico reef fish fishery. The size distribution of red snapper is not stratified by depth, and there is currently no evidence that directed fishery bycatch of red snapper is unusually high in a particular area. Further, because the red snapper co-occurs with a number of other reef fish species targeted by commercial and recreational fisheries, the Council would be required to prohibit the take of multiple species inside the closed area to limit the bycatch mortality of red snapper. Given the questionable benefits of a spatial management strategy to the red snapper stock, the Council believes it would be inequitable to limit the take of some co-occurring species, like vermilion snapper, which is determined not overfished and not undergoing overfishing. And the potential effects of shifting, or further concentrating effort, outside such a closed area are not well understood.

10. Establish compatible seasons for red snapper and vermilion snapper.

<u>Discussion</u>: The IFQ proposed in Amendment 26 to the Reef Fish FMP will control the commercial harvest of red snapper, thereby eliminating the need for seasonal closures in the commercial fishery. The recreational red snapper fishery is managed with seasonal closures; however, the recreational vermilion snapper fishery is not, and the most recent vermilion snapper stock assessment does not suggest a need for additional regulatory measures in that fishery. Consequently, the gear restriction alternatives evaluated by the Council in Section 5 are considered more reasonable methods of minimizing the bycatch of both species.

11. Account for recreational quota overages in subsequent seasons.

<u>Discussion</u>: The regulatory measures proposed by the Council in this amendment are intended to constrain the recreational fishery to its allocation. Recreational catch data are not available in time to manage accidental overages in real time or even annually. However, periodic assessments and reviews will identify and require managers to account for overages. Such a review formed the basis for this amendment. The next such review is scheduled for 2009.

12. **Evaluate 3, 4, and 6 MP TAC alternatives, and other TAC alternatives that would set fishing mortality rates as close to zero as possible.**

    Discussion: The Council considers TACs less than 5 million pounds inconsistent with the National Standard 8 mandate to minimize to the extent practicable adverse effects on fishing communities because the 2005 SEDAR assessment indicates a 5 million pound TAC is capable of ending overfishing immediately. A 6 million pound TAC falls within the range of TACs evaluated by the Council in Section 5.1

13. **Evaluate commercial minimum size limit alternatives other than 13" and no size limit. Specific alternatives proposed/considered include:**
    - **Reduce the minimum size limit to 12".**

    Discussion: **The 2005 SEDAR assessment indicates a commercial minimum size limit greater than 13" would have relatively little effect on the recovery rate of the stock and is probably slowing stock recovery because of the high discard mortality rate of the commercial fishery; particularly in the western Gulf, where the discard mortality rate is estimated to be 40 percent, but also in the eastern Gulf. The assessment indicated the effects of a 12" minimum size limit would be similar to those of eliminating the minimum size limit, which are fully evaluated in Section 5.1.**

14. **Establish a mandatory recreational record keeping and bycatch reporting requirement.**

    Discussion: This action is beyond the scope of this amendment, the purpose of which is to address SEDAR recommendations related to bringing the projected red snapper recovery rate back in line with the rebuilding plan approved in Amendment 22. Currently, the MRFSS program collects bycatch information on the recreational fishery. NMFS is working to improve that program in response to the recent National Research Council review. Additionally, the U.S. Congress is currently considering establishing a national recreational licensing program through Magnuson-Stevens Act reauthorization.

15. **Evaluate data collection alternatives essential to successfully rebuilding red snapper, such as: expand logbook program to larger section of the commercial fleet; increase observer coverage (consider coverage level and funding source sub-options); federal permits or licenses; and VMS.**

    Discussion: This action is beyond the scope of this amendment, the purpose of which is to address SEDAR recommendations related to bringing the projected red snapper recovery rate back in line with the rebuilding plan approved in Amendment 22. However, some actions recently proposed by the Council are expected to improve data collection in the fishery. Amendment 22 to the Reef Fish FMP proposes the development of a NMFS-managed observer program, which would require randomly selected reef fish vessels carry observers to collect bycatch information. Amendment 18A to the Reef Fish FMP proposes to require vessel monitoring systems onboard reef fish vessels. Also, the IFQ program proposed in Amendment 26 will provide real-time accounting of commercial landings. Finally, the U.S.

Congress is currently considering a national recreational license program in Magnuson-Stevens Act reauthorization discussions.

16. **Specify a rebuilding control rule to prevent TAC increases in response to strong recruitment events.**

    <u>Discussion</u>: The red snapper rebuilding plan approved in Amendment 22 to the Reef Fish FMP specifies catches will remain constant as the stock rebuilds. While the plan provides for needed adjustments following period reviews to ensure stock rebuilding stays on track, any such adjustments must be consistent with the approved rebuilding schedule and, thus, could not compromise stock rebuilding.

17. **Evaluate rebuilding review and evaluation alternatives, such as: compare annual total mortality w/specified total mortality on annual basis; make in-season adjustments or subsequent year adjustments to compensate for overages or reduce total mortality value following years to account for past year overages; and establish a 2-year review protocol w/trigger mechanism to ensure timely action. Additionally, consider rebuilding probabilities ranging from 50 to 90 percent.**

    <u>Discussion</u>: The current red snapper rebuilding plan is designed to ensure at least a 50 percent probability of achieving rebuilding goals, and provides for periodic reviews of where directed and incidental fishing mortality rates are in relation to those goals. This type of total mortality accounting forms the basis for this amendment. The next review is scheduled for 2009, and could require additional regulatory action if it indicates overages have occurred or fisheries have failed to achieve their bycatch reduction targets. Real-time bycatch monitoring and accounting is not currently feasible because recreational discards are calculated from the predicted catch-at-age matrices used in the 2005 SEDAR stock assessment. However, period reviews and adjustments will consistently increase the probability of achieving rebuilding on schedule.

18. **Lock-in post Hurricane effort reductions in the recreational fishery.**

    <u>Discussion</u>: The Council recently capped participation in the for-hire fishery through Amendment 25 to the Reef Fish Fishery. Preliminary fishing effort and landings data suggests some decrease in effort has occurred post-hurricane Katrina due to the direct effects of hurricanes, as well as increased fuel costs. Some decrease in effort was reported in all states, with the greatest changes in trips occurring in Mississippi and Louisiana during the months immediately following Hurricane Katrina. An analysis of an assumed 10 and 25 percent reduction in effort is included for Action 2 herein in Sections 2.0 and 5.0.

19. **Establish differing regulations for the eastern and western Gulf.**

    <u>Discussion</u>: Establishing differing regulations in the commercial fishery would compromise the objectives of the IFQ program recently proposed by the Council in Amendment 26 to the Reef Fish FMP by reducing the flexibility and efficiency of IFQ participants. The Council is considering differing recreational seasons in the eastern and western Gulf in Section 2.1.

20. **Establish and monitor a bycatch quota.**

Discussion: Currently, stock assessments estimate all sources of bycatch mortality and account for this mortality in total mortality estimates. Consequently, bycatch mortality has already been removed from the directed fishery ABC and TAC. As a result, a bycatch quota would be defined separate from the ABC and TAC. This would provide no benefits compared to no action unless an effective real-time bycatch mortality monitoring system could be developed, and the recreational fishery closed when the bycatch quota is reached. Such real-time bycatch monitoring and accounting is not currently feasible. Because recreational discards are calculated from the predicted catch-at-age matrices used in the 2005 SEDAR stock assessment, they can only be accounted for after subsequent assessments are completed. The next such assessment is scheduled for 2009. If it indicates the fisheries are not achieving their bycatch reduction targets, then additional regulatory action will be required and taken at that time.

21. **Alternative bag limit, minimum size limit, and seasonal closure combinations for the recreational sector.**

Discussion: The Council considered a number of additional minimum size limit, bag limit, and seasonal closure combinations, some of which fall within the range of those fully evaluated in Section 5.1, and others which did not achieve the necessary reductions.

Shrimp Fishery

Most of the shrimp fishery alternatives eliminated from detailed study in Amendment 27/14 are being evaluated in Shrimp Amendment 15. These include seasonal and/or area closures, a bycatch quota program, additional gear restrictions to reduce bycatch, and long-term effort management programs. The Council is evaluating these alternatives in a separate amendment to ensure it acts quickly to end overfishing in the directed red snapper fishery, as information to evaluate the need for, and effects of, these shrimp fishery alternatives is not currently available. Information needs include the number of participants who will apply for a moratorium permit under GMFMC (2005b), and the findings of two ad hoc working groups established by the Council. However, the amendment provides shrimp fishery participants one year to apply for a moratorium permit. The Ad Hoc Shrimp Effort Working Group is charged with determining the optimal levels of effort to produce maximum sustainable yield and maximum economic yield in the shrimp fishery. The Ad Hoc Shrimp Effort Management Advisory Panel is charged with evaluating alternative effort management strategies. Additional discussion specific to each shrimp fishery alternative eliminated from detailed study is described below.

1. **Evaluate alternative BRDs.**

Discussion: The Council is currently proposing in a regulatory amendment alternative certification criterion intended to increase flexibility, promote innovation, and allow for the certification of BRDs that achieve bycatch reduction levels equivalent to when BRDs were first introduced in the fishery. This action was evaluated and proposed separately to ensure the data and analytical needs associated with Amendment 27/14 do not prevent the Council from acting to address BRD performance as quickly as possible. However, the effects of this reasonably foreseeable future action are considered when evaluating the cumulative impacts of actions proposed in Amendment 27/14.

2. **Evaluate MPAs and time/area closures. Specific alternatives proposed/considered include:**
   - **Expand the Texas closure into entire Gulf and extend this closure through August or September.**
   - **Close hotspots using new GIS research.**
   - **Expand the Texas closure to include Louisiana or the entire Gulf.**
   - **Implement daytime closures.**

   Discussion: The Council is currently evaluating in Amendment 15 to the Shrimp FMP the potential benefits of area or seasonal closures in at least five areas identified through a review of recent literature and ongoing research programs. Three of these areas are located off the coast of Texas, one is located south of Mobile, and one is located west of the Mississippi Delta.

3. **Establish and monitor a bycatch quota. Specific bycatch quota alternatives proposed/considered include:**
   - **Establish a bycatch quota for the summer brown shrimp season (May 1 - August 31 of each year) and prohibit shrimp trawling in the EEZ once 75%, 85%, or 95% of the current average estimate of bycatch during this period has been taken during any given year.**
   - **Establish a bycatch quota for the fall white shrimp season (September 1 - November 30 of each year) and prohibit shrimp trawling in the EEZ once 75%, 85%, or 95% of the current average estimate of bycatch during this period has been taken during any given year.**
   - **Establish a bycatch quota for the winter and spring pink shrimp season (December 1 - April 30 of each year) and prohibit shrimp trawling in the EEZ once 75%, 85%, or 95% of the current average estimate of bycatch during this period has been taken during any given year.**
   - **Establish a bycatch quota by statistical subzone or combinations of subzones and prohibit shrimp trawling in the EEZ of such zones once 75%, 85%, or 95% of the current average estimate of bycatch from these zones has been taken during any given year.**
   - **Establish a bycatch quota by state (extending state lines by longitude to the limits of the EEZ) and prohibit shrimp trawling in the EEZ off such states once 75%, 85%, or 95% of the current average estimate of bycatch from a state has been taken during any given year.**
   - **Establish a bycatch quota for all species, year-round and prohibit shrimp trawling in the EEZ once 75%, 85%, or 95% of the current average estimate of bycatch has been taken during any given year.**
   - **Establish a bycatch quota for only red snapper and prohibit shrimp trawling in the EEZ once 75%, 85%, or 95% of the current average estimate of red snapper bycatch has been taken during any given year**
   - **Establish a bycatch quota for only the managed species in the EEZ and prohibit shrimp trawling in the EEZ once 75%, 85%, or 95% of the current average estimate of bycatch has been taken during any given year for:**
     – **Any managed species**
     – **All managed species**
     – **Only overfished species or species undergoing overfishing**

Specific bycatch quota monitoring alternatives proposed/considered include:

- **Use the standardized bycatch monitoring program established in Amendment 13 to the Shrimp FMP.**
- **Require fishermen to retain/weigh/count all bycatch subject to a quota.**
- **Authorize the NMFS to implement a bycatch quota monitoring program in accordance with any established bycatch quota program recommended by the Council and approved by NMFS.**

Specific bycatch quota enforcement alternatives proposed/considered include:

- **Require a properly functioning NMFS certified VMS aboard all shrimp trawl vessels fishing in or transiting one of the following areas: The Gulf of Mexico EEZ off West Coast of Florida South of 29ºN. Latitude; the Gulf of Mexico EEZ off Texas during any period in which only part of these waters is closed in conjunction with the Texas Closure; or the Gulf of Mexico EEZ off the West Coast of Florida South of 29ºN. Latitude, and the Gulf of Mexico EEZ off Texas during any period in which only part of these waters is closed in conjunction with the Texas Closure.**

Discussion: The Council is currently evaluating the feasibility of a bycatch quota program in Shrimp FMP Amendment 15. Preliminary analyses indicate the monitoring and enforcements components of a bycatch quota program are quite costly, particularly considering current economic conditions in the shrimp fishery and the questionable effectiveness of a strategy designed to manage the total number of juvenile red snapper captured in shrimp trawl gear. Statistical analyses conducted by NMFS Southeast Fisheries Science Center, Galveston Laboratory, indicate red snapper fishing mortality in the shrimp fishery is better correlated with offshore shrimp fishing effort than with the number of juvenile red snapper captured. This is because the fishing mortality rate is proportional to the number of juvenile red snapper available to the fishery. Consequently, the shrimp fishery would be expected to take larger numbers of juvenile red snapper in years of high recruitment relative to years of low recruitment, but the same proportion of red snapper in years of high recruitment relative to years of poor recruitment.

4. **Create a shrimp advisory panel to develop a long-term plan and evaluate alternatives, like latent permits, IFQs, bycatch quotas.**

Discussion: As noted in the introductory paragraph above, the Council is currently soliciting nominations for members of an Ad Hoc Shrimp Effort Management Advisory Panel to be established at its August 2006 meeting, and charged with evaluating alternative strategies for capping or reducing effort in the shrimp fishery.

5. **Establish additional gear restrictions to reduce bycatch. Specific alternatives proposed/considered include:**
   - **Limit the amount and/or type of trawl gear used by shrimp vessels.**

Discussion: The Council is currently proposing alternative BRD certification criterion in a regulatory amendment, and evaluating additional gear and effort restrictions in Shrimp FMP Amendment 15.

6. **Evaluate data collection alternatives essential to successfully rebuilding red snapper, such as: expand logbook program to larger section of the commercial fleet; increase**

observer coverage (consider coverage level and funding source sub-options); federal permits or licenses; and VMS.

<u>Discussion</u>: The Council recently evaluated most of these alternatives in Shrimp FMP Amendment 13. That amendment implemented an indefinite moratorium on shrimp permits; required a statistically valid sample of shrimp vessel permit holders to report via an electronic logbook program both the size and number of shrimp trawls deployed for each set and the type of BRD and TED utilized; and required randomly selected shrimp permit holders representing all statistical sub-zones to carry observers in order to collect bycatch and effort information. The amendment provides shrimp fishery participants one year to apply for a moratorium permit. The Council is currently evaluating in Shrimp FMP Amendment 15 the effects of a vessel monitoring system program in the shrimp fishery.

7. **Establish a total mortality limit for the shrimp fishery.**

   <u>Discussion</u>: As discussed in Shrimp FMP Amendment 13, it is not reasonable to manage shrimp harvest with a total allowable catch quota because shrimp species are short lived (essentially annual crops) and the year-class strength of shrimp populations is influenced primarily by environmental factors rather than by catch rates. Thus, fishing mortality is not believed to affect the long-term sustainability of shrimp populations unless the spawning stock has been reduced below a minimum threshold level by environmental conditions. Additionally, preliminary analyses indicate shrimp effort is a much better proxy for red snapper fishing mortality than is the number of red snapper taken incidental to the fishery. As noted in the introductory paragraph, the Council has established an Ad Hoc Shrimp Effort Working Group to determine the optimal levels of effort to produce maximum sustainable yield and maximum economic yield in the shrimp fishery, and is currently soliciting nominations for members of an Ad Hoc Shrimp Effort Management Advisory Panel that will be charged with evaluating alternative strategies for capping or reducing effort in the shrimp fishery.

8. **Implement a shrimp effort reduction program. Specific alternatives proposed/considered include:**
   - **Limit the number and/or duration of shrimp trawl trips by month, year, landings history, trip history, etc.**
   - **Specify the number of days or trips per month or per year that each qualified vessel can fish for shrimp. Set each vessel limit at or below its historical average.**
   - **Establish one of the following fractional permit systems, and require shrimp vessels to possess a full permit (i.e., two half permits) when fishing for shrimp:**
     - **Each shrimp vessel permit will revert to one-half of a permit beginning in the third, fifth, or tenth year following the implementation of the permit moratorium**
     - **Each shrimp vessel permit will revert to one-half of a permit upon transfer from one person (corporate or otherwise) to another following the implementation of the permit moratorium.**

     This provision would not apply to transfers between vessels owned by the same person (corporate or otherwise).
   - **Limit the transferability of shrimp vessel permits as follows:**
     - **Vessel permits may only be transferred to a vessel of equal or lesser size (in length)**
     - **Vessel permits may only be transferred to a vessel of equal or lesser horsepower.**

- **Vessel permits may only be transferred to a vessel or person (corporate or otherwise) that can demonstrate landings of shrimp in one of the past 3 years (or can demonstrate that the permittee or vessel could legally land and sell shrimp in a state in one of the past 3 years).**

- **Eliminate latent permits. Specific control dates proposed/considered include:**
  - **Three years from the implementation date of this amendment.**
  - **Five years from the implementation date of this amendment.**

  Specific qualifying criteria proposed/considered include:
  - **Demonstrated commercial landings of shrimp in 2 of the 3 years preceding the control date**
  - **Demonstrated commercial landings of shrimp in 3 of the 5 years preceding the control date**
  - **Demonstrated commercial landings of shrimp in excess of 10,000 pounds.**
  - **Demonstrated commercial landings of shrimp in excess of 15,000 pounds.**

Discussion: As noted in the introductory paragraph, the Council is currently evaluating these and other alternatives designed to cap or reduce effort in the shrimp fishery. The need for future actions will be determined following the completion of these analyses.

APPENDIX B: SUMMARY OF ESTIMATED REDUCTIONS IN RED SNAPPER FISHING MORTALITY RESULTING FROM VARIOUS RECREATIONAL FISHERY MANAGEMENT MEASURES

The following tables are from SERO 2006c and from unpublished data prepared for the Council in March 2007 (Strelcheck, personal communication). For a complete description of the methods used to estimate reductions in red snapper fishing mortality see SERO 2006c.

Table 1. Percent changes in harvest for various minimum size limits and bag limits. Changes in harvest include a 15 percent release mortality rate for eastern Gulf red snapper and a 40 percent release mortality rate for western Gulf red snapper.

	Bag Limit			
Size Limit	4	3	2	1
16"	0.0%	-6.8%	-17.1%	-32.5%
15"	9.8%	2.3%	-9.0%	-25.8%
14"	18.7%	10.5%	-1.7%	-19.9%
13"	26.4%	17.7%	4.7%	-14.7%

Table 2a. Percent changes in red snapper fishing mortality resulting from a 16-inch recreational minimum size limit combined with various bag limits and closed seasons.

		Bag Limit			
Open Season	Days Open	4	3	2	1
Apr 21 - Oct 31	194	0	-7	-17	-32
Apr 21 - Oct 15	178	-4	-11	-21	-36
May 1 - Oct 31	184	-6	-13	-22	-37
Apr 21 - Sept 30	163	-9	-15	-24	-38
May 1 - Oct 15	168	-12	-18	-27	-41
Apr 21 - Sept 15	148	-13	-19	-28	-41
May 1 - Sept 30	153	-15	-21	-29	-42
May 15 - Oct 31	169	-15	-21	-30	-42
Apr 21 - Aug 31	133	-17	-23	-31	-44
May 1 - Sept 15	138	-19	-25	-33	-45
May 15 - Oct 15	153	-19	-25	-33	-44
Jun 1 - Oct 31	153	-21	-27	-35	-47
Apr 21 - Aug 15	117	-22	-27	-35	-47
May 1 - Aug 31	123	-23	-28	-36	-48
May 15 - Sept 30	138	-24	-29	-37	-47
Jun 1 - Oct 15	137	-26	-31	-39	-50
Apr 21 - July 31	102	-26	-31	-39	-50
May 15 - Sept 15	123	-28	-33	-40	-50
May 1 - Aug 15	107	-29	-34	-41	-52
Jun 1 - Sept 30	122	-30	-35	-42	-52
May 15 - Aug 31	108	-32	-37	-44	-53
Jun 1 - Sept 15	107	-34	-38	-45	-55
May 1 - July 31	92	-35	-40	-47	-56
May 15 - Aug 15	92	-38	-42	-49	-57
Jun 1 - Aug 31	92	-39	-43	-49	-58
May 1 - July 15	76	-42	-46	-52	-60
May 15 - July 31	77	-44	-48	-54	-61
Jun 1 - Aug 15	76	-44	-48	-54	-62
May 1 - June 30	61	-48	-52	-57	-65
Jun 1 - July 31	61	-51	-54	-59	-67

Table 2b. Percent change in red snapper fishing mortality resulting from a 15-inch minimum size limit combined with various bag limits and closed seasons.

Open Season	Days Open	Bag Limit			
		4	3	2	1
Apr 21 - Oct 31	194	10	3	-9	-26
Apr 21 - Oct 15	178	5	-2	-13	-29
May 1 - Oct 31	184	4	-4	-14	-30
Apr 21 - Sept 30	163	1	-6	-17	-32
May 1 - Oct 15	168	-3	-10	-20	-34
Apr 21 - Sept 15	148	-4	-10	-20	-35
May 1 - Sept 30	153	-6	-12	-22	-36
May 15 - Oct 31	169	-6	-13	-22	-36
Apr 21 - Aug 31	133	-8	-15	-24	-38
May 1 - Sept 15	138	-11	-17	-26	-40
May 15 - Oct 15	153	-11	-17	-26	-39
Jun 1 - Oct 31	153	-13	-19	-28	-41
Apr 21 - Aug 15	117	-13	-19	-28	-42
May 1 - Aug 31	123	-15	-21	-30	-43
May 15 - Sept 30	138	-16	-22	-30	-42
Jun 1 - Oct 15	137	-18	-24	-32	-45
Apr 21 - July 31	102	-19	-24	-33	-45
May 15 - Sept 15	123	-20	-26	-34	-45
May 1 - Aug 15	107	-22	-27	-35	-47
Jun 1 - Sept 30	122	-23	-28	-36	-47
May 15 - Aug 31	108	-25	-30	-38	-48
Jun 1 - Sept 15	107	-27	-32	-40	-51
May 1 - July 31	92	-29	-34	-41	-52
May 15 - Aug 15	92	-32	-36	-43	-53
Jun 1 - Aug 31	92	-32	-37	-44	-54
May 1 - July 15	76	-36	-40	-47	-56
May 15 - July 31	77	-39	-43	-49	-57
Jun 1 - Aug 15	76	-39	-43	-49	-58
May 1 - June 30	61	-43	-47	-53	-61
Jun 1 - July 31	61	-46	-49	-55	-63

Table 2c. Percent change in red snapper fishing mortality resulting from a 14-inch western Gulf minimum size limit and a 15-inch eastern Gulf minimum size limit combined with various bag limits and closed seasons.

		Bag Limit			
Open Season	Days Open	4	3	2	1
Apr 21 - Oct 31	194	13	5	-6	-24
Apr 21 - Oct 15	178	8	1	-10	-27
May 1 - Oct 31	184	6	-1	-12	-28
Apr 21 - Sept 30	163	3	-4	-14	-30
May 1 - Oct 15	168	-1	-7	-18	-33
Apr 21 - Sept 15	148	-1	-8	-18	-33
May 1 - Sept 30	153	-4	-10	-20	-35
May 15 - Oct 31	169	-4	-10	-20	-34
Apr 21 - Aug 31	133	-6	-13	-22	-36
May 1 - Sept 15	138	-8	-15	-24	-38
May 15 - Oct 15	153	-9	-15	-24	-37
Jun 1 - Oct 31	153	-11	-17	-26	-40
Apr 21 - Aug 15	117	-11	-17	-26	-40
May 1 - Aug 31	123	-13	-19	-28	-41
May 15 - Sept 30	138	-14	-19	-28	-40
Jun 1 - Oct 15	137	-16	-22	-30	-43
Apr 21 - July 31	102	-17	-23	-31	-44
May 15 - Sept 15	123	-18	-24	-32	-43
May 1 - Aug 15	107	-20	-25	-33	-46
Jun 1 - Sept 30	122	-20	-26	-34	-46
May 15 - Aug 31	108	-23	-28	-36	-47
Jun 1 - Sept 15	107	-25	-30	-38	-49
May 1 - July 31	92	-27	-32	-39	-50
May 15 - Aug 15	92	-30	-34	-42	-51
Jun 1 - Aug 31	92	-30	-35	-42	-52
May 1 - July 15	76	-34	-38	-45	-55
Jun 1 - Aug 15	76	-37	-41	-47	-57
May 15 - July 31	77	-37	-41	-47	-56
May 1 - June 30	61	-41	-45	-51	-60
Jun 1 - July 31	61	-44	-48	-53	-62

Table 2d. Percent change in red snapper fishing mortality resulting from a 14-inch minimum size limit combined with various bag limits and closed seasons.

		Bag Limit			
Open Season	Days Open	4	3	2	1
Apr 21 - Oct 31	194	20	11	-1	-19
Apr 21 - Oct 15	178	14	6	-5	-23
May 1 - Oct 31	184	12	5	-7	-24
Apr 21 - Sept 30	163	9	2	-10	-26
May 1 - Oct 15	168	5	-2	-13	-29
Apr 21 - Sept 15	148	4	-3	-14	-30
May 1 - Sept 30	153	2	-5	-16	-31
May 15 - Oct 31	169	2	-5	-16	-30
Apr 21 - Aug 31	133	-1	-8	-18	-33
May 1 - Sept 15	138	-3	-10	-20	-34
May 15 - Oct 15	153	-3	-10	-20	-33
Jun 1 - Oct 31	153	-6	-12	-22	-36
Apr 21 - Aug 15	117	-6	-13	-22	-37
May 1 - Aug 31	123	-8	-14	-24	-38
May 15 - Sept 30	138	-9	-15	-24	-37
Jun 1 - Oct 15	137	-11	-18	-27	-40
Apr 21 - July 31	102	-12	-18	-27	-41
May 15 - Sept 15	123	-14	-20	-29	-40
May 1 - Aug 15	107	-15	-21	-30	-43
Jun 1 - Sept 30	122	-16	-22	-30	-43
May 15 - Aug 31	108	-19	-24	-33	-44
Jun 1 - Sept 15	107	-21	-26	-35	-46
May 1 - July 31	92	-23	-28	-36	-48
May 15 - Aug 15	92	-26	-31	-39	-49
Jun 1 - Aug 31	92	-26	-31	-39	-50
May 1 - July 15	76	-30	-35	-42	-53
May 15 - July 31	77	-33	-38	-45	-54
Jun 1 - Aug 15	76	-34	-38	-45	-55
May 1 - June 30	61	-38	-42	-49	-58
Jun 1 - July 31	61	-41	-45	-51	-60

Table 2e. Percent change in red snapper fishing mortality resulting from a 13-inch western Gulf minimum size limit and a 14-inch eastern Gulf minimum size limit combined with various bag limits and closed seasons.

		Bag Limit			
Open Season	Days Open	4	3	2	1
Apr 21 - Oct 31	194	22	14	1	-17
Apr 21 - Oct 15	178	17	9	-3	-21
May 1 - Oct 31	184	15	7	-5	-22
Apr 21 - Sept 30	163	11	4	-8	-25
May 1 - Oct 15	168	7	0	-11	-27
Apr 21 - Sept 15	148	6	-1	-12	-28
May 1 - Sept 30	153	4	-3	-14	-29
May 15 - Oct 31	169	4	-3	-14	-30
Apr 21 - Aug 31	133	1	-5	-16	-31
May 1 - Sept 15	138	-1	-8	-18	-33
May 15 - Oct 15	153	-1	-8	-18	-33
Jun 1 - Oct 31	153	-4	-10	-20	-35
Apr 21 - Aug 15	117	-4	-11	-21	-35
May 1 - Aug 31	123	-6	-12	-22	-36
May 15 - Sept 30	138	-7	-13	-22	-37
Jun 1 - Oct 15	137	-9	-15	-25	-38
Apr 21 - July 31	102	-10	-16	-25	-39
May 15 - Sept 15	123	-12	-18	-27	-40
May 1 - Aug 15	107	-13	-19	-28	-41
Jun 1 - Sept 30	122	-14	-20	-28	-41
May 15 - Aug 31	108	-17	-22	-31	-43
Jun 1 - Sept 15	107	-19	-24	-33	-45
May 1 - July 31	92	-21	-26	-34	-46
May 15 - Aug 15	92	-24	-29	-37	-48
Jun 1 - Aug 31	92	-24	-29	-37	-49
May 1 - July 15	76	-28	-33	-41	-51
Jun 1 - Aug 15	76	-32	-36	-43	-53
May 15 - July 31	77	-32	-36	-43	-54
May 1 - June 30	61	-36	-41	-47	-57
Jun 1 - July 31	61	-39	-43	-50	-59

Table 2f. Percent change in red snapper fishing mortality resulting from a 13-inch minimum size limit combined with various bag limits and closed seasons.

		Bag Limit			
Open Season	Days Open	4	3	2	1
Apr 21 - Oct 31	194	28	19	6	-14
Apr 21 - Oct 15	178	22	14	1	-18
May 1 - Oct 31	184	20	12	-1	-19
Apr 21 - Sept 30	163	17	9	-3	-21
May 1 - Oct 15	168	12	5	-7	-24
Apr 21 - Sept 15	148	11	4	-8	-25
May 1 - Sept 30	153	9	1	-10	-26
May 15 - Oct 31	169	9	1	-10	-25
Apr 21 - Aug 31	133	6	-1	-12	-28
May 1 - Sept 15	138	3	-4	-14	-30
May 15 - Oct 15	153	3	-4	-14	-29
Jun 1 - Oct 31	153	0	-7	-17	-32
Apr 21 - Aug 15	117	0	-7	-17	-32
May 1 - Aug 31	123	-2	-9	-19	-33
May 15 - Sept 30	138	-3	-9	-19	-33
Jun 1 - Oct 15	137	-5	-12	-22	-36
Apr 21 - July 31	102	-6	-12	-22	-37
May 15 - Sept 15	123	-8	-14	-24	-36
May 1 - Aug 15	107	-9	-16	-25	-39
Jun 1 - Sept 30	122	-10	-16	-26	-39
May 15 - Aug 31	108	-13	-19	-28	-40
Jun 1 - Sept 15	107	-16	-21	-30	-43
May 1 - July 31	92	-18	-23	-32	-44
May 15 - Aug 15	92	-21	-26	-34	-45
Jun 1 - Aug 31	92	-21	-27	-35	-46
May 1 - July 15	76	-25	-30	-38	-49
May 15 - July 31	77	-29	-34	-41	-50
Jun 1 - Aug 15	76	-29	-34	-41	-52
May 1 - June 30	61	-34	-38	-45	-55
Jun 1 - July 31	61	-37	-41	-48	-57

Table 3a. Recreational red snapper management scenarios that approximate a 3.43 MP recreational quota. Management alternatives are based on results presented in Tables 2a-f above.

TAC	Quota	Reduction	Bag Limit	Size Limit	Open Season	Days Open
7.0 mp	3.43 mp	23%	4	16"	May 15 - Sep 30	139
			4	16"	Jun 1 - Oct 15	137
			4	16"	May 1 - Aug 31	123
			4	16"	Apr 21 - Jul 31	102
			3	16"	Apr 21 - Aug 31	133
			3	16"	Jun 1 - Oct 31	153
			3	16"	May 15 - Oct 15	154
			2	16"	Apr 21 - Sep 30	163
			2	16"	May 1 - Oct 15	168
			2	16"	May 15 - Oct 31	170
			1	16"	Apr 21 - Oct 31	194
			4	15"	Jun 1 - Sep 30	122
			4	15"	May 15 - Aug 31	109
			3	15"	Jun 1 - Oct 15	137
			3	15"	May 15 - Sep 15	124
			3	15"	Apr 21 - Jul 31	102
			2	15"	Jun 1 - Oct 31	153
			2	15"	May 15 - Oct 15	154
			2	15"	May 1 - Sep 15	138
			2	15"	Apr 21 - Aug 31	133
			1	15"	Apr 21 - Oct 31	194
			4	14"	May 1 - July 31	92
			4	14"	May 15 - Aug 15	93
			4	14"	Jun 1 - Aug 31	92
			3	14"	May 15 - Aug 31	109
			3	14"	Jun 1 - Sep 15	107
			2	14"	May 1 - Aug 31	123
			2	14"	Jun 1 - Oct 15	137
			2	14"	May 15 - Sep 30	139
			1	14"	Apr 21 - Oct 15	178
			1	14"	May 1 - Oct 31	184
			4	13"	May 1 - Jul 15	76
			4	13"	May 15 - Jul 31	78
			3	13"	May 1 - Jul 31	92
			3	13"	May 15 - Aug 15	93
			2	13"	May 1 - Aug 15	107
			2	13"	May 15 - Sep 15	124
			2	13"	Jun 1 - Sep 30	122
			1	13"	May 1 - Oct 15	168
			1	13"	May 1 - Sep 30	153
			1	13"	May 15 - Oct 31	170

Table 3b. Recreational red snapper management scenarios that approximate a 2.45 MP recreational quota. Management alternatives are based on results presented in Tables 2a-f above.

TAC	Quota	Reduction	Bag Limit	Size Limit	Open Season	Days Open
5.0 mp	2.45 mp	45%	4	16"	May 1 - June 30	61
			4	16"	Jun 1 - July 31	61
			3	16"	May 1 - July 15	76
			3	16"	Jun 1 - Aug 15	76
			3	16"	May 15 - July 31	78
			2	16"	May 1 - July 31	92
			2	16"	Jun 1 - Aug 31	92
			2	16"	May 15 - Aug 15	93
			2	16"	Jun 1 - Sept 15	107
			1	16"	May 1 - Sept 15	138
			1	16"	Jun 1 - Oct 31	153
			1	16"	May 15 - Oct 15	154
			4	15"	Jun 1 - July 31	61
			3	15"	May 1 - June 30	61
			3	15"	Jun 1 - July 31	61
			2	15"	May 1 - July 15	76
			2	15"	May 15 - July 31	77
			2	15"	Jun 1 - Aug 15	76
			1	15"	Jun 1 - Oct 15	137
			1	15"	Apr 21 - July 31	102
			1	15"	May 15 - Sept 15	123
			1	15"	May 1 - Aug 15	107
			3	14"	Jun 1 - July 31	61
			2	14"	May 15 - July 31	77
			2	14"	Jun 1 - Aug 15	76
			1	14"	Jun 1 - Sept 15	107
			2	13"	May 1 - June 30	61
			2	13"	Jun 1 - July 31	61
			1	13"	May 1 - July 31	92
			1	13"	Jun 1 - Aug 31	92
			1	13"	May 15 - Aug 15	93

Table 3c. Recreational red snapper management scenarios that approximate at 1.47 MP recreational quota. Management alternatives are based on results presented in Tables 2a-f above and from data prepared for the Council during March 2007 (Strelcheck, personal communication).

TAC	Quota	Reduction	Bag Limit	Size Limit	Open Season	Days Open
3.0 mp	1.47 mp	67%	4	16"	July 1 - Aug 4	35
			4	16"	Aug 1 - Aug 31	31
			3	16"	Sept 1 - Oct 19	49
			3	16"	Aug 1 - Sept 5	36
			3	16"	May 1 - May 31	31
			2	16"	Sept 1 - Oct 26	57
			2	16"	Aug 1 - Sept 15	46
			1	16"	Aug 1 - Sept 30	61
			1	16"	July 1 - Aug 22	53
			3	15"	Sept 1 - Oct 15	45
			3	15"	July 1 - July 31	31
			2	15"	Sept 1 - Oct 22	52
			2	15"	Aug 1 - Sept 8	39
			1	15"	Sept 1 - Oct 31	61
			1	15"	July 1 - Aug 15	46
			1	15"	Aug 1 - Sept 25	56
			3	14"	Aug 1 - Aug 31	31
			2	14"	Sept 1 - Oct 26	57
			2	14"	July 1 - July 31	31
			2	14"	Aug 1 - Sept 4	35
			1	14"	Sept 1 - Oct 31	61
			1	14"	June 1 - July 7	37
			1	14"	July 1 - Aug 12	43
			1	14"	Aug 1 - Sept 20	51
			3	13"	Sept 1 - Oct 9	40
			2	13"	Sept 1 - Oct 15	45
			2	13"	Aug 1 - Aug 31	31
			2	13"	Aug 1 - Aug 31	31
			1	13"	July 1 - Aug 9	40
			1	13"	Aug 1 - Sept 15	46

Table 4a. Recreational red snapper management scenarios with weekend openings that approximate a 2.45 MP recreational quota. Alternatives are based on data prepared for the Council during March 2007 (Strelcheck, personal communication).

			Weekends		
Bag	Size	Core Season	Before	After	Days
4	16	June 1 - June 30	4	5	48
4	15	June 1 - June 30	4	4	46
4	14	June 1 - June 30	3	4	44
4	13	June 1 - June 30	3	3	42
4	16	July 1 - July 31	5	5	51
4	15	July 1 - July 31	4	5	49
4	14	July 1 - July 31	3	4	45
4	13	July 1 - July 31	3	3	43
4	16	Aug 1 - Aug 31	6	6	55
4	15	Aug 1 - Aug 31	5	6	53
4	14	Aug 1 - Aug 31	5	5	51
4	13	Aug 1 - Aug 31	4	5	49
3	16	June 1 - June 30	5	5	50
3	15	June 1 - June 30	4	5	48
3	14	June 1 - June 30	4	4	46
3	13	June 1 - June 30	3	4	44
3	16	July 1 - July 31	5	6	53
3	15	July 1 - July 31	5	5	51
3	14	July 1 - July 31	4	5	49
3	13	July 1 - July 31	4	4	47
3	16	Aug 1 - Aug 31	6	7	57
3	15	Aug 1 - Aug 31	6	6	55
3	14	Aug 1 - Aug 31	5	6	53
3	13	Aug 1 - Aug 31	5	5	51
2	16	June 1 - June 30	5	6	52
2	15	June 1 - June 30	5	5	50
2	14	June 1 - June 30	4	5	48
2	13	June 1 - June 30	4	4	46
2	16	July 1 - July 31	7	8	61
2	15	July 1 - July 31	6	6	53
2	14	July 1 - July 31	5	6	53
2	13	July 1 - July 31	5	6	53
2	16	Aug 1 - Aug 31	10	10	71
2	15	Aug 1 - Aug 31	9	9	67
2	14	Aug 1 - Aug 31	8	8	63
2	13	Aug 1 - Aug 31	6	6	55

Table 4b. Regional recreational red snapper management scenarios with weekend openings that approximate a 2.45 MP recreational quota. East = eastern Gulf; West = western Gulf. Alternatives are based on data prepared for the Council during March 2007 (Strelcheck, personal communication).

Bag Limit	Size Limit	Core Season	Weekends Before	Weekends After	Days
3	16	East: June 1 - Aug 23	0	0	84
		West: Aug 1 - Aug 31	8	8	63
3	16	East: June 1 - Aug 23	0	0	84
		West: July 1 - July 31	6	6	55
3	15	East: June 1 - Aug 12	0	0	73
		West: July 1 - July 31	5	5	51
3	14	East: June 1 - Aug 6	0	0	67
		West: Aug 1 - Aug 31	4	4	47
2	16	East: May 15 - Aug 15	0	0	93
		West: Aug 1 - Aug 31	10	10	71
2	16	East: May 15 - Aug 15	0	0	93
		West - July 1 - July 31	8	8	63
2	15	East: June 1 - Aug 31	0	0	92
		West: Aug 1 - Aug 31	8	8	63
2	15	East: June 1 - Aug 31	0	0	92
		West: July 1 - July 31	6	6	55
2	14	East: May 15 - July 31	0	0	76
		West: June 1 - June 30	6	6	54
2	14	East: May 15 - July 31	0	0	76
		West: July 1 - July 31	6	6	55
2	16	East: May 15 - Aug 15	0	0	92
		West: July 1 - July 31	6	7	57

Table 4c. Regional recreational red snapper management scenarios with weekend openings that approximate a 2.45 MP recreational quota. TX = Texas, and LA-FL = Louisiana through Florida. Alternatives are based on data prepared for the Council during March 2007 (Strelcheck, personal communication).

			Weekends		
Bag Limit	Size Limit	Core Season	Before	After	Days
3	16	LA-FL: June 1 - Aug 23	0	0	84
		TX: Aug 1 - Aug 31	8	8	63
3	16	LA-FL: June 1 - Aug 23	0	0	84
		TX: July 1 - July 31	6	6	55
3	15	LA-FL: June 1 - Aug 12	0	0	73
		TX: July 1 - July 31	5	5	51
3	14	LA-FL: June 1 - Aug 6	0	0	67
		TX: Aug 1 - Aug 31	4	4	47
2	16	LA-FL: May 15 - Aug 15	0	0	93
		TX: Aug 1 - Aug 31	10	10	71
2	16	LA-FL: May 15 - Aug 15	0	0	93
		TX - July 1 - July 31	8	8	63
2	15	LA-FL: June 1 - Aug 31	0	0	92
		TX: Aug 1 - Aug 31	8	8	63
2	15	LA-FL: June 1 - Aug 31	0	0	92
		TX: July 1 - July 31	6	6	55
2	14	LA-FL: May 15 - July 31	0	0	76
		TX: June 1 - June 30	6	6	54
2	14	LA-FL: May 15 - July 31	0	0	76
		TX: July 1 - July 31	6	6	55

Table 5a. Gulfwide recreational red snapper management scenarios with weekend openings that approximate a 1.47 MP recreational quota. Management alternatives are based on data prepared for the Council during March 2007 (Strelcheck, personal communication).

			Weekends		
Bag	Size	Core Season	Before	After	Days
3	16	Aug 1 - Aug 31	1	1	35
2	16	Aug 1 - Aug 31	2	2	39
2	16	July 1 - July 31	1	1	35
2	15	Aug 1 - Aug 31	1	1	35
2	15	July 1 - July 31	1	1	35
2	14	Aug 1 - Aug 31	1	1	35
2	16	Jun 1 - Jun 30	1	1	34
1	16	Aug 1 - Aug 31	4	4	47
1	16	July 1 - July 31	3	3	43
1	15	Aug 1 - Aug 31	3	3	43
1	15	July 1 - July 31	2	2	39
1	16	Jun 1 - Jun 30	2	2	38
1	14	Aug 1 - Aug 31	2	2	35
1	14	July 1 - July 31	1	1	35
1	15	Jun 1 - Jun 30	1	1	34

Table 5b. Regional recreational red snapper management scenarios with weekend openings that approximate a 1.47 MP recreational quota. East = eastern Gulf; West = western Gulf; TX = Texas, and LA-FL = Louisiana through Florida. Management alternatives are based on data prepared for the Council during March 2007 (Strelcheck, personal communication).

Bag Limit	Size Limit	Core Season	Weekends Before	Weekends After	Days
2	16	East: Aug 1 - Sept 15	0	0	42
		West: Aug 1 - Aug 31	2	2	39
2	16	East: Aug 1 - Sept 15	0	0	46
		West: Aug 1 - Aug 31	2	2	39
1	16	East: Aug 1 - Sep 30	0	0	61
		West: Aug 1 - Aug 31	4	4	47
1	16	East: July 1 - Aug 21	0	0	52
		West: July 1 - July 31	3	3	43
1	15	East: July 1 - Aug 15	0	0	46
		West: Jun 1 - Jun 30	2	2	38
1	15	East: Aug 1 - Sept 23	0	0	54
		West: Aug 1 - Aug 31	3	3	39
1	15	East: July 1 - Aug 15	0	0	46
		West: July 1 - July 31	2	2	35
1	14	East: Aug 1 - Sept 17	0	0	48
		West: Aug 1 - Aug 31	2	2	35

Bag Limit	Size Limit	Core Season	Weekends Before	Weekends After	Days
2	16	LA-FL: Aug 1 - Sept 15	0	0	42
		TX: Aug 1 - Aug 31	2	2	39
1	16	LA-FL: Aug 1 - Sep 30	0	0	61
		TX: Aug 1 - Aug 31	4	4	47
1	16	LA-FL: July 1 - Aug 21	0	0	52
		TX: July 1 - July 31	3	3	43
1	15	LA-FL: July 1 - Aug 15	0	0	46
		TX: Jun 1 - Jun 30	2	2	38
1	15	LA-FL: Aug 1 - Sept 23	0	0	54
		TX: Aug 1 - Aug 31	3	3	39
1	15	LA-FL: July 1 - Aug 15	0	0	46
		TX: July 1 - July 31	2	2	35
1	14	LA-FL: Aug 1 - Sept 17	0	0	48
		TX: Aug 1 - Aug 31	2	2	35

APPENDIX C: ECONOMIC EFFECTS OF THE GULF OF MEXICO REEF FISH FISHERY MANAGEMENT PLAN AMENDMENT 27 ON THE SPORTFISHING SECTOR: ANALYSIS SUMMARY (WITH SIX NEW ALTERNATIVES), 04/02/2007

Purpose: Describe the methods and data for the analysis of the economic Effects of the Gulf of Mexico Reef Fish Fishery Management Plan Amendment 27 on the Sportfishing Sector.

General Notes

- All changes are considered relative to the status quo red snapper regulations of a 4 fish bag, a 16" minimum size, and an open season of Apr21 to Oct31.

- All currency amounts are denominated in 2003 dollars unless noted otherwise. The base year of 2003 was selected to be consistent with the year of the data selected for the analysis. According to the U.S. city average consumer price index for all items (CPI series CUUR0000SA0) a dollar in 2006 is equivalent to 201.6/184.0 = 1.096 dollars in 2003. This factor can be used to update the value of any estimate presented in this analysis.

- The total economic effect of each policy is measured as the change in economic value measured as the total change in consumer surplus to recreational anglers and the total change in producer surplus to for-hire operators.

- The results for the additional policy (2 fish bag, 10% base effort reduction) proposed for the Interim Rule were added as Alternative 5 on 10/19/2006 and removed on 02/28/2007.

- All results were updated and expanded options for Alternatives 3 and 4 were added on 02/28/07.

- All results were updated to address the corrected version of Alternative 4 provided by Andy Strelcheck on 03/08/2007.

- The set of alternatives examined in this analysis are shown Table 1.

Private and Charter Boats

Method

- The total change in consumer surplus for private and charter boat anglers is calculated as follows for each State and mode

  (0.1) $$dV_{j,m} = \left(T0_{j,m} + dT_{j,m}\right)\left[s_{j,m}CVa + \left(s0_{j,m} - s_{j,m}\right)CVb\right]$$

  where $dV_{j,m}$ is the total equivalent variation measure of the consumer surplus change in State j = (TX, LA, MS, AL, FLW) using mode m = (charter, private), $T0_{j,m}$ is the base number of target angler trips in State j for mode m, $dT0_{j,m}$ is the change in the base number of target angler trips in State j for mode m, CVa is the average amount of money necessary to make an angler indifferent between the status quo and proposed bag/size limit policies on any given trip, *CVb* is the average amount of money necessary to make an angler indifferent between the status quo and proposed closed season on any given trip, and $s0_{j,m}$, and $s_{j,m}$ are the portion of angler trips taken in the open part of the year in State *j* using mode *m* for the status quo season and policy alternative season, respectively.

- The total compensating variation measure of the consumer surplus change has also been calculated using the base trip levels (i.e., expression (0.1) without the $dT0_{j,m}$ term). These results are available upon request. Note that the true change in economic value is bound by these measures of compensating and equivalent variation in the special case where *CVa* or *CVb* are independent of the number trips taken (Morey 1994).

- The change in the base number of target angler trips is calculated as $dT0_{j,m} = \quad {}_i dT0_{i,j,m}$ with $dT0_{i,j,m}$ defined as the change in target angler trips for each species, State and mode or

$$dT_{i,j,m} = T0_{i,j,m}\left[s_{j,m} dMa_i + \left(s0_{j,m} - s_{j,m} \right) dMb_i \right] \tag{0.2}$$

  where $T0_{i,j,m}$ is the base number of target angler trips for species *i* = (dolphin, grouper, king mackerel, red snapper) in State *j* using mode *m*, dMa_i is the percent change in target angler trips for species *i* due to bag/size limit policies, and dMb_i is the percent change in target angler trips for species *i* due to the closed season. Note that $T0_{j,m} = \quad {}_i T0_{i,j,m}$.

- The total estimated change in producer surplus to charter boat operators in state *j* is approximated as a change in net operating revenues as follows

$$dPS_{j,charter} = r_{charter} \cdot dT_{j,charter} \tag{0.3}$$

  where $r_{charter}$ is the average net operating revenue per angler on a charter trip in the Gulf of Mexico.

- Key assumptions:
  - The average change target angler trip market shares (dMa_i and dMb_i) for each target species associated with each alternative does not vary by mode, State, or time.
  - The average change value per angler trip (*CVa* and *CVb*) associated with each alternative does not vary by target species, mode, State, or time.

Data

- Table 2 shows the base number of private and charter boat target angler trips in the Gulf of Mexico by species and state. The numbers for LA, MS, AL, and W. FL are derived from the 2003 MRFSS using the method outlined in Holiman (1996) and the numbers for TX are calculated as the total number of charter and private boat angler trips times the proportion of EEZ anglers reporting targeting each species in the 2003 TPWD creel survey. Based on Table F.9 of Green and Campbell (2005), the proportion of private boat anglers in the Texas EEZ reporting that they sought grouper, red snapper, dolphin, and king mackerel is, respectively 0.0, 0.268, 0.012, and 0.258. Similarly, from Table G.9 in Green and Campbell, the proportion of charter boat anglers in the Texas EEZ reporting that they sought grouper, red snapper, dolphin, and king mackerel is, respectively 0.0, 0.375, 0.0, and 0.083.

- Table 3.shows the portion of angler trips ($s0_{j,m}$ and $s_{j,m}$) taken in the open part of the year for each alternative as calculated from the 2003 MRFSS and TPWD creel survey. Note that these calculations include all anglers, not just those who targeted grouper, red snapper, dolphin, or king mackerel.

- The change in the value per angler trip (*CVa* and *CVb*) and the changes in the market share for each target species (dMa_i and dMb_i) expected with each regulation change are shown in Table 4 based on data from the 2003 MRFSS SE Conjoint Add-On (Gentner 2004). Note that the changes in target angler trip market shares (*dMb*) and value per angler trip (*CVb*) associated with additional closed periods for red snapper are approximated as the changes associated with reducing the red snapper bag limit from four fish to zero fish. The estimates for *dMb* and *CVb* are shown in the last row of Table 4. Also, the effect of changes in the red snapper minimum size limit is based on the corresponding changes in expected legal size catch. NMFS SERO produced a table showing the percentage change in harvest expected with each size and bag limit combination (SERO 2006). It is assumed that the expected number of legal size red snapper per angler trip changes in proportion to the changes in total harvest calculated by SERO.

- Conjoint Discussion Points
    - The conjoint survey asked mail respondents to choose among hypothetical fishing trips. Attributes of the hypothetical fishing trips included the expected catch and keep of grouper, red snapper, dolphin, king mackerel and 'other' species; the cost of the trip; and size and bag limit regulations.
    - The conjoint survey questions asked respondents how they would behave (i.e., which option they would choose) *if* they were faced with the set of trip choices. It is important to note that not all respondents have the same probability of facing the given choices. Each angler's actual or perceived (subjective) probability of facing each suggested trade-off is unknown. In order to narrow the sample to those anglers most likely face the choices presented in the conjoint, we focus on those who indicated targeting grouper, red snapper, dolphin, or king mackerel in the previous year. Even if they have never been constrained by the regulations, the group of targeters should understand the choice set and be able form expectations over the given set of trip choices.
    - The average change in the value per angler trip is actually the value per choice occasion. That is, the value includes the option of not taking a trip. Since there are more choice occasions than angler trips, the change in value per choice occasion is less than the change in value per angler trip. However, there is not enough information to infer the number of occasions that anglers consider taking a fishing trip. Furthermore, as noted above, it is unlikely that all choice occasions in the Gulf of Mexico resemble the choice situations presented in the conjoint experiment, i.e. the choice between a taking a trip with expected catch of grouper, red snapper, dolphin, king mackerel or not taking a trip. Again, the conservative approach in this analysis uses the number of angler trips that target grouper, red snapper, dolphin, or king mackerel to gauge the effects of the policy changes.

- The estimate of $r_{charter}$ is \$136 from the "Preliminary results from the 2002/3 Gulf of Mexico Charter Boat Economic Survey (FHS Add-on)."

Head Boats

Method

- The total change in the consumer surplus for head boat anglers is calculated as follows

  (0.4) $$dV_{head} = \left(T0_{head} + dT_{head}\right)\left[s_{head}CVa + \left(s0_{head} - s_{head}\right)CVb\right]$$

  where the variables are defined in the section above on the private and charter boat analysis. Note that the variables subscripted with "head" indicate estimates for the entire Gulf of Mexico head boat sector; that is, estimates that are summed over all states.

- The total estimated change in producer surplus to head boat operators in the Gulf of Mexico is approximated as a change in net operating revenues as follows

  (0.5) $$dPS_{head} = r_{head} \cdot dT_{head}$$

  where r_{head} is the net operating revenue per angler on a head boat trip in the Gulf of Mexico.

- The changes in aggregate head boat angler days and the shares are calculated using the Gulf of Mexico Head Boat Effort Response model (HBERM) documented in Carter and Letson (2006). An updated paper documenting recent changes to this model is forthcoming.

- The HBERM does not estimate effort response at the state level. Effort response for the alternatives that considered state specific red snapper seasons were calculated as follows. The two versions of the geographically delineated policies were applied to the entire GOM. For example, the Texas weekend openings policies have one set of rules for Texas and another set for the rest of the Gulf of Mexico. Both sets of rules are applied to the entire Gulf of Mexico and the resulting angler days from each are weighted by the proportion of angler days in Texas and the rest of the Gulf of Mexico shown in and summed to get the total angler days with the policy. A similar strategy is applied to the Western Gulf of Mexico openings policies.

Data

- Table 5.1.3.1.2 shows the head boat angler days in the Gulf of Mexico for 2003. Note that these estimates represent all effort, not those angler days that targeted grouper, red snapper, dolphin, or king mackerel. There is insufficient information to partition the effort among target species.

- The change in the value per angler trip (*CVa* and *CVb*) expected with each regulation change are shown in Table 4 based on data from the 2003 MRFSS SE Conjoint Add-On (Gentner 2004). Note that the estimates based on the entire conjoint sample (last column) were used because, as noted above, head boat effort is measured in terms of all angler days, not just those days that targeted grouper, red snapper, dolphin, or king mackerel.

- The estimate of r_{head} is \$62 as described in "Average Net Revenue per Angler Day for Head Boats in the Gulf of Mexico."

Results

- Table 6 through Table 9 show the summary effects for the Gulf of Mexico.

References

Carter, D.W. and D. Letson. 2006. *Effort Response, Harvest, Climate, and the Economy in the Gulf of Mexico Recreational Red Snapper Fishery*. NOAA/SEFSC, April 14, 2006.

Gentner, B. 2004. *Estimating Target Species Substitution in the Face of Changing Recreational Fishing Policies*. IIFET 2004 Japan Proceedings.

Green, L.M. and P. Campbell. 2005. *Trends in Finfish Landings of Sport-Boat Anglers in Texas Marine Waters, May 1974-May2003*. TPWD Management Data Series No. 234.

Holiman, S.G. 1996. *Estimating Recreational Effort Using the Marine Recreational Fishing Statistics Survey*. NOAA Technical Memorandum NMFS-SEFSC-389.

Morey, E.R. 1994. "What is Consumer Surplus *Per Day of Use*, When is it a Constant Independent of the Number of Days of Use, and What Does it Tell Us about Consumer Surplus?" *Journal of Environmental Economics and Management* 26: 257-270.

SERO. 2006. *Evaluation of Reduced Minimum Size Limits for the Recreational Red Snapper Fishery*. May 26, 2006.

Table 1. Gulf of Mexico Reef Fish Management Plan Amendment 27 Management Alternatives Proposed for the Recreational Sector

TAC	Alt	Bag Limit	Minimum Size Limit	Season Opens	Season Closes	Weekends Open Before	Weekends Open After	States Affected*
	1	4	16	21-Apr	31-Oct	0	0	1 2 3 4 5
	2ai	4	16	15-May	30-Sep	0	0	1 2 3 4 5
	2aii	4	16	15-May	31-Aug	0	8	1 2 3 4 5
	2aiii	4	16	15-May	31-Aug	0	8	1
	2aiii	4	16	15-May	30-Sep	0	0	2 3 4 5
	2aiv	4	16	15-May	31-Aug	0	8	1 2
	2aiv	4	16	15-May	30-Sep	0	0	3 4 5
7	2bi	3	16	15-May	15-Oct	0	0	1 2 3 4 5
	2bii	3	15	1-Jun	15-Oct	0	0	1 2 3 4 5
	2ci	2	15	15-May	15-Oct	0	0	1 2 3 4 5
	2cii	2	13	15-May	15-Sep	0	0	1 2 3 4 5
	2ciii	2	15	15-May	31-Aug	0	12	1 2 3 4 5
	2civ	2	15	15-May	31-Aug	0	12	1
	2civ	2	15	15-May	15-Oct	0	0	2 3 4 5
	2cv	2	15	15-May	31-Aug	0	12	1 2
	2cv	2	15	15-May	15-Oct	0	0	3 4 5
	3ai	2	16	1-Jun	15-Sep	0	0	1 2 3 4 5
	3aii	2	16	1-May	31-Jul	0	0	1 2 3 4 5
	3bi	2	16	15-May	15-Aug	0	0	1 2 3 4 5
	3bii	2	16	1-Jul	31-Jul	6	7	1 2 3 4 5
	3biii	2	16	1-Jul	31-Jul	6	7	1
	3biii	2	16	15-May	15-Aug	0	0	2 3 4 5
	3biv	2	16	1-Jul	31-Jul	6	7	1 2
	3biv	2	16	15-May	15-Aug	0	0	3 4 5
5	3c	2	15	15-May	10-Aug	0	0	1 2 3 4 5
	3di	2	14	15-May	31-Jul	0	0	1 2 3 4 5
	3dii	2	14	1-Jun	15-Aug	0	0	1 2 3 4 5
	3diii	2	14	1-May	9-Jul	0	0	1 2 3 4 5
	3e	2	13	1-Jun	31-Jul	0	0	1 2 3 4 5
	3fi	1	14	15-May	30-Sep	0	0	1 2 3 4 5
	3fiii	1	14	1-May	10-Aug	0	0	1 2 3 4 5
	3gi	1	16	1-Jun	15-Oct	0	0	1 2 3 4 5
	3gii	1	16	1-May	15-Sep	0	0	1 2 3 4 5
3	4ai	2	16	1-Aug	15-Sep	0	0	1 2 3 4 5
	4aii	2	16	1-Aug	31-Aug	2	2	1 2 3 4 5
	4aiii	2	16	1-Aug	31-Aug	2	2	1

4aiii	2	16	1-Aug	15-Sep	0	0	2 3 4 5
4aiv	2	16	1-Aug	31-Aug	2	2	1 2
4aiv	2	16	1-Aug	15-Sep	0	0	3 4 5
4b	2	15	1-Aug	15-Sep	0	0	1 2 3 4 5
4c	2	14	1-Aug	8-Sep	0	0	1 2 3 4 5
4d	2	13	1-Aug	31-Aug	0	0	1 2 3 4 5

*States are coded as: 1=TX, 2=LA, 3=MS, 4=AL, 5=FL

Table 2. Summary of Private and Charter Boat Target Angler trips by Species and State in the Gulf of Mexico, 2003 ($T0_{ij}$)

State	Mode	Dolphin	Grouper	King Mackerel	Red Snapper	All Angler trips
AL	Charter	0	977	432	37,167	66,564
	Private	0	8,944	50,425	131,592	845,923
FL	Charter	29,604	25,974	19,746	40,962	496,210
	Private	89,249	290,099	197,514	92,390	9,221,723
LA	Charter	782	0	0	13,541	104,182
	Private	0	0	5,533	27,327	3,294,740
MS	Charter	0	0	149	3,686	24,406
	Private	0	0	3,829	27,800	747,620
TX	Charter	0	0	10,589	47,840	127,572
	Private	10,873	0	233,780	242,841	906,124

Sources: The base number of target angler trips for LA, MS, AL, and W. FL was derived from the 2003 MRFSS by Stephen Holiman at NMFS SERO. The base number of private and charter boat target angler trips for TX was derived the 2003 TPWD creel survey and the distribution of "species sought" reported in Tables F.9 and G.9 of Green and Campbell (2005). The estimates of “All angler trips” are taken from the MRFSS estimates of private and charter boat effort in the Gulf of Mexico.

Table 3. Proportion of Anglers that Fished During the Proposed Open Season by State and Mode in the Gulf of Mexico, 2003 ($s0_{ij}$ and s_{ij})

Alt	AL		FL		LA		MS		TX	
	Charter	Private	Charter	Private	Charter	Private	Charter	Private	Charter	Private
1	0.79	0.70	0.59	0.59	0.66	0.62	0.88	0.68	0.89	0.80
2ai	0.52	0.57	0.41	0.45	0.51	0.47	0.64	0.54	0.71	0.64
2aii	0.57	0.59	0.44	0.47	0.51	0.48	0.61	0.51	0.72	0.66
2aiii	0.52	0.57	0.41	0.45	0.51	0.47	0.64	0.54	0.72	0.66
2aiv	0.52	0.57	0.41	0.45	0.51	0.48	0.64	0.54	0.72	0.66
2bi	0.57	0.61	0.45	0.49	0.54	0.51	0.70	0.60	0.77	0.69
2bii	0.52	0.53	0.37	0.43	0.47	0.44	0.64	0.51	0.70	0.60
2ci	0.57	0.61	0.45	0.49	0.54	0.51	0.70	0.60	0.77	0.69
2cii	0.49	0.52	0.37	0.40	0.45	0.42	0.61	0.49	0.68	0.60
2ciii	0.60	0.61	0.47	0.51	0.55	0.52	0.63	0.58	0.73	0.70
2civ	0.57	0.61	0.45	0.49	0.54	0.51	0.70	0.60	0.73	0.70
2cv	0.57	0.61	0.45	0.49	0.55	0.52	0.70	0.60	0.73	0.70
3ai	0.44	0.44	0.30	0.34	0.38	0.34	0.55	0.40	0.61	0.51
3aii	0.40	0.41	0.34	0.32	0.39	0.32	0.40	0.31	0.49	0.43
3bi	0.38	0.40	0.32	0.32	0.36	0.32	0.41	0.30	0.56	0.48
3bii	0.34	0.45	0.22	0.26	0.31	0.28	0.36	0.29	0.39	0.39
3biii	0.38	0.40	0.32	0.32	0.36	0.32	0.41	0.30	0.39	0.39
3biv	0.38	0.40	0.32	0.32	0.31	0.28	0.41	0.30	0.39	0.39
3c	0.37	0.40	0.31	0.32	0.36	0.31	0.41	0.30	0.55	0.47
3di	0.33	0.37	0.29	0.29	0.34	0.26	0.38	0.29	0.45	0.40
3dii	0.33	0.32	0.25	0.26	0.28	0.24	0.35	0.22	0.49	0.39
3diii	0.29	0.32	0.26	0.24	0.28	0.24	0.32	0.23	0.33	0.33
3e	0.28	0.29	0.21	0.23	0.26	0.19	0.32	0.21	0.38	0.31
3fi	0.47	0.49	0.34	0.39	0.43	0.40	0.58	0.46	0.64	0.55
3fii	0.44	0.45	0.37	0.35	0.41	0.37	0.43	0.31	0.58	0.50
3gi	0.57	0.61	0.45	0.49	0.54	0.51	0.70	0.60	0.77	0.69
3gii	0.56	0.57	0.43	0.44	0.51	0.48	0.63	0.50	0.72	0.63
4ai	0.16	0.15	0.08	0.12	0.12	0.15	0.23	0.19	0.23	0.20
4aii	0.20	0.18	0.10	0.15	0.15	0.16	0.21	0.22	0.25	0.23
4aiii	0.16	0.15	0.08	0.12	0.12	0.15	0.23	0.19	0.25	0.23
4aiv	0.16	0.15	0.08	0.12	0.15	0.16	0.23	0.19	0.25	0.23
4b	0.13	0.14	0.07	0.10	0.07	0.12	0.23	0.16	0.22	0.18
4c	0.10	0.12	0.07	0.09	0.05	0.11	0.17	0.15	0.19	0.16
4d	0.10	0.12	0.06	0.08	0.05	0.10	0.13	0.14	0.18	0.16

Source: Calculated from the 2003 MRFSS and TPWS intercept data. Includes all angler trips, not just those that targeted grouper, red snapper, dolphin, and red snapper.

Table 4. Change in Private and Charter Boat Target Angler trip Share and Value per Angler trip from the Potential Red Snapper Policy Scenarios

			Change in Target Angler trip Shares (*dM*)				Change in Value Per Angler trip (*CV*)	
Size Limit	Bag Limit	Legal Catch per Angler trip	Dolphin	King Mackerel	Grouper	Red Snapper	Conjoint Targeters	Entire Conjoint Sample
16"	4	0.4218	0.000%	0.000%	0.000%	0.000%	$ -	$ -
15"	4	0.4569	-0.018%	-0.017%	-0.017%	0.074%	$ 11.69	$ 3.38
14"	4	0.4836	-0.032%	-0.029%	-0.029%	0.131%	$ 12.50	$ 3.65
13"	4	0.5029	-0.042%	-0.038%	-0.039%	0.171%	$ 13.09	$ 3.85
16"	3	0.3930	0.466%	0.414%	0.415%	-1.868%	$ (15.69)	$ (5.17)
15"	3	0.4257	0.449%	0.399%	0.400%	-1.802%	$ (14.76)	$ (4.85)
14"	3	0.4506	0.436%	0.388%	0.389%	-1.750%	$ (14.05)	$ (4.60)
13"	3	0.4685	0.427%	0.380%	0.381%	-1.713%	$ (13.55)	$ (4.42)
16"	2	0.3495	0.928%	0.809%	0.810%	-3.695%	$ (40.59)	$ (13.11)
15"	2	0.3786	0.914%	0.797%	0.798%	-3.638%	$ (39.82)	$ (12.83)
14"	2	0.4008	0.903%	0.788%	0.788%	-3.594%	$ (39.24)	$ (12.63)
13"	2	0.4167	0.895%	0.781%	0.782%	-3.564%	$ (38.82)	$ (12.48)
16"	1	0.2848	1.383%	1.185%	1.183%	-5.468%	$ (64.14)	$ (20.83)
15"	1	0.3085	1.372%	1.176%	1.174%	-5.425%	$ (63.57)	$ (20.62)
14"	1	0.3266	1.363%	1.169%	1.167%	-5.391%	$ (63.13)	$ (20.46)
13"	1	0.3396	1.357%	1.164%	1.162%	-5.367%	$ (62.81)	$ (20.35)
16"	0	n/a	1.774%	1.643%	1.676%	-7.300%	$ (81.26)	$ (26.44)

Source: Calculated by Brad Gentner, NMFS S&T, using the NMFS 2003 Southeast Conjoint Survey results. Changes in target angler trip shares and the value per angler trip are measured relative to the status quo red snapper regulations of a 4 fish bag limit and a 16" minimum size limit. The change in target angler trip shares are calculated for respondents (targeters) who reported targeting grouper, red snapper, dolphin, or king mackerel in the previous year. The changes in value per angler trip (*CVa*) are calculated for targeters and for the entire sample. The last row gives the change in target angler trips (*dMb*) and value per angler trip (*CVb*) due to a zero bag limit. The effects of red snapper minimum size limit changes are measured with changes in legal size catch per trip (column 3) which are assumed to be proportional to the corresponding total harvest changes calculated in NMFS SERO (2006).

Table 5. Head Boat Angler Days in the Gulf of Mexico, 2003

State	Angler Days	Share
TX	74,432	33%
LA	6,636	3%
EGOM	144,211	64%
Total	225,279	100%

Sources: NMFS Head Boat Survey

Table 6. Economic Effects of the Gulf of Mexico Reef Fish Management Plan Amendment 27 Options, Charter

Alt	Change in Target Angler trips					Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
	Dolphin	Grouper	King Mackerel	Red Snapper	Total			
1	0	0	0	0	0	$0	$0	$0
2ai	96	82	92	-2111	-1,840	-$3,613,235	-$250,244	-$3,863,480
2aii	105	89	98	-2162	-1,871	-$3,765,641	-$254,514	-$4,020,156
2aiii	96	82	93	-2128	-1856	-$3,635,674	-$252,422	-$3,888,096
2aiv	97	82	93	-2174	-1902	-$3,689,469	-$258,698	-$3,948,167
2bi	140	116	141	-3,207	-2,809	-$4,752,353	-$382,073	-$5,134,425
2bii	168	139	166	-3,663	-3,191	-$5,661,060	-$433,919	-$6,094,979
2ci	202	163	207	-4,736	-4,164	-$7,787,495	-$566,323	-$8,353,819
2cii	220	180	227	-5,123	-4,496	-$8,443,576	-$611,465	-$9,055,041
2ciii	218	176	223	-5,033	-4,416	-$8,316,757	-$600,513	-$8,917,270
2civ	202	163	213	-4,850	-4,273	-$7,935,569	-$581,102	-$8,516,670
2cv	202	163	213	-4,896	-4,318	-$7,986,484	-$587,251	-$8,573,735
3ai	243	200	249	-5,557	-4,865	-$9,248,055	-$661,668	-$9,909,723
3aii	231	190	253	-5,767	-5,093	-$9,372,647	-$692,702	-$10,065,349
3bi	236	194	249	-5,716	-5,038	-$9,347,560	-$685,108	-$10,032,667
3bii	327	272	329	-7,093	-6,164	-$11,968,520	-$838,372	-$12,806,892
3biii	236	194	272	-6,157	-5,456	-$9,906,448	-$742,053	-$10,648,501
3biv	237	194	272	-6,284	-5,582	-$10,045,175	-$759,085	-$10,804,259
3c	237	195	251	-5,741	-5,058	-$9,381,993	-$687,898	-$10,069,891
3di	243	201	263	-5,985	-5,277	-$9,749,528	-$717,696	-$10,467,223
3dii	253	209	266	-6,001	-5,274	-$9,864,803	-$717,245	-$10,582,048
3diii	249	207	279	-6,331	-5,597	-$10,239,723	-$761,163	-$11,000,886
3e	262	218	282	-6,318	-5,556	-$10,358,431	-$755,665	-$11,114,097
3fi	277	223	289	-6,564	-5,776	-$11,127,965	-$785,473	-$11,913,438
3fii	273	219	289	-6,631	-5,851	-$11,149,623	-$795,681	-$11,945,304
3gi	266	210	275	-6,317	-5,567	-$10,800,097	-$757,082	-$11,557,179
3gii	268	213	279	-6,401	-5,640	-$10,910,011	-$767,048	-$11,677,060
4ai	298	250	320	-7,083	-6,216	-$11,672,187	-$845,377	-$12,517,564
4aii	322	269	335	-7,340	-6,415	-$12,214,907	-$872,384	-$13,087,291
4aiii	298	250	320	-7,090	-6,223	-$11,680,213	-$846,303	-$12,526,515
4aiv	298	250	320	-7,120	-6,253	-$11,712,473	-$850,343	-$12,562,816
4b	300	252	322	-7,165	-6,291	-$11,785,770	-$855,595	-$12,641,365
4c	302	253	325	-7,269	-6,389	-$11,917,419	-$868,866	-$12,786,284
4d	303	255	327	-7,303	-6,417	-$11,976,640	-$872,759	-$12,849,399

Table 7. Economic Effects of the Gulf of Mexico Reef Fish Management Plan Amendment 27 Options, Private

	Change in Target Angler trips							
Alt	Dolphin	Grouper	King Mackerel	Red Snapper	Total	Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
1	0	0	0	0	0	$0	$0	$0
2ai	241	668	1160	-5517	-3,447	-$16,180,113	$0	-$16,180,113
2aii	318	894	1482	-7238	-4,544	-$21,102,586	$0	-$21,102,586
2aiii	247	668	1280	-6072	-3877	-$17,410,008	$0	-$17,410,008
2aiv	247	668	1287	-6207	-4005	-$17,585,785	$0	-$17,585,785
2bi	416	1,107	2051	-9,953	-6,378	-$24,398,163	$0	-$24,398,163
2bii	492	1,318	2473	-12,055	-7,772	-$30,502,939	$0	-$30,502,939
2ci	644	1,669	3170	-15,651	-10,169	-$43,751,006	$0	-$43,751,006
2cii	707	1,866	3483	-17,124	-11,068	-$47,989,854	$0	-$47,989,854
2ciii	727	1,904	3555	-17,749	-11,562	-$49,416,820	$0	-$49,416,820
2civ	652	1,669	3332	-16,405	-10,752	-$45,385,757	$0	-$45,385,757
2cv	652	1,669	3339	-16,549	-10,890	-$45,569,654	$0	-$45,569,654
3ai	775	2,058	3866	-19,004	-12,305	-$53,341,496	$0	-$53,341,496
3aii	798	2,113	4067	-19,996	-13,018	-$55,746,507	$0	-$55,746,507
3bi	793	2,112	3977	-19,636	-12,755	-$54,896,761	$0	-$54,896,761
3bii	1075	2,926	5119	-24,551	-15,432	-$70,973,600	$0	-$70,973,600
3biii	818	2,112	4485	-21,959	-14,544	-$59,928,343	$0	-$59,928,343
3biv	818	2,112	4498	-22,257	-14,829	-$60,303,038	$0	-$60,303,038
3c	792	2,112	3977	-19,615	-12,733	-$54,790,821	$0	-$54,790,821
3di	819	2,182	4168	-20,476	-13,307	-$57,055,873	$0	-$57,055,873
3dii	840	2,252	4255	-20,978	-13,631	-$58,452,265	$0	-$58,452,265
3diii	862	2,304	4422	-21,625	-14,037	-$60,318,218	$0	-$60,318,218
3e	872	2,340	4479	-21,993	-14,302	-$61,177,115	$0	-$61,177,115
3fi	913	2,354	4525	-22,512	-14,720	-$65,117,534	$0	-$65,117,534
3fii	930	2,414	4630	-23,006	-15,032	-$66,249,403	$0	-$66,249,403
3gi	883	2,233	4303	-21,543	-14,125	-$63,117,596	$0	-$63,117,596
3gii	902	2,304	4419	-22,042	-14,417	-$64,321,642	$0	-$64,321,642
4ai	976	2,654	4990	-24,262	-15,642	-$68,191,903	$0	-$68,191,903
4aii	1,032	2,816	5219	-25,581	-16,515	-$71,744,215	$0	-$71,744,215
4aiii	980	2,654	5057	-24,580	-15,889	-$68,867,936	$0	-$68,867,936
4aiv	980	2,654	5058	-24,607	-15,915	-$68,901,372	$0	-$68,901,372
4b	985	2,679	5035	-24,503	-15,804	-$68,797,091	$0	-$68,797,091
4c	995	2,709	5102	-24,825	-16,020	-$69,631,462	$0	-$69,631,462
4d	1,000	2,726	5117	-24,883	-16,039	-$69,864,874	$0	-$69,864,874

Table 8. Economic Effects of the Gulf of Mexico Reef Fish Management Plan Amendment 27 Options, Head Boats

Alt	Change in Angler Days	Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
1	0	$0	$0	$0
2ai	-3981	-$734,119	-$248,657	-$982,775
2aii	-5219	-$917,244	-$326,026	-$1,243,270
2aiii	-4390	-$794,632	-$274,220	-$1,068,852
2aiv	-4426	-$1,588,749	-$276,499	-$1,865,248
2bi	-2,790	-$2,566,002	-$174,308	-$2,740,310
2bii	1,402	-$2,766,618	$87,551	-$2,679,067
2ci	2,749	-$2,583,963	$171,745	-$2,412,218
2cii	10,164	-$2,919,838	$634,931	-$2,284,907
2ciii	490	-$2,831,284	$30,631	-$2,800,653
2civ	2,003	-$1,462,963	$125,121	-$1,337,842
2cv	1,936	-$2,673,590	$120,964	-$2,552,626
3ai	-6,356	-$3,153,210	-$397,018	-$3,550,228
3aii	-10,498	-$3,416,955	-$655,775	-$4,072,730
3bi	-9,349	-$3,406,276	-$583,988	-$3,990,264
3bii	-14,839	-$4,216,049	-$926,977	-$5,143,026
3biii	-11,163	-$3,674,033	-$697,311	-$4,371,344
3biv	-11,324	-$3,697,895	-$707,414	-$4,405,309
3c	-6,258	-$3,484,546	-$390,940	-$3,875,486
3di	-4,393	-$3,639,728	-$274,422	-$3,914,150
3dii	-3,149	-$3,620,467	-$196,728	-$3,817,195
3diii	-9,674	-$3,981,040	-$604,346	-$4,585,386
3e	-3,253	-$3,872,563	-$203,208	-$4,075,771
3fi	4,794	-$4,171,181	$299,496	-$3,871,685
3fii	-127	-$4,424,487	-$7,944	-$4,432,431
3gi	-2,925	-$3,795,295	-$182,695	-$3,977,989
3gii	-4,442	-$3,832,240	-$277,486	-$4,109,726
4ai	-18,965	-$4,657,264	-$1,184,712	-$5,841,975
4aii	-19,084	-$4,682,153	-$1,192,136	-$5,874,289
4aiii	-19,004	-$4,665,487	-$1,187,165	-$5,852,652
4aiv	-19,008	-$4,666,220	-$1,187,383	-$5,853,604
4b	-18,253	-$4,698,082	-$1,140,252	-$5,838,334
4c	-17,378	-$4,710,969	-$1,085,561	-$5,796,530
4d	-16,598	-$4,726,418	-$1,036,845	-$5,763,263

Table 9. Economic Effects of the Gulf of Mexico Reef Fish Management Plan Amendment 27 Options

Alt	Change from 2003 Target Effort			Change in Consumer Surplus (EV)	Change in Producer Surplus	Change in Economic Value
	Charter	Private	Head Boat			
1	0.00%	0.00%	0.00%	$0	$0	$0
2ai	-0.88%	-0.29%	-1.77%	-$20,527,467	-$498,901	-$21,026,368
2aii	-0.89%	-0.38%	-2.32%	-$25,785,471	-$580,540	-$26,366,012
2aiii	-0.88%	-0.33%	-1.95%	-$21,840,314	-$526,642	-$22,366,956
2aiv	-0.91%	-0.34%	-1.96%	-$22,864,003	-$535,197	-$23,399,200
2bi	-1.34%	-0.54%	-1.24%	-$31,716,518	-$556,381	-$32,272,898
2bii	-1.52%	-0.65%	0.62%	-$38,930,617	-$346,368	-$39,276,985
2ci	-1.98%	-0.86%	1.22%	-$54,122,464	-$394,578	-$54,517,043
2cii	-2.14%	-0.93%	4.51%	-$59,353,268	$23,466	-$59,329,802
2ciii	-2.10%	-0.97%	0.22%	-$60,564,861	-$569,882	-$61,134,743
2civ	-2.04%	-0.91%	0.89%	-$54,784,289	-$455,981	-$55,240,269
2cv	-2.06%	-0.92%	0.86%	-$56,229,728	-$466,287	-$56,696,015
3ai	-2.32%	-1.04%	-2.82%	-$65,742,761	-$1,058,686	-$66,801,447
3aii	-2.43%	-1.10%	-4.66%	-$68,536,109	-$1,348,477	-$69,884,586
3bi	-2.40%	-1.07%	-4.15%	-$67,650,597	-$1,269,096	-$68,919,692
3bii	-2.94%	-1.30%	-6.59%	-$87,158,169	-$1,765,349	-$88,923,518
3biii	-2.60%	-1.23%	-4.96%	-$73,508,824	-$1,439,364	-$74,948,188
3biv	-2.66%	-1.25%	-5.03%	-$74,046,108	-$1,466,499	-$75,512,606
3c	-2.41%	-1.07%	-2.78%	-$67,657,360	-$1,078,838	-$68,736,198
3di	-2.51%	-1.12%	-1.95%	-$70,445,129	-$992,118	-$71,437,246
3dii	-2.51%	-1.15%	-1.40%	-$71,937,535	-$913,973	-$72,851,508
3diii	-2.67%	-1.18%	-4.29%	-$74,538,981	-$1,365,509	-$75,904,490
3e	-2.65%	-1.21%	-1.44%	-$75,408,109	-$958,873	-$76,366,983
3fi	-2.75%	-1.24%	2.13%	-$80,416,680	-$485,977	-$80,902,657
3fii	-2.79%	-1.27%	-0.06%	-$81,823,513	-$803,625	-$82,627,138
3gi	-2.65%	-1.19%	-1.30%	-$77,712,988	-$939,777	-$78,652,764
3gii	-2.69%	-1.22%	-1.97%	-$79,063,893	-$1,044,534	-$80,108,428
4ai	-2.96%	-1.32%	-8.42%	-$84,521,354	-$2,030,089	-$86,551,442
4aii	-3.06%	-1.39%	-8.47%	-$88,641,275	-$2,064,520	-$90,705,795
4aiii	-2.96%	-1.34%	-8.44%	-$85,213,636	-$2,033,468	-$87,247,103
4aiv	-2.98%	-1.34%	-8.44%	-$85,280,065	-$2,037,726	-$87,317,792
4b	-3.00%	-1.33%	-8.10%	-$85,280,943	-$1,995,847	-$87,276,790
4c	-3.04%	-1.35%	-7.71%	-$86,259,850	-$1,954,427	-$88,214,276
4d	-3.06%	-1.35%	-7.37%	-$86,567,932	-$1,909,604	-$88,477,536

APPENDIX D: AVERAGE NET REVENUE PER ANGLER DAY FOR HEAD BOATS IN THE GULF OF MEXICO, 3/8/07

Purpose: Describe the derivation of the average net revenue per angler day in the head boat sector for the analysis of the economic effects of the Gulf of Mexico Reef Fish Fishery Management Plan Amendment 27 on the sportfishing sector.

Method

A = average total annual angler days out
= w1*0.5*d1*a1 + w2*d2*a2 + w3*2*d3*a3

where

w1, w2, w3 are the proportion of operators offering half, full, and overnight trips, respectively
d1, d2, d3 are the average number of half, full, and overnight trips, respectively for operators who offer these types of trips
a1, a2, a3 are the average number of half, full, and overnight passengers per trip, respectively for operators who offer these types of trips

RH = average total annual revenue for head boats
= w1*d1*rh1*a1 + w2*d2*rh2*a2 + w3*d3*rh3*a3

where

rh1, rh2, rh3 are the average head fee for half, full, and overnight head boat trips, respectively, for operators who offer these types of trips

NRH = weighted average net revenue per angler day out on a head boat
= (RH - C)/A

where C is the average total operating annual cost for trip-related expenses

Data

The data appears in the two tables following the References.

References

Holland, Stephen M., Fedler, Anthony J., and Milon, J. Walter. *The Operations and Economics of the Charter and Head Boat Fleets of the Eastern Gulf of Mexico and South Atlantic Coasts: 1999*. Report ID: MARFIN Grant No. NA77FF0553.

Sutton, Stephen G., Ditton, Robert B., Stoll, John R., and Milon, J. Walter. *A Cross-sectional Study and Longitudinal Perspective on the Social and Economic Characteristics of the Charter and Party Boat Fishing Industry of Alabama, Mississippi, Louisiana, and Texas: 1999*. Texas A&M University Human Dimensions Lab. Report ID: HD-612.

For Hire Average Per Trip Variable Costs by Gulf Zone ($1997)

Category	Western Gulf	Eastern Gulf	Included in Total Operating Cost?
Bookkeeping Services	$14,233	$1,420	No
Advertising and Promotion	$8,321	$7,242	No
Fuel and Oil	$61,367	$18,020	Yes
Bait Expenses	$14,171	$6,353	Yes
Docking Fees	$4,051	$11,533	No
Food/Drink for Customers/Crew	$2,000	$0	Yes
Ice Expenses	$2,515	$1,799	Yes
Insurance Expenses	$11,491	$8,570	No
Maintenance Expenses	$26,919	$13,385	No
Permits and Licenses	$1,238	$2,158	No
Wage and Salary Expense	$64,065	$52,000	No
Total Cost	$210,372	$122,479	
Total Operating Cost (C)	$80,053	$26,172	

Sources: Ditton et al. (1999); Holland et al. (1999)

Head Boat Average Net Revenue Per Trip Per Passenger

	Half Day	Full Day	Overnight	Total
		Eastern Gulf		
Proportion of operators offering each trip type (w)	1.00	1.00	1.00	
Average number of trips (d)	206	74	0	
Average number passengers per trip (a)	25	25	25	
Average base fees per passenger ($1997) (rh)	36	51	130	
Weighted average total annual angler days out	2,617	1,876	0	4,492
Weighted average total annual revenue ($1997) (RH)	186,347	94,846	0	281,193
Weighted average net revenue per angler day out ($2003) (NRH)				63
		Western Gulf		
Proportion of operators offering each trip type (w)	0.81	1.00	0.57	
Average number of trips (d)	67	177	9	
Average number passengers per trip (a)	38	38	38	
Average base fees per passenger (rh)	41	64	200	
Weighted average total annual angler days out	1,035	6,732	379	8,146
Weighted average total annual revenue (RH)	85,523	427,499	37,759	550,781
Weighted average net revenue per angler day out ($2003) (NRH)				62
		AVG (weighted by share of GOM trips)		
Weighted average total annual angler days out				6,107
Weighted average total annual revenue ($1997) (RH)				400,297
Average total annual variable costs ($1997) (C)				49,977
Weighted average net revenue per angler day out ($2003) (NRH)				62

Notes: The proportion of operators offering half, full, and overnight trips is from Ditton et al. (1999), Table 4.12 and Holland et al. (1999), Tables 4.14, B-4, B-8. The average number of half, full, and overnight trips and passengers per trip for operators who offer these types of trips is from Ditton et al. (1999) Tables 4-28 (w/o zeros) and Holland et al. (1999), Tables 4-31 (w/o zeros), 4-16, 4-18. Between 1986 and 1999 the average share of head boat angler days appearing in the Eastern and Western Gulf of Mexico, respectively, was 55.8% and 44.2% based on the NMFS Head Boat Survey. The 1982-84 base U.S. CPI was used to update the 1997 (160.5) revenue dollars to 2003 (184) values. The 1982 base U.S. PPI for #2 diesel fuel was used to update the 1997 (64.5) cost dollars to 2003 (100.5) values.

APPENDIX E: PRELIMINARY RESULTS FROM THE 2002/3 GULF OF MEXICO CHARTER BOAT ECONOMIC SURVEY (FHS ADD ON), 2/28/07

Purpose: Describe the derivation of the average net revenue per angler in the charter boat sector for the analysis of the economic effects of the Gulf of Mexico Reef Fish Fishery Management Plan Amendment 27 on the sportfishing sector.

Data source

This analysis relies on data generated by the 2002/3 Gulf of Mexico Charter Boat Economic Survey which was conducted as an add-on to the MRFSS For-Hire Survey (FHS) in the Gulf of Mexico. The FHS's population of interest is the universe of charter boat owners and operators. Since the FHS is not conducted in Texas, this economic add-on is also restricted to observations from Alabama, Florida (both coasts), Mississippi and Louisiana. The sampling frame consists of a master list of all known charter boats, which is continuously updated by the State agencies, and maintained at the Gulf States Marine Fisheries Commission (GSMFC). The survey is coordinated by the GSMFC and was implemented by the State agencies in 2002 and 2003. The data were collected through a telephone interview and participation was voluntary.

Data preparation

Six data sets, representing the six MRFSS waves from 07/01/02 to 06/30/03, of the economic survey data and the associated FHS data were each cleaned and then joined into a single data set.[32] After further cleaning, the total number of complete and usable observations is 1,222 trips by 700 unique vessels.[33]

The policy simulation motivating this analysis is based on expected changes to the number of trips targeting Red Snapper in the Gulf. The cost data does not contain a comparable 'targeting' variable. Instead, a sub-sample of the observations must be selected to best mirror this type of trip in order to generate the most appropriate revenue, cost and net revenue values for the policy analysis. To achieve this, the total number of observations is reduced by:

- Trips that originated on the Atlantic (east) coast of Florida
- Trips that were identified as 'head boat' trips by the respondent
- Trips that used fishing methods other than trolling or bottom fishing
- Trips that fished 'inland' waters, i.e. inshore waters

Hence, the remaining trips represent ***single day charter boat trips trolling or bottom fishing in offshore Gulf of Mexico waters***. We have 490 such observations by 288 unique vessels.

Definitions

Revenue: For the purpose of this analysis, total trip revenue includes the charter fee, tips and other trip related revenues reported by the respondents.

[32] The FHS sample for this time period was ~11,650 vessel-weeks; ~6,350 interviews were conducted; and ~1,300 of those collected economic data.

[33] As part of the cleaning process, multi-day trips were dropped due to data issues. They represent a very small portion of the overall number of trips. Ignoring these trips is unlikely to introduce any systematic bias, particularly on the per paying customer per day measures.

Costs: Costs for fuel, ice, bait and food are reported separately from costs for crew or captain services. Conceptually, the crew cost data does not measure the true cost of labor and captain's services. Any salaries not paid on a trip-basis and the return to an owner-operator's own labor will not be accounted for in the costs. The reported crew cost values should not be used for analysis.[34]

Net Revenue: The net revenues calculate in this analysis represent approximations of ***cash flow from operations***. This implies a short-term perspective. In economic terms, only trip-based variable costs are accounted for, while fixed costs are not (e.g. vessel maintenance, depreciation, insurance, loan payments, overhead). Consequently, the calculated *cash flow from operations* should – most appropriately – be considered an upper bound for 'net revenue'.

From an economic perspective, both crew cost and owner's profit are benefits derived from the productive process. Therefore, net revenue without crew cost is an appropriate measure of economic welfare changes to owner *and* crew in the charter boat sector.

Results

Table 1 lists the components and totals for average revenues, costs and net revenue on a per trip and a per paying customer basis.[35] Some further details about the fishing trips are given as well. The information is reported for Gulf "Red Snapper trips" in total and separately by State. For comparison, the last column gives the values for the full data set. All the dollar values are from 2002/3, as reported by the respondents.

Disclaimer

These results are tentative, pending further internal quality control. The general magnitudes of the revenues, costs and net revenues are fairly robust throughout the data set. In general, they are consistent (or vary as expected) across time, States, Florida regions, number of passengers, length of trip, fishing area, and gear/method used.

This note does not represent the main descriptive analysis and results of the 2002/3 Gulf charter boat economic survey. It has been prepared solely for Amendment 27/14 to the Reef Fish and Shrimp FMPs. As such, the results must be interpreted as preliminary and should not be used for any other purpose.

[34] The crew cost data suffers from a systematic response error. No correction was made for this in table 1.
[35] Note on 'per paying customer' values: The mean of the ratio x over z is not equal to the ratio of mean x over mean z. For all the 'per paying customer' values reported in the table, we first generated the per customer value for each individual trip and then took the sample mean of all these ratios.

Table 1: Mean Economic Values and Further Trip Characteristics

		"Red Snapper trips" (offshore charterboat trips trolling or bottom fishing in the Gulf of Mexico)					All Survey Observations
		Total (for analysis)	by State (departure) LA	MS	AL	FL	
	# of Observations	490	26	6	118	340	1,222
	# of unique boats	*288*	*18*	*5*	*67*	*248*	*700*
per Trip	Fees	$790	$1,114	$984	$965	$702	$575
per Trip	*quoted as per person*	*8%*	*31%*	*17%*	*3%*	*8%*	*11%*
per Trip	Tip	$78	$88	$88	$134	$57	$44
per Trip	Other Revenue	$1	$16	$0	$0	$0	$4
per Trip	Revenue	$869	$1,217	$1,073	$1,099	$759	$623
per Trip	Fuel cost	$101	$180	$84	$125	$87	$69
per Trip	Bait cost	$26	$38	$4	$32	$24	$19
per Trip	Ice cost	$9	$19	$4	$12	$8	$6
per Trip	Food cost	$1	$15	$0	$0	$1	$2
per Trip	Cost w/o crew payments	$138	$251	$91	$169	$119	$97
per Trip	Crew cost	$145	$320	$82	$93	$151	$154
per Trip	*crew size*	*1.9*	*1.9*	*2.2*	*2.0*	*1.8*	*1.5*
per Trip	*captain included*	*32%*	*69%*	*0%*	*28%*	*31%*	*46%*
per Trip	Cost with crew payments	$283	$571	$173	$262	$270	$251
per Trip	Net Revenue	$586	$646	$900	$837	$489	$371
per Trip	*w/o crew*	*$731*	*$966*	*$981*	*$931*	*$640*	*$526*
per paying Customer	Revenue	$163	$213	$106	$169	$158	$166
per paying Customer	Net Revenue	$103	$104	$88	$127	$95	$86
per paying Customer	*w/o crew*	*$136*	*$166*	*$96*	*$143*	*$133*	*$141*
	Persons	5.9	6.7	10.2	6.7	5.5	4.3
	Trip length (hours)	7.7	9.8	8.9	8.0	7.5	7.0
	Fishing time (hours)	4.5	5.7	6.4	4.2	4.5	4.8
	Fishing to trip time ratio	*60%*	*58%*	*72%*	*54%*	*62%*	*71%*
Area Fished	Inland	0%	0%	0%	0%	0%	30%
Area Fished	Less than 3 miles	2%	0%	33%	3%	1%	14%
Area Fished	Greater than 3 miles	98%	100%	67%	97%	99%	57%
Area Fished	*EEZ*	*80%*	*100%*	*67%*	*97%*	*73%*	*44%*
Gear (primary)	Trolling	26%	35%	33%	8%	31%	20%
Gear (primary)	Bottom fishing	74%	65%	67%	92%	69%	35%
Gear (primary)	Casting	0%	0%	0%	0%	0%	31%
Gear (primary)	Fly fishing	0%	0%	0%	0%	0%	6%
Gear (primary)	Drift fishing	0%	0%	0%	0%	0%	5%
Gear (primary)	Other	0%	0%	0%	0%	0%	1%
Season	2002 wave 4	27%	19%	33%	25%	28%	22%
Season	2002 wave 5	17%	15%	17%	19%	16%	17%
Season	2002 wave 6	9%	8%	0%	6%	11%	11%
Season	2003 wave 1	6%	12%	17%	0%	7%	10%
Season	2003 wave 2	11%	15%	0%	12%	11%	14%
Season	2003 wave 3	30%	31%	33%	37%	28%	24%
Fuel	Quantity (gallons)	84	140	77	106	72	54
Fuel	Price	$1.27	$1.36	$1.10	$1.21	$1.28	$1.43
Fuel	*percentage of costs*	*72%*	*72%*	*93%*	*71%*	*71%*	*68%*
Fuel	*percentage of revenue*	*12%*	*15%*	*9%*	*11%*	*12%*	*10%*
	Percentage in Florida	69%	0%	0%	0%	100%	69%
	No federal permit 02/03	22%	42%	0%	10%	25%	62%

APPENDIX F. NEPA comments from EPA on the DSEIS for Amendment 27 to the Reef Fish FMP and Amendment 14 to the Shirmp FMP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

May 22, 2007

Dr. Roy E. Crabtree
Regional Administrator
Southeast Regional office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

SUBJ: EPA NEPA Review of NOAA DSEIS for Amendment 27 to the Reef FMP and Amendment 14 to the Shrimp FMP (Amendment 27/14); Gulf of Mexico Fishery Management Council; Gulf of Mexico; (April 2007); 0648-AT87; CEQ# 20070154; ERP# NOA-E91018-00

Dear Dr. Crabtree:

Consistent with the National Environmental Policy Act (NEPA), the U.S. Environmental Protection Agency (EPA) has reviewed the subject National Oceanic and Atmospheric Administration /National Marine Fisheries Service (NOAA/NMFS) Draft Supplemental Environmental Impact Statement (DSEIS) for Amendment 27/14 prepared by the Gulf of Mexico Fishery Management Council (Council). This joint amendment evaluates "…long-term measures to reduce the red snapper fishing mortality rates of the directed red snapper fisheries, shrimp fishery, and other reef fish fisheries." The purpose of the supplement is to revise the current rebuilding plan (which page vii of the DSEIS indicated that the District Court ruled was based on flawed assumptions) and to update the interim management measures implemented by NMFS in 2007.

EPA supports the restoration of the Gulf of Mexico (GOM) red snapper fishery through implementation of control measures within the red snapper fishery as well as controls within the GOM shrimp fishery. We believe this dual approach to fishery management is essential in this case since many red snapper juvenile mortalities occur as bycatch during shrimp trawls.

Several alternatives for the eight proposed actions were offered. These actions are as follows (excerpted from pages xiii-xix):

* **Action 1** – Revise the red snapper rebuilding plan and end overfishing of red snapper by 2009 or 2010.
* **Action 2** – Post-hurricane reduction in directed fishery effort assumed for Action 1 TAC [Total Allowable Catch] alternatives.
* **Action 3** – Captain and crew bag limit.
* **Action 4** – Commercial minimum size limit.
* **Action 5** – Fishing gear restrictions.

* **Action 6** – Target reduction goal for juvenile red snapper mortality in the shrimp fishery of the northern and western Gulf of Mexico.
* **Action 7 –** Seasonal closure restrictions for shrimp industry.
* **Action 8** – Framework procedure for shrimp fishery.

EPA principally defers to NOAA/NMFS and the Council regarding technical fishery specifics such as setting the TAC, size limits and bycatch reductions, which were established through interpreting fishery data, trends and statistics. However, we wish to provide general comments on the alternatives presented for the above eight actions. We suggest consideration of the following comments during the development of the Final SEIS (FSEIS) by NOAA/NMFS and the Council:

* **Action 1 (Rate of Recovery)** – As we have suggested in previous NEPA comment letters, EPA supports an increased rate recovery for the overfished fishery resource (red snapper in this case). This could involve stronger control measures (such as the proposed reduction in TAC) and/or additional management measures (such as a reduction in bag limit to 2 for most recreational fishers). However, if these actions substantively impact societal issues (particularly if minority or low-income fishers (i.e., environmental justice populations) are disproportionately affected) or other managed fisheries (shrimp Fishery Management Plan (FMP) in this case) or even unmanaged fisheries, this should be considered in the decision-making process.

* **Action 2 (Hurricane Effects)** – Hurricane Katrina and Rita slowed the fishing efforts for red snapper and shrimp and other GOM reef fishes through shoreland destruction, marine debris and rough seas. Accordingly, reductions in landings and resultant temporary stock increases resulted. However, EPA suggests that any adjustments in TAC estimates or other management metrics should err on the side of conservatism in order to further enhance red snapper recovery. That is, taking minimal if any credit for reductions in fishing pressure or population increases would allow for an additional buffer to help insure/expedite stock recovery. We suggest that this approach (No Action or Alt. 3) be considered in the FSEIS selection of a preferred alternative for Action 2.

* **Action 3 (Bag Limits) –** The DSEIS preferred alternative for is action (Alt. 2) would allow a zero bag limit for for-hire vessels compared to the bag limit of 2 established in Action 1 for presumed other recreational fishers. This action is unclear and should be further explained in the FSEIS in the context of Action 1. We assume for-hire vessel fishers are considered recreational fishers even though such vessels are a business. As a business, we assume it is favored over general recreational fishers from a societal impact perspective and therefore are allowed a larger bag limit. We do not agree, however, that no (zero) bag limit is appropriate even if a bag limit that exceeds 2 is allowed for for-hire vessels.

* **Action 4 (Minimum Size Limits)** – We note that commercial minimum size limits are to be reduced from 15 to 13 inches TL in the DSEIS preferred alternative (2) but that recreational limits would stay at 16 inches TL. Page xxii discusses this inequity by indicating that the discard mortality rate for recreational fishers is substantially lower

than for commercial fishers. However, it is unclear how survival rates are verified and quantified for released regulatory discards ("shorts") that are released alive but injured.

Ordinarily, EPA supports increases (rather than reductions) in size limits as a management measure. However, in the case of the red snapper fishery where discard mortalities are found in both the commercial and recreational fishery, a decrease in minimum size could be beneficial (since snapper suffer from pressure changes by being rapidly brought to the surface from reef depths during hook-and-line capture, i.e., regulatory discards may not physiologically survive anyway or exhibit sublethal effects that make them more vulnerable to predation). Therefore, maintaining the minimum size limit or increasing it may exacerbate mortalities for this fishery since there likely would be more injured returns, especially in a fishery experiencing overfishing where a proportionately greater number of smaller individuals can be expected.

Despite this, lowering or maintaining the minimum size limit may otherwise be counterproductive to the fishery in terms of recovery since younger fish are harvested. As such, other management methods recommended by the NOAA/NMFS and the Council should be made sufficient and effective enough to overcome any such negative effects to recovery. The FSEIS should also report on the size of first maturity for male and female snapper for comparison against the proposed 13-inch TL minimum size limit. That is, how many spawning periods can be expected before most of the stock reaches 13 vs. 15 inches TL?

* **Action 5 (Fishing Gear)** – We fully support the use of circle hooks and advanced de-hooking devices proposed by the DSEIS preferred alternative (2) to minimize damage to hooked red snapper and thereby increase the survival rate of regulatory discards. However, we also favor Alternative 3 which proposes larger hooks to reduce the number of undersized fish that are hooked (based on mouth size). We suggest that both of these aspects should be preferred in the FSEIS for Action 5. The larger hook management measure can be applied to both circle and J-hooks.

The DSEIS suggests (pg. xvii) that use of larger hooks would be problematic since the industry has no standardization of hook size among vendors (presumably the hook size nomenclature varies). If so, perhaps another metric could be used to standardize hook size such as actual hook measurements made by fisher at the time of hook purchase (e.g., micrometer distance between two determined points on the hook), much like field micrometer measurements of carapace lengths for crabs or lobster.

* **Action 6 (Bycatch Reduction)** – For this action, NOAA/NMFS and the Council selected Alternative 4 in the DSEIS as the preferred alternative. This alternative targets a 74% reduction (below the 2001-2003 average) in the bycatch of juvenile red snapper. Page xix suggests that a comparable reduction (72%) is already expected for 2007 due to the use of improved Bycatch Reduction Devices (BRDs) and that bycatch may continue to decline with reductions in the shrimp industry's catch-effort for various reasons.

We are pleasantly surprised that the improved BRDs in shrimp trawls are expected to dramatically reduce the bycatch of juvenile red snapper. However, we recommend that the function and effectiveness of these improved BRDs be explained in the FSEIS as they relate to reducing juvenile red snapper bycatch. In addition, any BRD effects on reducing the target shrimp catch should also be discussed as well as possible sublethal effects on bypassed snapper juveniles (i.e., although no longer bycatch, what are the post-trawl chances of survival of entrained and bypassed juveniles?).

* **Action 7 (Shrimp Seasonal Closures) –** The DSEIS preferred alternative (2) proposes to seasonally close certain areas to the commercial shrimp fishery. The extent of such closures would be in response to "…annual evaluation of shrimp effort and red snapper mortality." We agree with such an adaptive management approach, i.e., using seasonal closures as a fallback measure to keep red snapper recovery on schedule as needed.

* **Action 8 (Shrimp Target Adjustment) –** Alternative 2 was selected in the DSEIS for this action. It proposes to "establish a framework to adjust the effort and closed season within the scope of alternatives identified in Actions 6 and 7." We presume that this action is another form of adaptive management that can be used as necessary to help ensure red snapper recovery. As such, this alternative appears reasonable.

EPA rates this DSEIS as "LO" (Lack of Objections) since we overall support Amendment 27/14 to help restore the GOM stocks of red snapper. We give deference to NOAA/NMFS and the Council regarding technical fishery specifics but nevertheless request FSEIS consideration of our general comments on the eight actions proposed. We particularly find appropriate the use of the dual management approach to concurrently manage both the red snapper and shrimp fisheries, the use of circle hooks and other gear to reduce injury to hooked undersized snapper that are returned as regulatory discards, the use of improved BRDs to notably reduce the bycatch of juvenile red snapper, reduction of minimum size limits for this fishery since regulatory discards are often injured during capture and may not survive a return to sea, and the approach to use fallback adaptive management measures such as potential shrimp seasonal closures to insure red snapper recovery.

EPA appreciates the opportunity to review this DSEIS. If you have questions regarding our comments, please contact Chris Hoberg of my staff at (404) 562-9617 or hoberg.chris@epa.gov.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

APPENDIX G. Responses to EPA's comments on the DSEIS for Amendment 27 to the Reef Fish FMP and Amendment 14 to the Shrimp FMP

Including comments from the EPA, 21,631 comments were received from individuals and organizations during the 45-day comment period on the DSEIS. Most of these comments were through an e-mail and letter writing campaign by a non-governmental organization that generally supported the actions in Amendment 27/14. The following is a response to these comments.

Overall, the EPA was supportive of NMFS's proposed actions intended to restore the red snapper stock and encouraged the agency to address fisheries management of this stock by addressing both the directed and shrimp fisheries. The EPA rated this DSEIS as an "LO" (Lack of Objections). For the most part, the EPA was supportive of the preferred alternatives and pointed out areas where the document could be strengthened. With respect to Action 3, it appears the EPA reviewers may have misinterpreted the preferred alternative. The preferred alternative would prohibit the captain and crew of a for-hire fishing vessel from keeping a bag limit of red snapper when conducting a for-hire trip. Language has been inserted to make this more clear. With respect to Action 5, the Council and NMFS have been in contact with hook manufacturers about hook standardization. In the future, it may be possible to develop some type of standardization or labeling making Alternative 3 of this action a more tenable solution. Alternatives considered but rejected through the development process of the DSEIS with an explanation of why they were rejected can be found in Appendix A.

The following are responses to comments received from individuals and organizations. Comments suggesting revisions to the text to clarify the discussion were incorporated into the FSEIS and are not listed below.

Comment: Establish a total mortality limit for both directed fisheries. This limit would include all killed fish for each sector. A sector that can reduce dead discards would conversely see an increase in allowed landings.

Response: Establishing a total mortality limit was not considered in Amendment 27/14. While this concept would provide incentives for the respective fisheries to minimize dead discards, better estimates of discard mortality are needed. Currently estimates of discard mortality are derived from logbooks, recreational surveys, and a limited number of scientific studies. There is a higher degree of uncertainty regarding this type of information that make it more difficult to assess what actual reductions in discard mortality might be achieved through particular actions by a fishery. To reduce uncertainty for this information, greater observer coverage, which provides the best information on discards, would be needed in the fishery,. NMFS has recently begun placing observers on reef fish vessels to obtain this type of information. Further efforts are underway to investigate the efficacy of using video systems on vessels to collect data on bycatch and discards.

Comment: Several respondents felt the need to institute management measures on the recreational fishery was not warranted. Another indicated technological improvements available to recreational fishermen require this sector to be managed more so than the commercial sector.

Response: Overfishing needs to be reduced for red snapper to a level consistent with the current rebuilding plan, and means a reduction in TAC. Additionally, NMFS is under a court order to establish a revised rebuilding plan by December 12, 2007, with a greater than 50 percent probability of success. Thus, reductions in TAC are needed.

In managing the recreational fishery such that harvest is constrained to the recreational quota, NMFS has employed bag limits, size limits, and seasonal closures. The combined effect of reducing the recreational bag limit from 4 to 2 fish, reducing the length of fishing season, and prohibiting a bag limit for the captain and crew bag limit of for-hire vessels should control effort sufficiently to ensure the recreational fishery remains within its 2.45 mp quota. A discussion of the effects of these measures can be found in Sections 2 and 5.1. To maintain a four-fish bag limit or the bag limit for the captain and crew of for-hire vessels, the fishing season would need to be further reduced. Testimony from fishermen, particularly the for-hire sector, has suggested they would prefer a reduction in the bag limit to a reduction in season length.

Comment: Some respondents suggested there is no evidence that red snapper are overfished in the northeastern Gulf, particularly off Alabama and the west coast of Florida. Therefore, management measures are not needed for this area.

Response: The stock assessment was able to separate eastern and western components of the fishery separated by the Mississippi River delta. This includes the finding that discard mortality rates for both the commercial and recreational fisheries are lower in the eastern Gulf than western Gulf. While the stock assessment did find the eastern portion of the stock to be in better condition than the western portion, the eastern stock is still considered overfished. Recovery of red snapper in this region is more sensitive to reductions in recreational fishing mortality and bycatch, thus management measures to further constrain the recreational harvest are needed. Should artificial reefs be shown to significantly increase productivity, further measures to encourage their use may be developed.

Comment: One comment suggested the impact of artificial reefs on stock productivity should be considered.

Response: During the data workshop portion of the SEDAR process, several presentations were made estimating high numbers of recruits. In all cases, artificial structures were discussed as one of several possible mechanisms to account for this high recruitment. At this time, it would be premature to select one mechanism over others. However, the SEDAR did encourage these various mechanisms be examined in more detail through future research.

Comment: One comment suggested the fishing season be revised to exclude the red snapper spawning season

Response: The Council indicated the minimum season length to be considered for the recreational fishery should cover a core period that included the summer months. Therefore, alternative fishing seasons considered for this amendment were limited to those combinations of bag and size limits that maintained at least this season. Red snapper spawning occurs over an extended period during the summer and fall, and thus could not be considered under the seasonal constraint imposed by the Council

For the commercial sector, a new IFQ program was implemented for the 2007 fishing year and allows the fishery to stay open all year long. This type of program was developed in part to eliminate the derby fishery conditions that had developed in response to short fishing seasons. As summarized in Amendment 26 to the Reef Fish FMP, derby fisheries create negative social and economic conditions by: Reducing or eliminating considerations about weather conditions in deciding when to fish, which adversely affects safety at sea; interrupting normal fishing patterns;

flooding the market with fish, which depresses ex-vessel prices and reduces producer surplus; making it difficult to comply with and enforce fishery regulations, which frustrates fishery participants and reduces regulatory effectiveness; and increasing competition and differential regulations, which exacerbates user conflicts. Further, derby fisheries can unnecessarily adversely affect target and non-target stocks by providing participants less flexibility in deciding when, where, and how to fish.

Comment: Some respondents suggested closing the directed red snapper (commercial and recreational) and shrimp fisheries to allow the red snapper stock to recover.

Response: TACs less than 5 mp, including no harvest, were considered but rejected by the Council in developing Amendment 14/27. This is because these lower TACs are considered inconsistent with the national standard (NS) 8 mandate to minimize to the extent practicable adverse effects on fishing communities because the 2005 SEDAR assessment indicates a five million pound TAC is capable of ending overfishing immediately, and of rebuilding the red snapper stock under the revised rebuilding plan.

Comment: A few respondents questioned why TAC was being reduced rather than creating seasonal or area closures to protect spawning aggregations. They indicated fishing for snapper should be closed in areas and at those times when snapper are known to spawn.

Response: Area closures were considered but rejected by the Council as a management tool for the directed fishery in Amendment 14/27. The effectiveness of closing additional areas for the purpose of reducing red snapper bycatch in the directed fishery is questionable given the broad distribution of the red snapper stock, the effects of closed areas on effort shifting, and the multispecies nature of the Gulf reef fish fishery. However, fishing is restricted or prohibited within a number of areas in the Gulf, including the Alabama Special Management Zone, a reef fish longline and buoy gear restricted area, the Tortugas Marine Reserves, the Florida Middle Grounds Habitat Area of Particular Concern (HAPC), the West and East Flower Garden Banks HAPC, the reef fish stressed area, and the Madison-Swanson and Steamboat Lumps marine reserves.

The size distribution of red snapper is not stratified by depth, and there is currently no evidence that directed fishery bycatch of red snapper is unusually high in a particular area. Further, because the red snapper co-occurs with a number of other reef fish species targeted by commercial and recreational fisheries, this type of action would require prohibiting the take of multiple species inside the closed area to limit the bycatch mortality of red snapper. Given the questionable benefits of a spatial management strategy to the red snapper stock, it would likely be considered inequitable to limit the take of some co-occurring species, like vermilion snapper, which is determined not overfished and not undergoing overfishing. Additionally, the potential effects of shifting, or further concentrating effort, outside such a closed area are not well understood.

Comment: A few respondents indicated high fuel prices and the after affects of 2005 hurricanes have reduced recreational fishing effort and thus no further actions need to be taken to constrain red snapper harvest. Other comments suggested there is no substantive information to support reductions in post-hurricane fishing effort be applied over the long term.

Response: Based on public testimony, the Council chose to incorporate a 10-percent reduction in effort and landings when evaluating TAC, fishing seasons, and harvesting restrictions (see

Action 2). They viewed this as appropriate given increases in fuel prices and impacts to the reef fish fishery and infrastructure from the 2005 hurricane season. Preliminary data does suggest some declines have occurred since the 2005 hurricane season, the magnitude of reductions varies by fishing sector and is often less than 10 percent. It is unknown how long post-hurricane reductions in landings and fishing effort may continue into the future. These would be evaluated in future stock assessments and adjusted accordingly.

Comment: Some comments indicated while recreational size limits and bag limits should be used to control recreational harvest in the short term, long-term measures, including economic incentives, should be developed to reduce recreational discard mortality.

Response: Measures selected as preferred in Action 5 should help to reduce discard mortality in the recreational reef fish fishery. These include the requirement that venting tools, dehookers, and circle hooks be used when fishing for reef fish. The Council is also exploring other means to reduce bycatch. At their June 2007 meeting, the Council appointed an Ad Hoc Recreational Red Snapper Advisory Panel which will be examining options, including limited access privilege programs (LAPPs), to better manage this fishery.

Comment: One comment suggested the bag limit for red snapper should be the first 5 or 6 fish caught, fishermen would not be allowed to discard any red snapper.

Response: This alternative was considered but rejected (Appendix A) because preliminary analyses indicated this type of regulation would increase total recreational fishing mortality Gulf-wide and across all modes, thus slowing recovery. Measures that slow recovery have negative long-term economic consequences.

Comment: Several comments indicated reducing the commercial minimum size limit will adversely affect stock recovery, enhance user conflict, and are not fair and equitable.

Response: The environmental consequences of reducing the commercial minimum size limit was extensively discussed and analyzed in the SEIS used to examine the effects of different bycatch alternatives for the commercial fishery. The current 15-inch commercial minimum size limit is the greatest factor contributing to bycatch in the directed commercial red snapper fishery. Bycatch logbook records indicate greater than 99 percent of all commercially caught red snapper are due to regulatory discards. Analyses conducted by the Southeast Fisheries Science Center indicate red snapper recovery rates and spawning potential are faster if the commercial minimum size limit is reduced or eliminated; however, recovery rates are increasingly slowed if the recreational minimum size limit is reduced. High release mortality rates in the commercial fishery provide little, if any, protection to the stock because the released fish mostly die rather than contribute to filling the quota. In contrast, the 16-inch recreational minimum size limit affords some protection to the stock, because discard mortality rates are lower and a greater percentage of discarded fish will survive to spawn and later contribute to the quota as larger animals. Yield-per-recruit analyses indicate yield-per-recruit is maximized at 12-inches total length in the western Gulf commercial fishery and 15-inches total length in the eastern Gulf commercial fishery. However, there is virtually no difference (less than 0.3 percent) in maximum yield-per-recruit for the eastern Gulf commercial fishery for minimum size limits ranging from 12 to 15 inches total length.

Although differences in minimum size limits may potentially result in user conflicts, the Council weighed the consequences of taking this action and determined the benefits of maintaining the current recreational size limit outweighed the disadvantages of reducing this size limit. Consequences of reducing the size limit would be further reducing the bag limit or fishing season. The Council did examine the possibility of segregating the commercial and recreational fisheries by depth to reduce user conflict, but this alternative was considered but rejected. The Council determined moving the commercial fishery offshore to attempt to reduce potential user conflicts would reduce the flexibility and efficiency of commercial fishermen under the IFQ program, and would likely increase the discard mortality rate of that fishery on red snapper and other species, like vermilion snapper, because survival rates decrease in deeper waters. Further, the proposed IFQ program is expected to further reduce user conflicts by dispersing the commercial fishery, both temporally and spatially.

Comment: Several respondents pointed out to reduce bycatch in the recreational fishery, the current four-fish bag limit should not be reduced and/or the recreational minimum size limit should be lowered or removed.

Response: As mentioned in a previous response, overfishing needs to be reduced for red snapper to a level consistent with the current rebuilding plan, and means a reduction in TAC. In managing the recreational fishery such that harvest is constrained to the recreational quota, NMFS has employed bag limits, size limits, and seasonal closures. Assuming a 10-percent reduction in recreational effort due to hurricanes and fuel prices, the combined effect of reducing the recreational bag limit from 4 to 2 fish, reducing the captain and crew bag limit for for-hire vessels, and reducing the season to a May 15 to October 15 should control effort sufficiently to ensure the recreational fishery remains within the 2.45 mp quota. To maintain a four-fish bag limit, the fishing season would need to be further reduced. Testimony from fishermen has suggested they would prefer a reduction in the bag limit to a reduction in season length. However, some have commented they would prefer to maintain the bag limit over season length.

Reductions in the size limit, as described in an above response significantly slows the recovery rate of the red snapper stock. This type of action, if implemented, would require further reductions in the season length or bag limit.

Comment: Size limits between the eastern and western recreational fisheries need to be different due to different discard mortality rates. A lower size limit in the western Gulf is justified given the higher discard mortality rate.

Response: The Council did consider different regulations between the eastern and western Gulf for the recreational fishery. In Action 1, Alternative 2, different seasons were considered; however, these options were not selected in part because of confusion for anglers from weekend openings and in areas around where the line of demarcation between the eastern and western Gulf is drawn (see discussion of Action 1 in Section 2 and Section 5). With respect to size limits, analyses (SERO 2006) found for both the eastern and western Gulf, YPR is maximized at 16 inches. Therefore there would be no advantage to having differential size limits between regions. Higher bag limits in one region or the other would cause a reduction in the fishing season to less than the core summer season identified by the Council.

Comment: Many comments suggested the level of shrimp bycatch mortality should be reduced by at least 74 percent from the benchmark years of 2001-2003.

The Council did select a 74-percent bycatch mortality target which meets the 68-80 percent target mortality reduction level necessary to rebuild the red snapper stock to spawning potential ratios of 20 percent or greater. This level appears reasonable given information through 2006, which suggests effort has continued to decline in offshore waters of the western Gulf. Therefore, similar to the directed red snapper fishery, effort for 2006 and 2007 is likely to be less than the level of effort documented during 2005 in areas where red snapper are commonly taken. Additional bycatch mortality reduction is expected from the introduction of new BRDs for the fishery under a pending revision to the certification criterion for BRDs. In combination, NMFS estimates red snapper bycatch mortality attributable to the shrimp fishery over the next few years may closely approximate the needed 68-80 percent reductions from the benchmark years of 2001-2003, while allowing the industry some flexibility in achieving optimum yield, as it is currently defined for the fishery.

Comment: Some comments suggested the Council explore further options to manage the shrimp fishery such as the elimination of latent permits, a shrimp IFQ program, and further time/area closures such as biodiversity "hot spots."

Response: The Council recognizes long-term measures are required to control shrimp effort and bycatch. Recently, the NMFS implemented Shrimp Amendment 13 which established a moratorium on the issuance of shrimp permits, a first step towards developing a LAPP for the shrimp fishery. The Council is currently evaluating in Shrimp Amendment 15 the potential benefits of additional alternatives that would establish long-term measures to control effort. These include measures to address latent effort. In addition, seasonal or fixed closures in at least five areas identified through a review of recent literature and ongoing research programs could be considered. Three of these areas are located off the coast of Texas, one is located south of Mobile, and one is located west of the Mississippi Delta.

Comment: Several comments suggested observers need to be placed on shrimp vessels to document bycatch and areas where bycatch is worst.

Response: NMFS continues to place observers on shrimp vessels to evaluate bycatch and funds various research projects designed to evaluate methods to reduce bycatch. Additionally, NMFS annually conducts surveys in the Gulf using trawls to quantify densities of benthic fish species. This information has been used to determine areas where potential bycatch is greatest.

Comment: One comment suggested that Action 6, Alternative 5 should be the preferred alternative because it gives more flexibility to the amount of reduction required. The percent reduction can be set through subsequent assessments.

Response: The Council developed a new preferred alternative for Action 6 to create more flexibility similar to that suggested in the above comment. The preferred alternative establishes for 2008 through 2010 a target reduction of red snapper shrimp trawl bycatch mortality 74 percent less than the 2001-2003 benchmark time period. The target reduction is then relaxed as allowed, over time, to a target reduction goal of 60 percent.

Comment: Because the shrimp fleet has been shrinking due to imports and high fuel prices, there is no need to establish a framework procedure because the fleet won't exceed required reductions in effort.

Response: NMFS intends to provide shrimp trawl effort information to the Council for their evaluation. If shrimp effort for is above the target, NMFS the Council could take further action, if necessary, to maintain the proposed reductions in shrimp effort in areas of the western GOM where red snapper are most abundant. However, unless a framework is in place, the response to an increase in effort would be delayed as the Council develops a plan amendment. This could result in more severe management measures than if addressed in a more timely fashion through framework.

Comment: Several respondents indicated measures to reduce bycatch in the directed fishery appeared inadequate because the discard mortality would not be reduced by 74 percent.

As explained in discussion of Action 1 in Section 2, the maximum ABC for red snapper that would end overfishing within the timeframe set by the Council's rebuilding plan is 7 mp. However, a 7 mp TAC would require all sources of fishing mortality (i.e., directed fishery, closed season bycatch, and shrimp trawl bycatch) be reduced by 74 percent in order to end overfishing. Based on management measures considered in this amendment, bycatch is unlikely to be reduced in the directed fishery by 74 percent; especially closed season discards. In recognition of this, the Council selected a lower TAC of 5 mp in recognition that the bycatch mortality target would not be reached. Thus, landings that could have gone to the fishery are foregone. This revised rebuilding plan is consistent with the objectives of Reef Fish Amendment 22, which would end overfishing between 2009 or 2010 and give the stock a better than 50 percent probability of rebuilding to B_{MSY} by 2032.

Comment: Some respondents suggested mandatory classes should be taught to charter vessel captains and crew on how to properly dehook, vent, and release fish to reduce bycatch mortality.

Response: Similar classes designed for proper sea turtle handling and release protocols, are currently requisites for obtaining a permit required in some highly migratory species fisheries. However, they have not been developed for reef fish fisheries. While properly designed fish handling classes could provide long-term benefits to the stock, mandating classes could be difficult to schedule give the diversity within the directed fishery. NMFS will continue its outreach efforts and will continue to work with Seagrant, state marine fisheries resource agencies, and other partners to educate fishermen on proper ways to release fish.

Comment: One comment indicated fishing gear restrictions should be enforceable. The proposed restrictions in Action 5 will be difficult to enforce.

Response: While it is difficult to mandate fishermen to actually use the gear proposed in Action 5, requiring the gear to be onboard a vessel when fishing is enforceable. However, much of the gear listed in the preferred alternative for Action 5 is currently being used in the directed fishery. Anecdotal information suggests circle hook use is common in the commercial fishery and some sectors of the recreational fishery. Dehooking devices are required in the commercial and for-hire fisheries through Amendment 18A to the Reef Fish FMP; however, this requirement is aimed at protected species, such as sea turtles. The extent these sectors would also use dehookers to assist in releasing fish is unknown. Various state and federal agencies have been conducting outreach to the directed fishery on venting fish and have provided venting tools to fishermen.

Comment: One respondent indicated restricting harvest of red snapper will cause a shift in effort towards other species. This will cause increased restrictions on those other species, making it even harder for fishermen to make a living.

Response: While some shift in harvest towards other species is likely to occur, most species the directed fishery may shift to currently have harvest restrictions designed to protect these species. With respect to adverse economic effects, certainly a reduction in TAC will adversely affect fishermen in the directed fishery. The commercial fishery is managed under an IFQ program which should result in an increase in dockside prices, partially offsetting the effects of the quota reduction. For the for-hire industry, best available survey and modeling results indicate that relatively few trip cancellations are expected to occur as a result of this action. Most survey respondents indicated that when faced with a reduced red snapper bag limit, they would either continue fishing for red snapper or fish for another species. This switching behavior may generate distributional effects (i.e., the substituted trip may occur from a different port, different mode, or in a different season, resulting in one port/season losing while another gains). These distributional effects, however, cannot be predicted with current data.