SUMMARY OF RED SNAPPER MANAGEMENT

This document is a summary of recent regulations affecting red snapper.

NMFS issued a Red Snapper Interim Rule that became effective on December 4, 2009. The rule prohibited harvest and possession of red snapper from January 4, 2010 to June 2, 2010. The rule was then extended 186 days.

Amendment 17A implemented the following regulations, effective December 3, 2010:

- Established an F_{MSY} proxy of F_{30%SPR}. The MSY proxy value is 2,431,000 lbs (whole weight)
- Established a rebuilding schedule of 35 years. Total annual kill allowed under rebuilding plan = 144,000 lbs ww.
- Established a rebuilding strategy where $F_{OY} = F98\%_{F30\%}$ and ACL=0
- Implemented a monitoring program as the Accountability Measure:
 - 1. Track the CPUE of red snapper via a fishery-independent monitoring program to track changes in biomass and take action to end overfishing if the assessment indicates progress is not being made.
 - 2. Track the biomass and CPUE through fishery-dependent sampling.
 - 3. CPUE would be evaluated every three years and adjustments would be made using the framework action.
- Established area closure where all snapper grouper fishing would be prohibited (except snapper grouper species other than red snapper caught with black sea bass pots or spearfishing gear)

Regulatory Amendment 10 implemented the following regulation, effective May 31, 2011:

• Removed the area closure implemented through Am 17A



Figure 1. Timeline of recent red snapper management measures.

Latest Stock Assessment (SEDAR 24) Results:

Overfished Status

Estimated time series of stock status (SSB/MSST) shows decline until the late 1980s, and then some increase since the mid-1990s. The increase in stock status appears to have been initiated by the 1992 management regulations, and then perhaps reinforced by strong recruitment events. Base-run estimates of spawning biomass have remained below MSST throughout most of the time series. Current stock status was estimated in the base run to be $SSB_{2009}/MSST = 0.09$. Uncertainty from the MCB analysis suggests that the estimate of overfished status (i.e., SSB < MSST) is robust. Age structure estimated by the base run shows fewer older fish than the (equilibrium) age structure expected at MSY. However, in the terminal year (2009), ages 3 and 4 approach the MSY age structure as a result of recent strong year classes.

Overfishing Status

The estimated time series of F /FMSY suggests that overfishing has been occurring throughout most of the assessment period. Current fishery status in the terminal year, with current F represented by the geometric mean from 2007–2009, is estimated by the base run to be $F_{2007-2009}/F_{MSY} = 4.12$. This estimate indicates current overfishing and appears robust across MCB trials. It might, however, be subject to some retrospective error.

Table 1. Summary of stock status determination criteria. Estimates of yield do not include discards. Rate estimates (F) are in units of y-1; status indicators are dimensionless; and biomass estimates are in units of metric tons or pounds, as indicated. Spawning stock biomass (SSB) is measured by total gonad weight of mature females.

Criteria	Recommended Values from SEDAR 24		
	Definition	Value	
M (Instantaneous natural mortality; per year)	Average of Lorenzen M (if used)	0.08	
F ₂₀₀₉ (per year)	Apical Fishing mortality in 2009	0.9076	
F _{current} (per year)	Geometric mean of the fishing mortality rates in 2007 - 2009	0.73*	
F _{MSY} (per year)	F _{MSY}	0.178	
B _{MSY} (metric tons)	Biomass at MSY	13632	
SSB ₂₀₀₉ (metric tons)	Spawning stock biomass in 2009	13	
SSB _{MSY} (metric tons)	SSB _{MSY}	156	
MSST (metric tons)	(1-M)*SSB _{MSY}	144	
MFMT (per year)	F _{MSY}	0.178	
MSY (1000 pounds)	Yield at MSY	1842	
OY (1000 pounds)	Yield at F _{OY}	OY (65% F _{MSY})= 1712 OY (75% F _{MSY})= 1780 OY (85% F _{MSY})= 1821	
F _{OY} (per year)	F _{OY} = 65%,75%, 85% F _{MSY}	65% F _{MSY} = 0.115 75% F _{MSY} = 0.133 85% F _{MSY} = 0.151	
Biomass Status	SSB ₂₀₀₉ /MSST	0.09	
Exploitation Status	F _{current} /F _{MSY}	4.12	

*Fcurrent was adjusted down for the projections to reflect the moratorium

SUMMARY OF AMENDMENT 17A TO THE SNAPPER GROUPER FISHERY MANAGEMENT PLAN OF THE SOUTH ATLANTIC REGION (AMENDMENT 17A)



The South Atlantic Fishery Management Council (Council) is developing regulations for red snapper to end overfishing and rebuild the stock. The regulations are expected to be implemented in late 2010 or early in 2011. The stock status is based upon a red snapper stock assessment that was completed in 2008. A new red snapper stock assessment is currently underway; results will be presented to the Council at their December 2010 Council meeting. Regulations could change based upon that assessment.

This document is intended to serve as a SUMMARY for all the actions and alternatives in Amendment 17A. It also includes a summary of the expected biological and socio-economic effects from the management measures.

Table of Contents for Actions in Amendment 17A

Establish a maximum sustainable yield proxy for red snapper	S-4
Establish a red snapper rebuilding plan	S-6
Rebuilding schedule	S-6
Rebuilding strategy, optimum yield, annual catch limit and accountability measures	S-7
Accountability measures	S-8
Establish red snapper management measures	S-11
Require the use of circle hooks	S-18
Establish a red snapper monitoring program	S-19

Background

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires the Regional Fishery Management Councils and NOAA Fisheries Service to prevent overfishing while achieving optimum yield (OY) from each fishery. When a stock is undergoing overfishing, measures must be put in place to end overfishing immediately upon implementation. In cases where stocks are overfished, the Councils and NOAA Fisheries Service must implement rebuilding plans.

The most recent assessment for the red snapper stock in the South Atlantic shows that the stock is experiencing overfishing and is overfished (SEDAR 15 2008). A new benchmark assessment for red snapper is expected to be completed by the end of 2010.

Overfishing

A rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield (MSY) on a continuing basis.

Overfished

When a fish stock is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding.

OVERFISHING is occurring at a high degree

(This is a graph of red snapper mortality rate from fishing activities over time)





The stock is severely OVERFISHED.

(This is a graph of biomass in pounds (top line) and spawning stock biomass over time)

Purpose and need of the proposed action

The *purpose* of Amendment 17A is threefold: (1) to implement management measures to end overfishing of the red snapper stock in the South Atlantic immediately upon implementation; (2) to rebuild the stock so it may ultimately produce optimum yield (OY); and (3) to minimize to the extent practicable adverse social and economic effects expected from the first two items.

The *need* for the action is to bring the red snapper stock back to a level that will produce optimum yield (OY). By allowing the red snapper stock to increase in biomass and maximize its reproductive potential, the population will again produce the optimum yield. Optimum yield, the ultimate goal of any fishery management plan, is the level of harvest that provides the greatest economic, social, and ecological benefit to the nation.

List of Management Actions

There are five *actions* in Amendment 17A that will accomplish the purpose and need.

- (1) Establish a maximum sustainable yield proxy for red snapper
- (2) Establish a red snapper rebuilding plan
 - a. Rebuilding schedule (timeline)
 - b. Rebuilding strategy, optimum yield, annual catch limit and accountability measures
- (3) Establish red snapper management measures
- (4) Require the use of circle hooks
- (5) Establish a red snapper monitoring program

Each action has a range of *alternatives* in order to accomplish the purpose and need. Alternatives are developed for Council members and the public to weigh biological, economic and social impacts. The public is given the opportunity to comment on the alternatives as well. The range must include at least the no action (to do nothing) and preferred (the Council's choice) alternatives.

Red Snapper Life History – An Overview



The red snapper is found from North Carolina to the Florida Keys, and throughout the Gulf of Mexico to the Yucatan Peninsula in waters ranging from 33-623 feet. Adults are usually found over rocky bottoms. Juveniles inhabit shallow waters and are common over sandy or muddy bottoms. Red snapper do not migrate but can move long distances. They live in both pelagic (open ocean) and benthic (ocean bottom) habitats during their life cycles.

The spawning season for red snapper varies with location, but in most cases occurs nearly year round. The spawning season off the southeastern United States extends from May to October, peaking in July through September. Females are mature at 11 to 13 inches total length. Red snapper eat fishes, shrimps, crabs, worms, other invertebrates, and some plankton.

Red snapper can attain sizes as great as 40 inches total length and 50 lbs. The 2008 stock assessment for South Atlantic red snapper indicated that red snapper can live to a maximum of 54 years, far longer than the previous (1997) estimate of 25 years. Red snapper in the Gulf of Mexico have been reported up to 57 years old.

Among red snapper, larger fish aren't always older fish. There is a great deal of variability in the age of red snapper at larger sizes. For example, the average size of a 10 year old red snapper is around 32 inches, but 10 year old fish range in size from 27 to 40 inches in length. Fish are currently being caught before they become old enough to reach their peak reproductive levels. Increasing the abundance of older, mature fish is important to long-term sustainability.

The red snapper stock is part of the snapper grouper multi-species fishery with many species occupy the same habitat at the same time. For example, red snapper co-occur with vermilion snapper, tomtate, scup, red porgy, white grunt, black sea bass, red grouper, scamp, and others. Because red snapper are part of a multi-species fishery, they can be incidentally caught and killed when fishermen target cooccurring species.

Action 1. Establish a Maximum Sustainable Yield (MSY) proxy for red snapper

The MSY alternatives are in Table S-1. Under the Magnuson-Stevens Act, the Council is required to set MSY. If there is not enough data to establish MSY, a proxy must be used. A proxy is a place-holder until sufficient data becomes available to estimate MSY.

Alternatives	Equation	F _{MSY}	MSY Proxy Values (lbs whole weight)	
Alternative 1 (No Action) (Preferred)	MSY equals the yield produced by F _{MSY} . F _{30%SPR} is used as the F _{MSY} proxy.	$F_{30\% SPR}^{1} = 0.148^{2}$	2,431,000 ³	
Alternative 2	MSY equals the yield produced by F_{MSY} or the F_{MSY} Proxy. MSY and F_{MSY} are recommended by the most recent SEDAR/SSC ⁴ . F_{MSY} proxies will be specified by the Council.	F _{40%SPR} =0.104 ²	2,304,0005	
 ¹Prior to SEDAR 15 (2008), Potts et al. (2001) estimated F_{30%SPR}= 0.40. ²Source: Red Snapper Projections V dated March 19, 2009. ³The value for MSY was not specified in Amendment 11. Based on SEDAR15 (2008) F_{30%SPR} = 0.148; yield at F_{30%SPR} = 2,431,000 lbs whole weight (Table 4.1 from Red Snapper Projections V dated March 19, 2009). ⁴The Review Panel from SEDAR and the SSC recommended a proxy of F_{40%SPR} for F_{MSY}. ⁵The values for MSY and F_{40% SPR} are defined by Red Snapper Projections V dated March 19, 2009. The range of MSY from sensitivity runs is 559,000 lbs whole weight to 3,927,000 lbs whole weight. 				

Table S-1. MSY and MSY proxy alternatives for red snapper.

Maximum Sustainable Yield (MSY)

Largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.

- MSY = Maximum Sustainable Yield
- The Council must set MSY.
- There currently is not enough information to calculate MSY for red snapper. Therefore, a proxy must be used.
- A proxy is a placeholder until sufficient data become available to estimate MSY.

Impacts from Action 1 (Establish MSY Proxy)

Biological

Alternative 2 is based on the Council's Scientific and Statistical Committee's (SSC) recommendation and would specify an MSY proxy equal to the yield at $F_{40\%SPR}$. Alternative 2 would establish a new proxy for F_{MSY} not previously used for red snapper, which is more conservative than the No Action proxy of $F_{30\%SPR}$. Alternative 2, provides greater assurance overfishing would be ended and the stock would rebuild within the specified time as the rebuilding goal (SSB_{MSY}) is higher (Table S-2). Therefore, the biological benefits of Alternative 1 (No Action) (Preferred), because Alternative 2 would allow for less harvest and there would be a greater probability overfishing would end and the stock would be rebuilt to SSB_{MSY}.

Table S-2.	A compariso	n of the	rebuilding	attributes when
using two	different F _{MSY} p	oroxies.		

	F _{MSY} Proxy			
	F _{30%SPR}	F _{40%SPR}		
Rebuilding goal	Lower	Higher		
(SSB _{MSY})	(13,283,000 lbs)	(17,863,000 lbs)		
ACL in Year One	Higher	Lower		
(2010)				
OY at Equilibrium	Higher	Lower		
Years to rebuild to	Less time	More time		
SSB _{MSY}				
Probability of	Higher	Lower		
rebuilding to SSB _{MSY}				

Socio-economic

As the yield at $F_{30\%SPR}$ is greater than the yield at $F_{40\%SPR}$, a F_{MSY} proxy that is too conservative could have unnecessary negative social and economic effects in terms of more restrictive management measures including larger area closures. In principle, more stringent measures would logically be required under an MSY alternative that is more conservative from a biological standpoint; conversely, less stringent measures would be required under an MSY alternative that is less conservative. As with any fishing regulation, the economic issue involves the balancing of short-term costs and long-term benefits. The economically preferable MSY proxy choice would be one that results in the highest net economic benefits over time. In 2003-2007, the average combined commercial and recreational red snapper landings were approximately 551,000 pounds. In contrast, the MSY proxy could yield 2.431 million pounds (MP) under Alternative 1 (No Action) (Preferred) and 2.304 MP under Alternative 2once the stock is rebuilt. This wide gap between current landings and potential landings has at least two implications. First, both MSY proxy options would require stringent management measures to rebuild the red snapper stock. Second, there is a relatively high likelihood that future benefits from the fishery would outweigh the costs of implementing stringent management measures.

What does this table mean?

In Action 1 (MSY Proxy), the Council is deciding on what proxy to use to determine MSY. A proxy must be used as there is not enough information to specify MSY for red snapper. The two options under consideration are to use either $F_{30\%SPR}$ or $F_{40\%SPR}$. This table compares the two options. Basically, the use of $F_{40\%SPR}$ as a proxy for F_{MSY} is more conservative and provides greater assurance overfishing would be ended and the stock would rebuild within the specified time as the rebuilding goal (SSB_{MSY}) is higher.

* Action 2. Establish a rebuilding plan for red snapper

A **rebuilding plan** is a plan to recover overfished stocks to a sustainable level (B_{MSY}) within a specific period of time. Rebuilding **schedules** and **strategies** are two components of a plan.



• Rebuilding schedule

Alternatives for the **rebuilding schedule** are in Table S-3. The Council must choose the time period during which to rebuild the overfished red snapper stock. The Magnuson-Stevens Act and subsequent guidance sets a minimum and maximum amount of time the Councils have to rebuild overfished stocks. This range depends on several factors including the life history of the stock and the level of depletion of the stock.

Alternative	Year One	Time Period Allowed by Law	Years to Rebuild to Goal (SSB _{MSY})
Alternative 1 (No Action)		Do not implement a re	building plan
Alternative 2	2010 Shortest (15 years) 2024		
Alternative 3	2010	Mid-point (25 years)	2034
Alternative 4 (Preferred)	2010	Longest (35 years)	2044

Table S-3. Rebuilding schedule alternatives for red snapper.

Rebuilding Plan

A plan to recover overfished stocks to a sustainable level within a specific period of time.

B_{MSY}

Biomass when fishing at the maximum sustainable yield. B_{MSY} is often used as a biological reference point in fisheries management.

- The Council must establish a rebuilding schedule.
- A rebuilding schedule specifies the number of years to recover the stock; this choice will affect the rebuilding strategies and management measures chosen.
- The Council's preferred option is to take the maximum amount of time allowed by law (35 years) to rebuild the stock. The Council believes this minimizes the expected adverse social and economic impacts to the fishing industry.

Rebuilding strategy (includes optimum yield, annual catch limit, and accountability measures)

The **rebuilding strategy** specifies the maximum rate of fishing mortality allowed during rebuilding. **Each strategy alternative has a corresponding Optimum Yield (OY) and Annual Catch Limit (ACL) (Table S-4).** The OY at equilibrium is the amount of catch that will provide the greatest overall benefit to the nation when the red snapper stock is rebuilt. Think of this as the long-term goal in terms of the poundage of red snapper in the ocean. The ACL is the level of annual catch (pounds or numbers) that triggers accountability measures to ensure that overfishing is not occurring. Accountability measures are discussed in the next section. The Council establishes the ACL and this number cannot exceed the Acceptable Biological Catch recommendations from the scientists. ACLs can be established for each sector (e.g., commercial, recreational) and would be called "sector-ACLs".

Alternatives	Rebuilding strategy	ACL in Year (20	1 of Rebuilding (10) ^{1, 2}	OY Proxy Values at
Alternatives	(F _{OY} Equal To)	Sub-Alt. A (Preferred)	Sub-Alt. B	(lbs whole weight)
Alternative 1				
(No Action)	F _{45%SPR}	Not s	specified	2,196,000
Alternative 2	$85\%F_{40\%SPR}$	0	89,000	2,199,000
Alternative 3	$75\%F_{40\%SPR}$	0	79,000	2,104,000
Alternative 4	$65\%F_{40\%SPR}$	0	68,000	1,984,000
Alternative 5	97%F _{40%SPR}	0	101,000	2,287,000
Alternative 6	$85\%F_{30\%SPR}$	0	125,000	2,392,000
Alternative 7	$75\%F_{30\%SPR}$	0	111,000	2,338,000
Alternative 8	65%F _{30%SPR}	0	97,000	2,257,000
Alternative 9				
(Preferred)	98%F _{30%SPR}	0	144,000	2,425,000
¹ For alternative 2-9, the ACL specified for 2010 would remain in effect beyond 2010 until modified.				
² In Amendment 17A, the	ACL and AM option	ns are tied togethe	r. See the next sectio	n for the AM alternatives.

Table S-4. Rebuilding strategy, OY, and ACL alternatives for red snapper.

Rebuilding Strategy

The fishing rate that will result in a rebuilt stock within the designated rebuilding schedule.

Optimum Yield (OY)

The amount of catch 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.

Annual Catch Limits (ACL) The level of annual catch

(pounds or numbers) that triggers accountability measures to ensure that overfishing is not occurring.

Based on the Council's preferred alternative (highlighted in table):

> The rebuilding strategy sets the maximum fishing mortality allowed during rebuilding at "98%F_{30%SPR}". The ACL would be 0 and the OY (yield when rebuilt) would be 2,291,000 lbs. Why the ACL would be 0 is explained later.

Accountability measures

Accountability measures (AMs) are management controls to prevent ACLs, including sector specific ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur. There are two categories of AMs: (1) in-season AMs and (2) AMs for when the ACL is exceeded. In the theoretical graphic of annual harvest below, **AM 1** represents a form of in-season regulation that prevents the ACL from being exceeded. An example is to close a fishery when a percentage of an ACL is reached. If catch exceeds the ACL, **AM 2** would implement actions after the fishing year. Examples include decreasing the ACL in the following year or shortening the subsequent year's fishing season.



adjustments to regulations (principally the size of the area closure) depending on CPUE. The Council also intends to set ACL = 0 and not

preferred options.

change the closure size if discards exceed the ACL. The Council

believes that *self-reported* discard information should not be the sole determinant of closure size. Therefore, "B" Sub-Alternatives are not the

Accountability Measures (AMs) Management controls to prevent ACLs, including sector-ACLs, from being exceeded, and to correct or mitigate overages of the ACL if they occur.

The accountability measures alternatives are in Table S-5. In Amendment 17A, the ACL and AM options are tied together.

Table S-5. AN	l and ACL	alternatives.
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Sub-Alternative	ACLs (lbs)	Accountability Measures
Alternative 1		
(No Action)	Do	not implement AMs or ACLs
Alternative 2A	0	1. Track the CPUE of red snapper via
Alternative 3A	0	a fishery-independent monitoring
Alternative 4A	0	program to track changes in biomass and take action to end overfishing if
Alternative 5A	0	the assessment indicates progress is
Alternative 6A	0	not being made.
Alternative 7A	0	through fishery-dependent sampling.
Alternative 8A	0	3. CPUE would be evaluated every
Alternative 9A		three years and adjustments would be
(Preferred)	0	made using the framework action.
Alternative 2B	89,000	
Alternative 3B	79,000	Same as above but the following is added to number three: "The
Alternative 4B	68,000	Council would evaluate the size of
Alternative 5B	101,000	the area closures when the dead
Alternative 6B	125,000	discards are estimated to exceed
Alternative 7B	111,000	the ACL.
Alternative 8B	97,000	
Alternative 9B	144,000	

Action 2: Establish Rebuilding Plan - Accountability Measures -

Impacts from Action 2 (Rebuilding Plan)

a) Rebuilding Schedule

Biological

Alternative 1	-	no action
Alternative 2	-	15 years
Alternative 3	-	25 years
Alternative 4	-	35 vears

Alternatives 2-4 would establish rebuilding schedules that would rebuild red snapper within the time periods allowed by the reauthorized Magnuson-Stevens Act. These alternatives differ in the length of time prescribed to rebuild the species, ranging from 15 years (Alternative 2) to 35 years (Alternative 4 (Preferred)). Generally, the shorter rebuilding timeframes translate into higher biological benefits. Alternative 2, which would implement the shortest rebuilding schedule, would require more stringent regulations to achieve the goal of rebuilding in the shortest amount of time. However, Alternative 2 may not be realistic as it would not be expected to rebuild the stock to B_{MSY} because it is not possible to eliminate incidental mortality on one species in a multispecies complex, without prohibiting fishermen from targeting all co-occurring species. The Council is considering substantial measures to reduce fishing mortality in this amendment including an area closure for all snapper grouper species. This would reduce bycatch of red snapper but it is uncertain to what extent. Consequently, the Council has chosen the longest rebuilding schedule alternative (Alternative 4; 35 years) as the preferred.

Socio-economic

Alternative 3 would incur a level of negative short-term socioeconomic impacts between that of Alternatives 2 and 4. Alternative 4 would require the least restrictive harvest limitations in order to achieve a rebuilt status within the 35-year period, and therefore, would incur the least negative socioeconomic impacts relative to Alternatives 2 and 3. In addition, Alternative 4 would provide a timeframe sufficiently long to rebuild the red snapper stock as well as flexibility in the type of management measures to implement over time. In this sense, **Alternative 4** may have a higher likelihood of generating the highest net benefits over time.

b) Rebuilding strategy (includes optimum yield, annual catch limit and accountability measures)

Biological

OY values at equilibrium in the nine alternatives are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. The more conservative the estimate of OY, the larger the sustainable biomass when the stock is rebuilt. The greatest biological benefit would be provided by **Alternative 4**, which would specify an OY at equilibrium equal to $65\%F_{40\%SPR}$ and would require a 91% reduction in total kill relative to 2005-2007 landings. The least amount of biological benefit would be provided by **Alternative 9** (**Preferred**), which would specify a rebuilding strategy of $98\%F_{30\%SPR}$.

In general, the greater the percent reduction in red snapper mortality, the greater the positive impact to the stock and associated ecosystem (Table S-6).

Alternative	Total Kill	Percent Reduction	Year Rebuilt (50% Prob)	Prob rebuilt 2044
Alternative 1 (No Action) (F _{45%SPR})	89,000	85%	2035*; 2025**	70%*; 99%**
Alternative 2 (85%F _{40%SPR})	89,000	85%	2035	70%
Alternative 3 (75%F _{40%SPR})	79,000	87%	2032	84%
Alternative 4 (65%F _{40%SPR})	68,000	91%	2029	94%
Alternative 5 (97%F _{40%SPR})	101,000	83%	2044	50%
Alternative 6 (85%F _{30%SPR})	125,000	79%	2031	78%
Alternative 7 (75%F _{30%SPR})	111,000	82%	2028	92%
Alternative 8 (65%F _{30%SPR})	97,000	84%	2026	98%
Alternative 9 (Preferred) (98%F _{30%SPR})	144,000	76%	2040	53%

Table S-6. The annual limit in red snapper kill, the percent reduction needed in total removals to end overfishing, and the probability of rebuilding for Alternatives 1-9.

*Compared to SSB_{MSY} = 17,863,000 lbs whole weight for $F_{40\%SPR}$ F_{MSY} proxy.

**Compared to SSB_{MSY} = 13,283 000 lbs whole weight for $F_{30\%SPR}$ proxy for F_{MSY} .. Total kill = landings and discards

Socio-economic

Alternative 4 and Sub-alternative 4A, expected to result in the largest biological benefit, are also expected to offer the largest long-term economic benefits but would require the most severe short-term reductions and therefore largest short-term negative economic impacts. Alternative 9 (Preferred) with Subalternative 9B is expected to yield the smallest biological benefit. This would likely result in less stringent management measures and therefore the smallest short-term negative economic impacts but also the smallest long-term economic benefits to the fishermen.

Alternative 5 identifies an OY level based on the proxy proxy for F_{MSY} ($F_{40\% SPR}$) recommended by the Council's SSC. This alternative has the longest rebuilding period and a higher reduction

Based on the Council's preferred alternative (highlighted in table):

- The annual red snapper kill through fishing activities (including as bycatch) cannot exceed 144,000 lbs. If it does, overfishing is occurring.
- An 76% reduction in red snapper fishing mortality is required to end overfishing. (This will affect the size of the area closure discussed in the next section.)
- There is a **53% chance** that the red snapper stock will be rebuilt within the chosen time frame (35 years, as discussed earlier).

in total removals (83%) than Alternatives 6, 7, and 9 but lower than Alternatives 1, 2, 3, 4, and 8. Alternative 5 could be expected to result in smaller long-term benefits than those alternatives with shorter rebuilding periods but might result in less stringent management measures and smaller short-term negative impacts than some alternatives.

Setting ACL to a Poundage Level Versus Setting ACL to Zero

If the Council chooses to set an ACL based on total mortality, the Southeast Fisheries Science Center (SEFSC) would be required to monitor discarded red snapper in the commercial and recreational sectors. There are concerns that the monitoring of discards would rely on self-reporting by fishermen. This could create a disincentive for fishermen to report discards if they know that once a certain level of discarded fish is reached, accountability measures (AMs) would be triggered, which could potentially further restrict their snapper grouper harvest. Because of these concerns with monitoring discards, catch per unit effort (CPUE) of red snapper would be tracked via a fishery-independent monitoring program to identify changes in biomass. Furthermore, the Council is considering the use of fishery-dependent data collection by headboat and charterboat operators to determine if there are changes in CPUE and biomass.

Action 3. Establish red snapper management measures

Alternative	Action
	Do not change current management
Alternative 1 (No Action)	measures.
Alternative 2	Prohibit red snapper.
	Prohibit red snapper and close
Alternative 3A-4D	bottom fishing in certain areas.
	Fishing exceptions within closed
Alternatives 5-7	area
Alternatives 8A-8C	Transit allowance within closed area.

Red Snapper Prohibition (Alternative 2)

Current regulations for red snapper include a recreational bag limit of 2 fish per person per day and a 20 inch total length minimum size limit for both commercial and recreational fishermen. Through Amendment 17A, the Council is proposing to implement of a total prohibition of harvest/retention of red snapper. However, a closure of the fishery will not end overfishing because of red snapper bycatch mortality that occurs whenfishermen pursue other species in the snapper grouper complex. The red snapper stock is part of the multi-species fishery; many species occupy the same habitat at the same time. For example, red snapper co-occur with vermilion snapper, tomtate, scup, red porgy, white grunt, black sea bass, red grouper, scamp, and others. This is a significant issue as release mortality rates for red snapper are estimated at 40% for the recreational fishery and 90% for the commercial fishery (due to deeper waters fished and handling practices).

Area Closures for All Snapper Grouper Species (Alternatives 3A through 4D)

Due to the nature of the fishery and release mortality rates, Amendment 17A also includes alternatives (Alternatives 3A through 4D) that would prohibit the harvest/retention of *all snapper grouper species* in certain areas *in addition* to a prohibition of red snapper throughout the South Atlantic. The alternatives for the closed areas focus on locations where concentrated landings of red snapper are reported, primarily off the coasts of Georgia and the north and central east coasts of Florida (figure below). Alternatives 5 through 7 evaluate the allowance of specific fishing activities within the closure. Alternatives 8A through 8C investigate transit provisions within the closed area.



NOTE: The following two pages contain maps of the area closure alternatives and details for Alternative 3E (the Council's preferred).

Eight Non-Preferred Area Closure Alternatives



Alternative 4A



Alternative 4B (66-240 ft)







Alternative 4C (98-240 ft)



Alternative 4D (98-300 ft)



The proposed area closures (Alternatives 3A - 4D) would prohibit fishing for or the possession of all Snapper Grouper species year-round. *In addition*, harvest of red snapper would be prohibited in federal waters (3 to 200 miles) in the South Atlantic region.

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Area Closure Alternative 3E - Preferred



Alternative 3E (the Council's preferred) would prohibit fishing for or possession of Snapper Grouper species within the defined area between 98 and 240 feet. *In addition*, red snapper harvest/retention would be prohibited throughout federal waters in the South Atlantic

Point	Latitude	Longitude
1	28° 00' 00"	80° 00' 00"
2	28° 00' 00"	80° 10' 57"
3	29° 31' 40"	80° 30' 34"
4	30° 02' 03"	80° 50' 45"
5	31° 00' 00"	80° 35' 19"
6	31° 00' 00"	80° 00' 00"
7	30° 52' 54"	80° 00' 00"
8	30° 27' 19"	80° 11' 41"
9	29° 54' 31"	80° 15' 51"
10	29° 24' 24"	80° 13' 32"
11	28° 27' 20"	80° 00' 00"

Table S-7. Waypoints for Alternative 3E (Preferred).

Species in the Snapper Grouper Fishery Management Unit.

Snappers	Groupers	Grunts	Jacks
Blackfin	Black	Black margate	Almaco
Black	Coney	Blue-striped	B. rudderfish
Cubera	Gag	Cottonwick	Bar jack
Dog	Goliath	French	Blue runner
Gray	Graysby	Margate	Crevalle
Lane	Misty	Porkfish	G. amberjack
Mahogany	Nassau	Sailors choice	L. amberjack
Mutton	Red	Smallmouth	Yellow
Queen	Red hind	Spanish	Porgys
Red	Rock hind	Tomtate	Grass
Schoolmaster	Scamp	White	Jolthead
Silk	Snowy	Triggerfish	Knobbed
Vermilion	Speckled hind	Gray	Longspine
Yellowtail	Tiger	Ocean	Red
Tilefishes	Warsaw	Queen	Saucereye
Blueline	Yellowedge	Sea basses	Scup
Sand	Yellowfin	Bank sea	Sheepshead
Tilefish	Yellowmouth	Black sea	Whitebone
Spadefishes	Wreckfish	Rock	Wrasses
A. spadefish	Wreckfish	Wreckfish	
			Puddingwife

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Other Provisions for Area Closures

Harvest Exceptions Within the Closed Area

The Council is considering allowing harvest of snapper grouper species (not red snapper) in the closed areas with the use of certain gear. These gears are known to have low interaction with red snapper. Alternatives under consideration are shown in Table S-8.

Table S-8. Summary of harvest exception alternatives.

Alternative	Harvest Exception					
Alternative 5 (Preferred)	Allow fishing for, harvest and possession of snapper grouper species (with exception of red snapper) in the closed area if fish were harvested with black sea bass pots.					
Alternative 6	Allow fishing for, harvest and possession of snapper grouper species (with exception of red snapper) with bottom longline gear in the closed area deeper than 50 fathoms as specified in CFR §622.35.					
Alternative 7 (Preferred)	Allow fishing for, harvest and possession of snapper grouper species (with the exception of red snapper) in the closed area if fish were harvested with spearfishing gear.					

Transit Allowance Within Closed Area

The Council is considering allowing transit through the proposed closed area. Alternatives under consideration are shown in Table S-9.

Table S-9. Summary of transit allowance alternatives.

Alternative	Transit Allowance
Alternative 8A (Preferred)	The prohibition on possession does not apply to a person aboard a vessel that is in transit with snapper grouper species on board and with fishing gear appropriately stowed.
Alternative 8B	The prohibition on possession does not apply to a person aboard a vessel that has snapper grouper species onboard if the vessel is in transit.
Alternative 8C	The prohibition on possession does not apply to a person aboard a vessel that has wreckfish onboard if the vessel is in transit.

Based on the Council's preferred alternative:

 Spearfishing for snapper grouper species would be allowed in the proposed closure area (98 to 240 feet), as would fishing with black sea bass pots.
 Note: Harvest of red snapper would be prohibited in the closed area.

Based on the Council's preferred alternative:

- Transit is allowed with snapper grouper species onboard if gear is stowed.
- The term "transit" means: Underway, making way, not anchored, and a direct, nonstop progression through any snapper grouper closed area in the South Atlantic EEZ on a constant heading, along a continuous straight line course, while making way by means of a source of power at all times.

Impacts from Action 3 (Area Closures)

Biological

The proposed regulations are expected to benefit the stocks of not only red snapper, but also the stocks of other species managed by the Council. As shown in Table S-6 earlier, a **76% reduction** in red snapper removals is required to end overfishing. The reduction expected from each alternative is shown in Table S-10. The reduction varies with the differing assumptions in terms of the following: (1) expected effects of recent management actions, (2) change in release mortality stemming from management actions, and (3) compliance rate of proposed regulations.

Table S-10. The reduction in red snapper mortality from each management measure alternative and scenario type.

Alternative	Closed	Scenario						
	Depths	1	2	3	4	5	6	7
2	None	29%	39%	52%	55%	60%	60%	60%
3A	n/a	72%	72%	83%	83%	87%	89%	90%
3B	66-240 ft	69%	70%	81%	81%	85%	87%	88%
3C	98-240 ft	63%	65%	76%	77%	81%	83%	84%
3D	98-300 ft	63%	66%	76%	77%	81%	83%	84%
3E	98-240 ft	60%	63 %	74%	75%	<mark>79%</mark>	80%	81%
4A	n/a	76%	77%	86%	86%	89%	91%	93%
4B	66-240 ft	73%	74%	83%	84%	87%	89%	91%
4C	98-240 ft	66%	69%	78%	80%	83%	85%	86%
4D	98-300 ft	67%	69%	79%	80%	83%	85%	86%



Scenario 1: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 60%/60% offshore release mortality; 20%/20% inshore release mortality.

Scenario 2: No impacts A13C, A16; A17A eliminates targeted trips only; 80% compliance; 40%/90% offshore release mortality, 40%/90% inshore release mortality.

Scenario 3: No impacts A13C, A16; A17A eliminates targeted trips only; 85% compliance; 40%/40% offshore release mortality, 20%/20% inshore release mortality.

Scenario 4: Directed and targeted trips eliminated by A13C, A16, A17A; 85% compliance; 40%/90% offshore release mortality; 20%/20% inshore release mortality.

Scenario 5: Directed and targeted trips eliminated by A13C, A16, A17A; 87% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Scenario 6: Directed and targeted trips eliminated by A13C, A16, A17A; 95% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

Scenario 7: Directed and targeted trips eliminated by A13C, A16, A17A; 100% compliance; 40%/40% offshore release mortality; 20%/20% inshore release mortality.

See More.....See Appendix E for more information on the biological model and the description of the scenarios.

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Impacts from Action 3 (continued)

Socio-economic

Commercial Industry

The proposed regulations are expected to adversely affect certain commercial fishermen, especially those that fish off Georgia and Northeast Florida. However, there are long-term benefits from having a rebuilt stock. The graph below displays the predicted changes in net operating revenues compared to the no action alternative for Amendment 17A. *For reference, the colors in the graph and around the maps match.*



A commercial vessel will typically have



* Action 4. Require the Use of Circle Hooks

The Council is considering requiring the use of circle hooks for all snapper grouper species to help reduce discard mortality of red snapper. Alternatives under consideration are shown in Table S-11.

Alternative	Circle Hook Requirement
Alternative 1 (No Action)	Do not require the use of circle hooks when using hook and line gear for snapper grouper species within any particular area of the South Atlantic EEZ when fishing for snapper grouper species.
Alternative 2 (Preferred)	Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear north of 28 degrees. It is unlawful to possess snapper grouper species without possessing non- stainless steel circle hooks. Apply to the use of natural baits only.
Alternative 3	Require the use of non-stainless steel circle hooks when fishing for snapper grouper species with hook and line gear within the South Atlantic EEZ. It is unlawful to possess snapper grouper species without possessing non-stainless steel circle hooks. Apply to the use of natural baits only.

Table S-11. Summary of harvest exception alternatives.

Impacts from Circle Hook Requirement (Action 4)

Studies on the effects of circle hooks and J hooks on retention and survival are limited to a handful of snapper grouper species. Some studies indicate beneficial effects while others are inconclusive. Due to limited data, it may not be possible to quantify the reduction in red snapper release mortality that would result from using circle hooks. Furthermore, not all species in the snapper grouper complex have the same mouth morphology and it is possible that circle hooks could negatively impact survival. Alternatively, use of circle hooks could substantially reduce harvest of some species, would have positive biological benefits but have negative social and economic impacts on fishermen dependent upon the species. In general, requiring the use of circle hooks may not substantially increase the cost of fishing to either the commercial or the recreational sectors, though the potential reduction in the harvest of some important species is noted.



Based on the Council's preferred alternative:

- The use of circle hooks would be required when fishing north of 28 degrees (southern boundary of the area closures) for species in the snapper grouper fishery management unit as listed on page S-13.
- The Council felt it was important to limit the circle hook requirement to South Atlantic areas north of 28 degrees to not affect fishing for species such as yellowtail and mangrove snapper. Fishermen report that these species are not caught easily with circle hooks.

What are the existing data programs?

Fishery-dependent methods include the Marine Recreational Information Program (MRIP), logbook, discard logbook, headboat logbook, Trip Interview Program (TIP), and dealer reported landings. Fisheryindependent methods include Marine Resources Monitoring Assessment and Prediction Program (MARMAP) and the Southeast Area Monitoring and Assessment Program (SEAMAP).

* Action 5. Establish a Red Snapper Monitoring Program

The Council is implementing a plan to monitor red snapper recovery. The Council recognizes **the effectiveness of traditional fishery-dependent data would diminish with the implementation of an area closure.** Further, existing fishery-independent data collection programs would not be sufficient to monitor red snapper due to limitations associated with the range of sampling. Monitoring program alternatives under consideration are shown in Table S-12.

Alternative	Red Snapper Monitoring Program
Alternative 1 (No Action)	Utilize existing data collection programs to monitor the rebuilding progress of red snapper.
Alternative 2 (Preferred)	Establish a fishery-independent monitoring program to track progress of red snapper rebuilding. Sampling would include deployment of gear such as chevron traps, cameras, and hook and line at randomly selected stations in a manner determined by the Southeast Fisheries Science Center in consultation with the South Atlantic Fishery Management Council.
Alternative 3	Establish a red snapper fishery-dependent monitoring program involving for-hire vessels (charter boat and headboats). Participating vessels may be authorized to harvest and land fish in excess of Federal possession limits and/or during fishery closures. Retention limits for red snapper would be based upon research objectives. The trip limits and number of trips per month will depend on the number of selected vessels, available quota, and objectives of the research fishery.

Table S-12. Summary of red snapper monitoring program alternatives.

Impacts from Establishing a Monitoring Program (Action 5)

Alternatives 2 and 3 would benefit the stock as it would track rebuilding progress of red snapper through the rebuilding period. Those alternatives may benefit fishery participants in the long-term when data shows harvest may be increased.

- A fishery-independent program will be used to track the recovery of red snapper.
- Fishery-dependent data becomes limited if red snapper harvest is prohibited and area closures are used.

Conclusion

The most recent assessment for the red snapper stock in the South Atlantic indicates that the stock is experiencing overfishing and is overfished. The purpose of Amendment 17A to the Snapper Grouper Fishery Management Plan (FMP) is to implement long-term management measures to end overfishing of the red snapper stock in the South Atlantic immediately upon implementation and to rebuild the stock ultimately achieving optimum yield (OY) while minimizing, to the extent practicable, adverse social and economic effects.

Current regulations for red snapper allow for a recreational bag limit of two fish per person per day and require a 20 inch total length minimum size limit for both commercial and recreational fishermen. Through Amendment 17A, the Council is proposing the implementation of a *total prohibition of red snapper harvest*. Due to the nature of the red snapper fishery and the high release mortality rates, Amendment 17A also includes alternatives that would prohibit the harvest of *all snapper grouper species* in certain area to reduce mortality of red snapper, including those incidentally caught when fishermen target co-occurring species. The alternatives for the closed area focus on locations where concentrated landings of red snapper are reported, primarily off Georgia and the north and central east coasts of Florida.

The Council and NOAA Fisheries Service are considering a range of options in Amendment 17A. In general, the positive effects to the stock and ecosystem are greatest with the largest closure and lowest annual catch limits. In turn, negative socio-economic effects increase with such options. However, there are long-term socio-economic effects from a rebuilt stock. As with many fishing regulations, the economic issue involves the balancing of short-term costs and long-term benefits. There is a wide gap between the current landings (approximately 440 thousand pounds) and potential landings for a rebuilt stock (approximately 2.2 million pounds). This has at least two implications: first, more stringent management measures are needed to rebuild the red snapper stock; second, there is a relatively high likelihood that future benefits from the fishery would outweigh the costs of implementing stringent management measures.



A Healthy Red Snapper Stock

 A healthy stock will allow biomass, age and size structure, sex ratio, and genetic and community structure to be restored to more natural levels.



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Regulatory Amendment 10

to the Snapper Grouper Fishery Management Plan of the South Atlantic Region

Red Snapper Management





DRAFT ENVIRONMENTAL ASSESSMENT

INITIAL REGULATORY FLEXIBILITY ACT ANALYSIS REGULATORY Impact Review

SOCIAL IMPACT ASSESSMENT

JANUARY 2011

Excerpt – Chapter 4

Chapter 4. Environmental Effects

Required Reduction 2011: 70-75% 2012: 62-69%

Chapter 4 describes the effects to the biological, economic, social, and administrative environment from the alternatives in Action 1 (Table 4-1).

Table 4-1. Characteristics of alternatives 1 through 11 in Action 1 and reductions in red snapper removals with varying degrees of projected effort shift.

Alt.	Snapper G	rouper Spat	Reduction (includes reduction from moratorium)			
	Commercial Logbook Grids	Depth (ft)	Length of Closure	Effort shift= 100%	Effort shift= 50%	Effort shift= 0%
1 (no action)	2880, 2980, 3080	98-240	Year-round	2011: 70 2012: 79	2011: 71 2012: 80	2011: 73 2012: 81
2	2880, 2980	98-240	May through October	68	69	70
3	2880, 2980, 3080	98-240	May through August	68	70	71
4	2880, 2980, 3080	98-240	July through December	69	70	72
5	2880, 2980, 3080	98-240	May through December	70	71	73
6	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 66-240 2012: 98-240	2011: May through December 2012: May through October	2011: 71 2012: 68	2011: 73 2012: 69	2011: 75 2012: 70
7	2011: 2880, 2980 2012: 2980	2011: 98-240 2012: 98-240	2011: May through October 2012: June through July	2011: 68 2012: 66	2011: 69 2012: 67	2011: 70 2012: 67
8	2011: 2880, 2980 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: May through October 2012: July	2011: 68 2012: 65	2011: 69 2012: 66	2011: 70 2012: 67
9	2011: 2880, 2980, 3080 2012: 2880, 2980	2011: 98-240 2012: 98-240	2011: July through December 2012: January through April	2011: 69 2012: 68	2011: 70 2012: 69	2011: 72 2012: 71
10	2011: 2880, 2980, 30802011: 98-2402012: 2880, 29802012: 98-240		2011: May through December 2012: January through April	2011: 70 2012: 68	2011: 71 2012: 69	2011: 73 2012: 71
11 (preferred)	Do not implement the snap 17A to the Snapper Group	oper grouper area closu er Fishery Managemen		77% ¹		

¹An evaluation of predicted moratorium effectiveness using 2007-2009 baseline data indicates that the moratorium will provide a 66% reduction in removals of red snapper based on an Interactive Combined Effects (ICE) Model for South Atlantic Red Snapper (SERO 2010). However, analyses contained in **Appendix I** suggest that the red snapper fishing moratorium has been more effective in reducing mortality of red snapper. The analyses incorporate fishing effort reduction, in addition to the reduction in red snapper removals in 2010 in the South Atlantic. Evidence provided by the Marine Recreational Fisheries Statistics Survey (MRFSS) suggests effort in the South Atlantic is down 33% and total removals in pounds are down 81% when 2010 is compared to the 2007-2009 baseline. Including MRFSS Wave 1-4 data for 2010 as a percentage reduction from the 2007-2009 baseline period, along with the projected trip elimination reductions for the commercial and headboat sector, suggests that an overall reduction in red snapper removals of 77% may have been achieved by the moratorium in 2010.

4.1 **Biological Effects**

The Council is proposing restrictions to fishing mortality through fishing prohibitions. An increase in biomass and a decrease in fishing mortality from current levels of the red snapper and other stocks of fish is expected. Therefore, all 11 alternatives in Action 1 offer *beneficial effects* to fish stocks, including the red snapper stock, in the South Atlantic.

The beneficial biological effects of Alternative 1 (No Action) for red snapper have been described in Amendment 17A to the Snapper Grouper Fishery Management Plan (FMP) (SAFMC 2010a). The effects include a return to population characteristics of a more natural state, including age and size structure, sex ratio, genetic structure, and biomass. Components of the ecosystem (e.g., predator/prey relationship, community structure) are expected to more closely resemble those of an unfished population.

Alternatives 2 through 10 each propose a decrease in the size and length of the closure proposed in Amendment 17A (Table 4-1). These alternatives would have a lower level of beneficial effects to red snapper than Alternative 1 (No Action). Alternative 11 (preferred) offers less beneficial effects as it would not implement a snapper grouper area closure but does provide the necessary reduction in red snapper mortality to end overfishing immediately.

The alternatives each differ in their level of beneficial effects as each differs in the following:

- reductions in red snapper removals estimated by the Interactive Combined Effects Model (ICE)
- size of closure
- length of closure
- duration of closure during the spawning season and peak spawning season

The following section summarizes the effects of each of the above items and presents a ranking of the alternatives in terms of anticipated biological effects. Regardless of the alternatives selected, the fishery's operation under Regulatory Amendment 10 is not anticipated to cause new effects to protected species that were not previously considered. In the unlikely event the fishery is affecting protected species in a way not previously considered, an ESA section 7 consultation can be reinitiated to evaluate and address those effects.

- Beneficial effects from all ten closure alternatives are expected
- The red snapper population and associated ecosystem are expected to return to a more natural state
- Alternative 1 has the greatest positive biological effects; alternatives are ranked



A model, called the **Interactive Combined Effects Model (ICE)**, is used to project red snapper removal rates under a variety of spatial closure sizes,

configurations, and input assumptions. See

Appendix F for a detailed description of the model and results. ICE uses input assumptions and data from the new 2010 benchmark assessment (SEDAR 24 2010) to *project reductions* in red snapper removals across all three fishing sectors (i.e., commercial, recreational private, and for-hire charter and headboat) (Table 4-2).

Effort shift commonly occurs following the implementation of a

Table 4-2. Projected reductions in red snapper

 removals as projected through the ICE Model.

Alt.	Reduction By Effort Shifts of 100%, 50% and 0%							
	100%	50%	0%					
1 (no action)	2011: 70 2012: 79	2011: 71 2012: 80	2011: 73 2012: 81					
2	68	69	70					
3	68	70	71					
4	69	70	72					
5	70	71	73					
6	2011: 71 2012: 68	2011: 73 2012: 69	2011: 75 2012: 70					
7	2011: 68 2012: 66	2011: 69 2012: 67	2011: 70 2012: 67					
8	2011: 68 2012: 65	2011: 69 2012: 66	2011: 70 2012: 67					
9	2011: 69 2012: 68	2011: 70 2012: 69	2011: 72 2012: 71					
10	2011: 70 2012: 68	2011: 702011: 712011: 72012: 682012: 692012: 7						
11	77							

month prior to the closure and the month following the closure.

 A model was used to project the reduction in red snapper removals

- Effort shifts of 100%, 50%, and 0% (or no effort shift) were modeled
- Alternatives 1 and 6 have the highest reductions

closure. Effort shift may be *spatial* (a shift into surrounding areas during the closure) or *temporal* (a shift before and after a closed season). The ICE Model allows the user to specify where effort might shift, what sectors might shift effort, and the percent of effort shifting that may occur. Effort shifting within a commercial statistical grid (also called "grid cell") with a time-area closure was modeled as occurring in the

Effort Shift Example

If grid cell 3080 were closed in June-August and the effort shifting was 50%, removals in May and September would be 125% (e.g., 100% + 50%/2 months = 125%) of the modified baseline output from Equations 3 and 4 (see **Appendix I**). Effort shifting to adjacent statistical areas during time-area closures was assumed to occur during the time-area closure, and the percent effort shifting was apportioned equally amongst the specified effort shifting cells. For example, if cell 2980 were closed in June and effort shifting was specified into cells 3081, 3080, 2981, and 2880 at 50%, then removals in each of these adjacent cells would be 112.5% (e.g., 100% + 50%/4 cells = 112.5%) of the modified baseline output by Equations 3 and 4 (see **Appendix I**).





Alternatives 1 through 10 vary in area size (Table 4-3). All the alternatives are bounded by 98 to 240 foot depth with the exception of Alternative 6 in 2011, which has a border at 66 foot depth on the western side. In terms of the northern and southern sides, all the

Table 4-3. The area ofthe alternatives

Alt.	Area (mi ²)
1	4,827
2	3,765
3	4,827
4	4,827
5	4,827
6	2011: 10,788
	2012: 3,765
7	2011: 3,765
	2012: 1,389
8	2011: 3,765
	2012: 3,765
9	2011:4,827
	2012: 3,765
10	2011: 4,827
	2012:3,765

boundaries include commercial logbook grid 2880, some 2980, and others 3080 (Figure 4-1).

The larger the closure, the greater the beneficial biological effects to the red snapper stock and associated ecosystem. A larger closed area is beneficial for a number of reasons. A larger closed area will offer the greatest reduction in fishing mortality. In addition, effort shift to surrounding areas may reduce the biological benefits of a closed area. As closures increase in size, the level of effort shift often decreases as the effort shift is distributed over a greater area.

The alternatives are different in terms of their degree of protection to identified red snapper spawning sites. Without the protection of

spawning sites, fishermen can remove significant numbers of adult fish from a spawning site before they have a chance to spawn. Grid cell 2880 contains the greatest concentration of identified red snapper spawning sites as identified by Moe 1963; however, the MARMAP survey identified spawning locations in grid cells to the north (Figure 4-2). In 2011, Alternative 6 is the only alternative to offer protection shoreward to a 66 foot depth.

- Largest closure = greatest biological benefits
- Greatest amount of spawning location in southernmost grid (2880) as identified by Moe (1963)

 Alternative 6 has the greatest beneficial effects in terms of size as it includes all three grids and goes to a depth of 66 feet



Figure 4-1. The three commercial logbook grids that serve as the northern and southern boundaries for the closure alternatives.



Figure 4-2. Red snapper spawning areas as identified by Moe 1963 and MARMAP surveys.

Alternatives 1 and 6 have the greatest beneficial biological effects for red snapper in terms of size as both include all three grids and Alternative 6 extends shoreward to a depth of 66 feet. Alternative 2 and Alternative 7 both offer less biological benefits for red snapper as they would implement the smallest area closure. Alternative 11 (Preferred) offers the least beneficial biological effects as it would not implement a snapper grouper area closure but does provide the necessary reduction in mortality to end overfishing of red snapper immediately.



The alternatives differ in the length of the closures during the fishing season. In general, the longest closures have the greatest beneficial biological effects to the red snapper stock and associated ecosystem. Temporal effort shifts may be less for longer area closures.



The alternatives differ in terms of which months are closed (**Table 4-4**). The alternatives with the greatest biological benefits are those that offer the greatest level of protection during the red snapper spawning season and peak spawning season. White and Palmer (2004) reported that the spawning season for female red snapper off the southeastern United States extends from May to October, peaking in July through September.

Fishing activities often remove the largest fish from the population. This often has negative effects to the population as larger females usually have an exponentially greater quantity of eggs than smaller females. The condition of larvae also improves with the size and age of fish and, in turn, affects survivorship.

Red snapper often reproduce in spawning aggregations. Spawning aggregations leave fish vulnerable to heavy exploitation.

Alternatives 1, 2, 5, and 6 offer the greatest level of protection to spawning red snapper followed by Alternatives 7, 8, and 10 (2011 only; Table 4-4). Alternative 11 (Preferred) offers less positive beneficial effects as it would not implement a snapper grouper area closure but does provide the necessary reduction in mortality to end red snapper overfishing immediately.

- Spawn primarily May through October.
 Peak is July through September
- Protection of spawning fish important for sustainable harvest

alt		Space					Tim	е						
	Reduction in removals	Area (mi²)	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	ОСТ	NOV	DEC
1	79-81%	4,827	2011											
2	68-70%	3,765					2011]	
3	68-71%	4,827					2011							
4	69-72%	4,827							2011					
5	70-73%	4,827					2011							
6	2011: 71-75% 2012: 66-67%	10,788 3,765					2011 2012							
7	2011: 68-70% 2012: 66-67%	3,765 1,389					2011	201	.2]	
8	2011: 68-70% 2012: 65-67%	3,765 3,765					2011		2012]	
9	2011: 70-73% 2012: 68-71%	4,827 3,765	201	12					2011					
10	2011: 70-73% 2012: 68-71%	4,827 4,827	201	12			2011							

Table 4-4. Closure time periods during female red snapper spawning (orange) and peak spawning (red) time periods. The blue bars indicate the closed months.

Each of the alternatives have been ranked according to their anticipated biological benefits (Figure 4-3). Generally, the alternatives that offer the greatest biological protection are the largest closures that cover the spawning season with the greatest reductions to red snapper removals as determined by the ICE Model.



Figure 4-3. Ranking of the alternatives in terms of biological effects.

4.2 Economic Effects

4.2.1 Effects to the Commercial Sector

4.2.1.1 Background and Methodology of Analysis

In this analysis, economic effects results are calculated to illustrate that Regulatory Amendment 10 is expected to benefit the commercial fishery, but that the benefits would accrue as smaller reductions in net operating revenues rather than actual increases in net operating revenues. Recall that the snapper grouper area closure in Amendment 17A has not been implemented, so that net operating revenues are expected to decline for commercial fishermen regardless of whether the closures associated with Amendment 17A or one of the alternatives from Regulatory Amendment 10 is implemented.

A simulation model was employed to calculate the expected economic outcomes for Alternative **1** (No Action) and each of the preliminary alternatives. The model hypothetically imposes the proposed restrictions on commercial fishing activities as defined by logbook trip reports that were submitted to the NMFS during 2007-2009. This is the same model and procedure that were used to examine the expected economic effects of management alternatives that were proposed for Amendment 17A. However, the analysis for Amendment 17A used data for 2006-2008 because data for 2009 were unavailable at that time. Therefore, the results presented here for the expected outcome of Amendment 17A, which is Alternative **1** (No Action) alternative for Regulatory Amendment 10, are based on updated logbook data from 2007-2009 and will differ from the results that appear in Amendment 17A.

The advantages and disadvantages of the simulation model were discussed in Amendment 17A. Briefly, the advantages are:

- The analysis uses data about actual fishing activities as reported by fishermen;
- The analysis considers the effects of the preliminary management alternatives on trip revenues and trip costs, and allows for the possibility that the restrictions may make some individual trips unprofitable; and
- The analysis considers the interaction of preliminary management alternatives with existing regulations.

The disadvantage is that logbook data reflect fishing patterns and strategies given regulations that will no longer apply. Fishermen will modify their fishing patterns and strategies to minimize the effects of new regulations, but the simulation model does not account for these changes. Therefore, it can only approximate the true, but unknown, outcomes of proposed regulations. Nevertheless, the approach provides useful insights about the relative magnitudes of change due to proposed alternatives and the distribution of effects among subgroups within the fishery.

The simulation model uses information from the recent past (in this analysis, 2007-2009) as a predictor of the near future. Because the future is unknown and because economic and environmental conditions vary over time, we do not know which year is the best predictor of the near future. Therefore, the 3-year average of simulated results from 2007-2009 is used as the expected predictor of the effects for each preliminary management alternative. The model is most appropriately applied to short-term evaluations because information from the recent past is a more reliable predictor of the near-future than of the distant future.

4.2.1.2 Economic Effects Results

Results are presented in terms of net operating revenues, defined as commercial dockside revenues minus trip costs which include fuel, oil, bait, ice, and other supplies, and exclude fixed costs and labor costs. Therefore, net operating revenues represent the incomes for labor (including crew) plus the gross income for boat owners who must pay fixed costs and other non-trip costs related to owning and operating the vessel.¹ Net operating revenues were adjusted to constant 2008 dollars with the consumer price index for all items and all urban consumers.

Amendment 17A, Alternative 1 (No Action), is expected to result in a decrease of \$794,000 (7.8%) annually in net operating revenues for the snapper grouper commercial fishery. The analyses below show the effects of Alternatives 2-11 assuming that the Amendment 17A closure is implemented January 1, 2011. It is, however, acknowledged that the Amendment 17A closure will not be implemented until June 1, 2011. The effects of the alternatives show increases in net operating revenues compared to implementation of the Amendment 17A closure on January 1st, 2011 because, at the time of the analysis, the delayed implementation of Amendment 10 was not yet in place. Therefore, the results presented here are likely overestimates of benefits of what will actually accrue due to the fact that implementation of the Amendment 17A closure will now be delayed until June 1, 2011 (five months).

Under Alternative 1 (No Action), both black sea bass pots and spearfishing gear are exempted from the closure approved in Amendment 17A. The exemptions are intrinsic in Alternatives 2-10 as well, and irrelevant in Alternative 11 (Preferred) since there is no closure proposed. Under Alternatives 2-11, changes in net operating revenues range from an increase of \$48,000 (Alternative 6) to an increase of \$91,000 (Alternative 3) annually based on the two year average from 2011-12. The change in net operating revenues annually compared to Alternative 1 (No Action) as a result of Alternatives 2-11 is shown in Table 4-5. Alternative 11 (Preferred) (no Amendment 17A closure but maintain the ban on retention of red snapper) results in an increase of \$88,000 which is slightly lower than the benefits occurring under Alternative 3. This result occurs because while Georgia and Florida gain under Alternative 11 (Preferred), North and South Carolina lose because of the benefits that accrue to North and South Carolina under Amendment 17A (see Table 4-6 below for state by state/region breakouts).

¹ The logbook database does not collect prices or revenues for landed fish. Trip revenues were calculated as reported landings multiplied by average prices, by species, from the NMFS Accumulated Landings System. Trip costs were calculated from sample data as a function of trip characteristics such as type of gear and amount of gear used, crew size, duration of trip, and pounds landed.

	2011 010 2012.	
Alternatives	Change in net operating revenues	Percentage change in net
	in 1000s of dollars (\$)	operating revenues
2	\$53	0.3%
3	\$91	0.7%
4	\$71	0.2%
5	\$50	0.1%
6	\$48	0.0%
7	\$68	0.6%
8	\$69	0.6%
9	\$72	0.5%
10	\$62	0.4%
11 (Preferred)	\$88	0.9%

Table 4-5. Average annual changes in net operating revenues from Alternatives 2-11 compared to Alternative 1 (No Action) for 2011 and 2012.

Note: This analysis assumes a January 1, 2011 start date for Amendment 17A.

The economic effects of the proposed alternatives by state is shown in **Table 4-6**. Alternative **11 (Preferred)** has the greatest benefit to Georgia/Northeast Florida and southeast Florida as well as the greatest losses for North Carolina and South Carolina due to the gains the latter two states are expected to experience under Amendment 17A.

regions from Alternatives 2-11 compared to Alternative 1 (No Action) for 2011 and 2012.						
Alternatives	NC	SC	GA-NEFL	SEFL	KEYS	
2	-\$216	-\$103	\$337	\$35	-\$1	
3	-\$118	-\$55	\$215	\$49	\$0	
4	-\$124	-\$71	\$213	\$55	-\$1	
5	-\$70	-\$31	\$135	\$17	\$0	
6	-\$143	-\$66	\$235	\$22	-\$1	
7	-\$225	-\$114	\$344	\$64	-\$1	
8	-\$227	-\$114	\$346	\$65	-\$1	
9	-\$178	-\$99	\$280	\$70	-\$1	
10	-\$151	-\$79	\$241	\$51	-\$1	
11 (Preferred)	-\$241	-\$129	\$358	\$103	-\$2	

Table 4-6. Average annual changes in net operating revenues in 1000s of dollars (\$) to various regions from Alternatives 2-11 compared to Alternative 1 (No Action) for 2011 and 2012.

Note: This analysis assumes a January 1, 2011 start date for Amendment 17A.

4.2.2 Effects to the Recreational Sector

Several red snapper management measures have been considered to achieve the desired fishing mortality reduction, inclusive of discard mortality based on the most recent stock assessment. These measures specifically address the prohibition on the harvest, retention, and possession of red snapper throughout the South Atlantic EEZ implemented through Amendment 17A.

The methodology employed in this assessment follows the methodology used in assessing the economic effects of Amendment 17A (SAFMC 2010a) on the recreational sector. A summary description of this methodology is provided below. Appendix N of Amendment 17A provides more details on the method used to estimate the economic effects of the red snapper management measures on the recreational sector.

This assessment evaluated the expected change in economic value relative to the no action alternative to fishers and for-hire vessels in response to the proposed alternatives. The change in economic value is measured in terms of consumer surplus (CS) to recreational anglers and net operating revenues (NOR) to for-hire vessels. CS in the present case is the net benefit an angler derives from an additional fish kept on a fishing trip and is equivalent to the difference between the monetized benefit an angler receives and the actual cost. This value is an appropriate measure of economic effects on recreational anglers as a result of changes in fishing regulations. NOR is the net operating revenue, expressed on a per angler basis, a charterboat or headboat derives from a fishing trip. NOR is calculated as revenue minus the costs for fuel, ice, bait, and other supplies.

The economic effects of Alternatives 2 through 11 relative to Alternative 1 (No Action) are presented in the tables below. The CS values were computed by multiplying the number of affected angler target trips by the CS per trip and average fish per angler per trip. The NOR values were computed by multiplying the number of affected for-hire angler trips by the NOR per angler, per trip. In contrast to the economic analysis of Amendment 17A, the present economic analysis considers only the effects of the various alternatives on fishing operations for snapper grouper species other than red snapper. Because Alternatives 2 through 11 are less restrictive than Alternative 1 (No Action), all CS and NOR changes are positive.

Several limitations characterize the estimated changes in CS and NOR. One such limitation is the possible overestimation of affected target trips and hence also the economic effects. The headboat data collection program does not collect target intent, much less on a species-specific basis, so an alternative estimation approach was used which generated snapper grouper angler trips from the estimated total angler days. Moreover, charter and private target trips were assigned by statistical grid using similar information from the distribution of headboat trips by statistical grid. In addition, headboat and MRFSS data do not contain depth information, so the assignment of target trips by depth made use of similar information from the commercial logbook program. Furthermore, the analysis does not take into account possible effort shift due to area, season, or species substitution. Leaving the fishery altogether remains an option for some for-hire owners/operators, but given the relatively low level of local and national economic

activities, there's a good chance these persons would remain in the fishing industry. If so, they would have to fish for other snapper grouper species, fish in the open areas, fish in the same area during the open season, move their operations to other areas in the South Atlantic or nearby locations, or offer other services to make up for their revenue and profit losses. These options may not totally compensate for their profit losses if they incur higher operating cost and/or additional fixed costs or generate lower revenues; nevertheless, these options would imply the economic effects on the for-hire sector would be less than currently estimated. Private anglers may also shift their effort to target other species or the same species (except red snapper) in the open areas/seasons rather than stop fishing altogether. Again, this would imply the current estimates of CS reductions to be overestimates.

Another limitation pertains to the use of CS and NOR values. The CS value used is uniform across all fishing modes and areas, and this may not necessarily be the case. Headboat anglers may value some snapper grouper species differently, on average, than private and charterboat anglers. The direction and magnitude of such difference are unknown, though the higher cost of fishing to charterboat anglers suggests the CS to headboat anglers would be less than that to charterboat anglers. The NOR value used is uniform across all areas, and thus does not account for area variations in charter and headboat operations that could result in varying NOR values.

One other limitation worth noting here is essentially the one-year horizon considered in the analysis. Spatial and temporal changes to the area closure proposed in this amendment are likely to remain in effect for the next several years, given the existing rebuilding schedule for red snapper. The long-term economic effects of these changes are not explicitly estimated in this assessment due to limited and uncertain information regarding the stock status of red snapper and other snapper grouper species, regulations, and socioeconomic conditions, among others. It is only noted here that the estimated one-year effects may be considered as annual effects of the area closure changes for the first year and second year.

Table 4-7a presents the economic effects of the various alternatives relative to **Alternative 1** (No Action). These economic effects are positive, i.e., increases in angler CS and for-hire vessel NOR, because all alternatives shown in the table are less restrictive than the no action alternative. Due to the location of the area closure, the various alternatives would mainly affect fishing activities and operations in northeast Florida and Georgia. The economic effects of **Alternatives 6 through 5** and **Alternative 11 (Preferred)** are annual effects; those of **Alternatives 6 through 10** are separated into effects in the first year (e.g. **Alternative 6a**) and those of the second year and beyond (e.g., **Alternative 6b**). It is worth reiterating here that these effects were estimated under the assumption that affected trips are cancelled and not shifted to the open season or area. If effort shifting occurs the actual increases in CS and NOR relative to **Alternative 1 (No Action)** would be higher than those presented in the table.

	Charterboat	Headboat	Private	Total			
		Alternative 2					
CS	398,483	2,447,762	1,288,336	4,134,581			
NOR	215,983	766,008		981,991			
Total	614,466	3,213,770	1,288,336	5,116,572			
		Alternative 3					
CS	322,802	2,104,524	1,099,797	3,527,123			
NOR	174,963	658,594		833,557			
Total	497,765	2,763,118	1,099,797	4,360,680			
		Alternative 4					
CS	373,083	2,065,022	1,082,406	3,520,511			
NOR	202,216	646,232		848,448			
Total	575,298	2,711,254	1,082,406	4,368,959			
		Alternative 5					
CS	263,655	1,376,448	657,982	2,298,085			
NOR	142,905	430,748		573,653			
Total	406,560	1,807,196	657,982	2,871,738			
	1	Alternative 6a					
CS	246,408	1,253,413	582,714	2,082,536			
NOR	133,557	392,246		525,802			
Total	379,965	1,645,659	582,714	2,608,338			
		Alternative 6b					
CS	398,483	2,447,762	1,288,336	4,134,581			
NOR	215,983	766,008		981,991			
Total	614,466	3,213,770	1,288,336	5,116,572			
		Alternative 7a					
CS	398,483	2,447,762	1,288,336	4,134,581			
NOR	215,983	766,008		981,991			
Total	614,466	3,213,770	1,288,336	5,116,572			
00	500.004	Alternative 7b	4 750 700				
CS NOP	526,321	3,132,324	1,758,789	5,417,434			
NOR Tatal	285,273	980,236	4 750 700	1,265,509			
Iotal	811,594	4,112,560	1,758,789	6,682,943			
LS NOP	398,483	2,447,762	1,288,330	4,134,581			
Total	215,983		1 200 220	981,991			
	014,400	3,213,770	1,288,336	5,110,572			
CS	572 774	2 162 157	1 77/ 202	5 160 191			
NOR	323,724 202 QCE	3,102,437	1,774,302	3,400,404 1 372 521			
Total	203,003	200,000 A 152 122	1 77/ 202	1,273,331 6 724 015			
10101	807,589	4,152,123	1,774,302	0,734,015			

Table 4-7a. One-year increases in consumer surplus (CS) and for-hire net operating revenues (NOR) under the various alternatives relative to the no action alternative, in 2009 dollars.

Alternative 9a							
CS	373,083	2,065,022	1,082,406	3,520,511			
NOR	202,216	646,232		848,448			
Total	575,298	2,711,254	1,082,406	4,368,959			
		Alternative 9b					
CS	353,944	2,249,485	1,352,729	3,956,157			
NOR	191,842	703,958		895,800			
Total	545,786	2,953,443	1,352,729	4,851,957			
Alternative 10a							
CS	263,655	1,376,448	657,982	2,298,085			
NOR	142,905	430,748		573,653			
Total	406,560	1,807,196	657,982	2,871,738			
		Alternative 10b					
CS	353,944	2,249,485	1,352,729	3,956,157			
NOR	191,842	703,958		895,800			
Total	545,786	2,953,443	1,352,729	4,851,957			
Alternative 11							
CS	572,005	3,400,754	1,906,229	3,293,887			
NOR	310,034	1,064,239		1,818,444			
Total	882,038	4,464,993	1,906,229	5,112,330			

Table 4-7a. Continued. One-year increases in consumer surplus (CS) and for-hire net operating revenues (NOR) under the various alternatives relative to the no action alternative, in 2009 dollars.

As mentioned above, some alternatives include closure changes in the second year that differ from those in the first year. For direct comparison of alternatives, two-year effects were summed, and results are presented in Table 4-7b. Applying discount rates changed the magnitudes but not the ranking of alternatives. Discounted results are not reported in this document. On a two-year basis, the overall effects of the various alternatives would range approximately from \$1.1 million to \$2.7 million in NOR and from \$4.6 million to \$11.8 million in CS. The low numbers are associated with Alternative 5 whereas the high numbers, with Alternative 11 (Preferred). For charterboats, the CS effects would range approximately from \$527,000 to \$1.1 million and the NOR effects would be from \$286,000 to \$620,000. The low ends of the ranges are associated with Alternative 5 and the high ends, with Alternative 11(Preferred). For headboats, the CS effects would range from \$2.8 million to \$6.8 million and NOR effects, from \$861,000 to \$2.1 million. The low ends are associated with Alternative 5 and the high ends, with Alternative 11 (Preferred). For anglers fishing through the private mode, the CS effects would range approximately from \$1.3 million (Alternative 5) to \$3.8 million (Alternative 11). Hence, Alternative 11 (Preferred) is best and Alternative 5 worst for all sectors. Annual economic effects may be approximated by a simple averaging of twoyear effects. For example, the annual economic effects of Alternative 5 would be approximately \$2.298 million in CS and \$0.574 million in NOR; those of Alternative 10 would be approximately \$3.127 million in CS and \$0.735 in NOR.

	Charterboat	Headboat	Private	Total			
		Alternative 2					
CS	796,966	4,895,524	2,576,672	8,269,162			
NOR	431,966	1,532,015		1,963,981			
Total	1,228,932	6,427,539	2,576,672	10,233,143			
		Alternative 3					
CS	645,604	4,209,048	2,199,593	7,054,246			
NOR	349,926	1,317,188		1,667,114			
Total	995,530	5,526,236	2,199,593	8,721,360			
		Alternative 4					
CS	746,165	4,130,044	2,164,813	7,041,023			
NOR	404,431	1,292,464		1,696,896			
Total	1,150,597	5,422,509	2,164,813	8,737,919			
		Alternative 5					
CS	527,311	2,752,895	1,315,964	4,596,170			
NOR	285,809	861,497		1,147,306			
Total	813,120	3,614,392	1,315,964	5,743,476			
		Alternative 6					
CS	644,891	3,701,175	1,871,050	6,217,117			
NOR	349,540	1,158,253		1,507,793			
Total	994,431	4,859,428	1,871,050	7,724,910			
		Alternative 7					
CS	924,804	5,580,086	3,047,125	9,552,015			
NOR	501,256	1,746,243		2,247,499			
Total	1,426,060	7,326,330	3,047,125	11,799,515			
		Alternative 8					
CS	922,207	5,610,220	3,062,638	9,595,065			
NOR	499,848	1,755,673		2,255,522			
Total	1,422,055	7,365,893	3,062,638	11,850,586			
		Alternative 9					
CS	727,027	4,314,507	2,435,135	7,476,668			
NOR	394,058	1,350,190		1,744,248			
Total	1,121,085	5,664,697	2,435,135	9,220,917			
Alternative 10							
CS NOP	617,599	3,625,932	2,010,711	6,254,242			
	334,747	1,134,707	2 040 744	1,469,453			
10tal	952,346	4,760,639	2,010,/11	/,/23,696			
CS	1 1 4 4 0 0 0			11 757 075			
NOR	1,144,009	0,801,509	3,812,437	11,/3/,9/5			
Total	020,008	2,128,478	2 042 457	2,748,546			
Total	1,764,077	8,929,987	3,812,457	14,506,521			

Table 4-7b. Two-year increases in consumer surplus (CS) and for-hire net operating revenues (NOR) under the various alternatives relative to the no action alternative, in 2009 dollars.

Based on two-year effects, the next three tables present the ranking of alternatives for each sector and for all sectors combined. As a basis for comparison, **Table 4-7c** uses the sum of CS and NOR effects; **Table 4-7d** uses CS effects only; and, **Table 4-7e** uses NOR effects only.

As shown in **Table 4-7c**, each sector individually and all sectors combined have the same top three alternatives (**Alternatives 11, 8, and 7**) and lowest three alternatives (**Alternatives 5, 10, and 6**). It is rather obvious that **Alternative 11 (Preferred)** is the best alternative, since it would not impose any area closure at all. On the other end of the scale is **Alternative 5**, which is the worst alternative for all sectors. It may be recalled that **Alternative 5** would close all three statistical areas from May through December while some of the top alternatives, like **Alternative 7** or **Alternative 8**, would close only two statistical areas at a shorter duration, especially in the second year. The water depths subject to closure are the same for these alternatives. Thus, it is almost expected that **Alternative 5** would be ranked much lower than either **Alternative 7** or **Alternative 8**.

Only slight changes in the ranking of alternatives occur when considering the CS effects only **(Table 4-7d)**. Alternative 3 is now ranked higher than Alternative 4 and Alternative 10 is ranked higher than Alternative 6. These rank switches occur only for all sectors combined. The ranking of alternatives for each sector individually remain the same.

The ranking of alternatives using NOR effects only is the same as that using the sum of CS and NOR effects (Table 4-7e). This holds true for each sector individually and for all sectors combined.

Rank	Charterboat	Headboat	Private	All Sectors
1	Alternative 11	Alternative 11	Alternative 11	Alternative 11
2	Alternative 7	Alternative 8	Alternative 8	Alternative 8
3	Alternative 8	Alternative 7	Alternative 7	Alternative 7
4	Alternative 2	Alternative 2	Alternative 2	Alternative 2
5	Alternative 4	Alternative 9	Alternative 9	Alternative 9
6	Alternative 9	Alternative 3	Alternative 3	Alternative 4
7	Alternative 3	Alternative 4	Alternative 4	Alternative 3
8	Alternative 6	Alternative 6	Alternative 10	Alternative 6
9	Alternative 10	Alternative 10	Alternative 6	Alternative 10
10	Alternative 5	Alternative 5	Alternative 5	Alternative 5

Table 4-7c. Rank of alternatives based on two-year increases in consumer surplus (CS) plus forhire net operating revenues (NOR).

Rank	Charterboat	Headboat	Private	All Sectors
1	Alternative 11	Alternative 11	Alternative 11	Alternative 11
2	Alternative 7	Alternative 8	Alternative 8	Alternative 8
3	Alternative 8	Alternative 7	Alternative 7	Alternative 7
4	Alternative 2	Alternative 2	Alternative 2	Alternative 2
5	Alternative 4	Alternative 9	Alternative 9	Alternative 9
6	Alternative 9	Alternative 3	Alternative 3	Alternative 3
7	Alternative 3	Alternative 4	Alternative 4	Alternative 4
8	Alternative 6	Alternative 6	Alternative 10	Alternative 10
9	Alternative 10	Alternative 10	Alternative 6	Alternative 6
10	Alternative 5	Alternative 5	Alternative 5	Alternative 5

Table 4-7d. Rank of alternatives based on two-year increases in consumer surplus (CS).

Table 4-7e. Rank of alternatives based on two-year increases in net operating revenue (NOR).

Rank	Charterboat	Headboat	Private	All Sectors
1	Alternative 11	Alternative 11		Alternative 11
2	Alternative 7	Alternative 8		Alternative 8
3	Alternative 8	Alternative 7		Alternative 7
4	Alternative 2	Alternative 2		Alternative 2
5	Alternative 4	Alternative 9		Alternative 9
6	Alternative 9	Alternative 3		Alternative 4
7	Alternative 3	Alternative 4		Alternative 3
8	Alternative 6	Alternative 6		Alternative 6
9	Alternative 10	Alternative 10		Alternative 10
10	Alternative 5	Alternative 5		Alternative 5

The magnitude of economic effects of the various alternatives directly correlates with the size and duration of the area closure. The ranking of alternatives based on the magnitude of economic effects underscores this point. However, there are certain features of the estimated effects that need to be recognized.

First, some alternatives are very close to each other in terms of economic effects, although a discrete ranking of these alternatives was achieved as shown in the tables above. Take the case of **Alternatives 7 and 8**, which are both ranked either as second or third. Both alternatives are the same with respect to the size and length of area closure for the first year. They differ only in the second year, with **Alternative 7** closing one area in June and July and **Alternative 8** closing two areas in July. Their overall effects differ only somewhat marginally. **Alternative 7** has slightly higher economic effects than **Alternative 8** for charterboats and slightly lower economic effects for the other sectors, including all sectors combined. It appears then that, for all intent and purposes, the two alternatives have the same economic effects.

Second, some alternatives appear to have about the same overall economic effects, but they differ in structure and in their economic effects on certain segments of the recreational sector. Alternatives 3 and 4, which are ranked somewhere in the middle, belong to this mold. Both alternatives would close the same three areas and water depths. They differ only in the duration of the closure – Alternative 3 has a four-month closure (Mav-August) whereas Alternative 4 has a six-month closure (July-December). Their overall effects for all sectors combined are close to each other (\$8.721 million vs. \$8.737 million). Their effects on the private mode do not differ much (\$2.199 million vs. \$2.164 million). On the other hand, their effects on headboats or charterboats are quite different: \$5.526 vs. \$5.422 for headboats and \$0.995 million vs. \$1.15 for charterboats. What is even a little surprising here is that Alternative 3 (4-month closure) has lower economic effects on charterboats than Alternative 4 (6-month closure). The reverse is true for headboats and private mode. This signifies the different seasonal distribution of charterboat and headboat/private mode effort. Based on 2007-2009 activities, charterboats took more trips in May and June than in September through December, thus Alternative 3 has higher economic effects than Alternative 4. In a sense, the economic effects on charterboats would tone down the economic effects on the other sectors, resulting in Alternatives 3 and 4 to have relatively similar total economic effects.

Another pair of alternatives worth comparing consists of Alternatives 6 and 10, both of which are ranked at the bottom. In the first year, both alternatives would close the same three statistical areas from May through December, but Alternative 6 would close water depths from 66 feet to 240 feet and Alternative 10, from 98 feet to 240 feet. In the second year, both alternatives would limit the closure to the same two statistical areas and have the same water depths (98 feet to 240 feet) but differ in the length and timing of the closure. Alternative 6 would close May through October whereas Alternative 10, January through April. As expected, the first year economic effects of Alternative 10 would be higher than those of Alternative 6 (\$2.872 million vs. \$2.608 million, Alternative 6a and Alternative 10a in Table 4-7a). The second year effects, however, did not turn out to be as generally expected – Alternative 6 would result in higher economic effects than Alternative 10 despite its longer closure (\$5.116 million vs. \$4.852 million, Alternative 6b and Alternative 10b in Table 4-7a). This implies that a shorter closure in the early months would affect more recreational trips, particularly the charterboat and headboat sectors, than a longer closure toward the middle and end months. On a two-year basis, Alternative 6 would favor the charterboat and headboat sectors while Alternative 10 would favor the private mode anglers. At any rate, the overall economic effects of both alternatives would be about the same: \$7.725 million for Alternative 6 and \$7.724 million for Alternative 10.

Another issue worth noting here is that economic effects of the various alternatives would filter through the recreational fishing support industries and local communities where recreational fishing activities are concentrated. The economic impacts on these industries and communities would generally be proportionate to the estimated economic effects on anglers and for-hire fleet.

One other important point to consider with the estimated results is the manner the no action alternative was defined in the present economic assessment. The closed area under Amendment 17A was assumed to commence on January 1, 2011, although as noted elsewhere in this document, implementation of the area closure has been delayed until June 1, 2011. Explicit

consideration of this delayed implementation of the area closure would change the magnitudes of economic effects of the various alternatives and potentially also the ranking of these alternatives. What is certain, however, is that **Alternative 11 (Preferred)** would still come out as the best alternative for all segments of the recreational sector in the short term.

The long-term scenario for the various alternatives depends, to a great extent, on the biological condition of the red snapper stock over time. If the current ban on harvest, retention, and possession of red snapper is sufficient to end overfishing and keep the pace of rebuilding along the desired trajectory, then the short-term benefits of the various alternatives will be sustained over time. In particular, **Alternative 11 (Preferred)** will provide the largest long-term economic benefits. If some form of area closure is needed, it could happen that some of the lesser alternatives (e.g., **Alternative 7 or Alternative 8**) would be better than **Alternative 11 (Preferred)** in the long term.

4.3 Social Effects

4.3.1 General Social Effects

Regulatory change in general may cause some of the following direct and indirect social consequences: increased crew and dockside worker turnover; displacement of social or ethnic groups; increased time at sea (potentially leading to increased risk to the safety of life and boat); decreased access to recreational activities; demographic population shifts (such as the entrance of migrant populations replacing or filling a market niche); displacement and relocation as a result of loss of income and the ability to afford to live in coastal communities; increased efforts from outside the fishery to affect fishing related activities; changes in household income source; business failure; declining health and social welfare; and increased gentrification of coastal communities as fishery participants are unable to generate sufficient revenue to remain in the community. Ultimately, one of the most important measurements of social change is how these social forces, in coordination with the strategies developed and employed by local fishermen to adapt to the regulatory changes, combine to affect the local fishery, fishing activities and methods, and the community as a whole.

An additional indirect effect of fisheries management on the fishing community and related sectors may include increased confusion and differences between the community and the management sector in levels of understanding and agreement on what is best for both the resource and fishermen and associated businesses and communities. The fact that "the science" can cause relatively large changes in harvests, particularly reductions, may be disconcerting to fishermen and concerned stakeholders. This can induce compliance issues with current and future regulations, which can lead to inefficient use of resources, ineffectual regulations, and failure to meet management targets, which may precipitate additional restrictions. Essentially, the effectiveness of management, from biological, economic, and social perspectives, requires buy-in by affected entities.

A description of the communities expected to be affected by the actions in this amendment is provided in **Section 3.3.3**.

Alternative 1 (No Action) would not be expected to result in any change in any direct short or long-term social effects associated with new restrictions because no new restrictions on the fishery would occur. Under Alternative 1 (No Action), the actions approved under Amendment 17A would go into effect, with the exception of the delayed application of the harvest prohibition of snapper grouper species other than red snapper until June 2011, and all entities associated with the red snapper component of the snapper grouper fishery would be expected to experience the effects of these actions. The expected social effects of these actions are discussed in Amendment 17A and are incorporated herein by reference.

Although Alternative 1 (No Action) would not be expected to result in any change in social effects associated with management change, reduction in social benefits may accrue to a possible perception of inappropriate management. As discussed in Section 1.4, the most recent assessment of the red snapper resource indicates that the stock is in better shape than the conditions that precipitated the adoption of the actions approved under Amendment 17A, and this improved condition supports a lessening of the restrictions proposed by Amendment 17A. From the perspective that less restrictive measures can achieve the biological goals for the red snapper resource, failure to lessen the planned restrictions and reduce the expected adverse social and economic benefits associated with these planned restrictions would not be expected to be well received by affected entities and may be perceived as inappropriate exercise of management authority.

Alternatives 2-11 are less restrictive than the prohibitions approved under Amendment 17A. As a result, the expected social effects of all of the alternative harvest prohibitions and exemptions would be expected to be positive relative to Alternative 1 (No Action). However, because Alternative 1 (No Action) equates to the implementation of the actions approved under Amendment 17A, and these actions are expected to result in reductions in short-term social benefits relative to historical performance in the snapper grouper fishery, the less restrictive measures considered in the current amendment would be expected to result in net increased short-term social benefits relative to Alternative 1 (No Action), but reduced short-term social benefits relative to the historic fishery.

Because Alternatives 2-11 would equally prohibit all commercial and recreational harvest of red snapper in the South Atlantic EEZ and in state waters by vessels with federal snapper grouper permits, none of these alternatives would be expected to have any differential social effects from the perspective of red snapper harvest or fishing. Instead, these alternatives vary in the extent to which they lessen the restrictions on the harvest of other snapper grouper species expected to go into effect as a result of Amendment 17A. As the severity of restrictions expected to be implemented as a result of Amendment 17A is reduced, assuming the biological goals are not compromised, the greater the expected increase in social benefits.

It should be emphasized that this assessment assumes that all of the alternatives considered would be successful in achieving the biological goals of red snapper management. A discussion of the expected biological effects of the proposed alternatives is provided in **Section 4.1**. As detailed in **Table 2-1**, the alternatives are expected to result in different percentage reductions in red snapper mortality. Although changing future conditions could result in a need for greater red

snapper harvest reductions in subsequent years than currently projected, such that higher shortterm reductions than currently projected may be beneficial, assessment of such considerations are beyond the scope of this analysis. As a result, this assessment assumes that the social benefits are maximized with the minimum reduction in red snapper harvest necessary to meet the biological goals for the resource. Specifically, if a certain percentage reduction is expected to meet recovery goals, it is assumed that social benefits would not be increased by a higher percentage reduction.

The expected social effects of the alternative harvest prohibitions and exemptions would be expected to be generally proportional to the magnitude of expected economic effects. The expected economic effects of these alternatives are provided in **Section 4.2**. In general, the less extensive the proposed harvest restriction, in terms of geographic coverage, duration, and more liberal exemptions, the greater the resultant short-term increase in social effects relative to **Action 1 (No Action)**. The expected economic effects have been used to generate estimates of the expected changes in business activity, which have an inarguable social content, and are provided in **Section 4.3.2**. As explained in **Section 4.3.2**, the estimates of the changes in business activity are proportional and unidirectional to the expected economic effects of the alternatives.

The estimates of the expected change in business activity can be used as a guide to ranking the expected changes in social benefits. However, four caveats should be noted. The first caveat is, as discussed above, all results assume that the biological goals would be met under each alternative; specifically, harvest reductions that are greater than those currently expected to be sufficient to achieve rebuilding goals would not be expected to result in greater social or economic benefits. The second caveat is that all calculations are based on a two-year calendar basis encompassing both 2011 and 2012, but the calculations do not include the effects of the expected delay of the implementation of the area closure until June in 2011. As a result, the expected changes in business activity, and associated social effects, would be expected to exceed the actual changes by an unknown amount (losses would not be as severe, nor gains as great) because the calculations artificially return or take away changes that are not expected to occur as a result of the delayed implementation of the area closure in 2011. This caveat affects the magnitude but not the expected ranking of the effects. The third caveat is, as discussed in Section 4.3.2, the calculations do not allow for behavioral changes, so any estimates are likely inflated by an unknown amount. The final caveat is that the results provided in Section 4.3.2 assume both the pot and dive gear exemptions apply in tandem with each alternative prohibition. It is appropriate to apply these exemptions because of their approval and implementation through Amendment 17A.

With these considerations in mind and the assumption that the ranking based on economic and business activity effects is a sufficient indicator of ranking from a social perspective, it can be seen in **Section 4.3.2** that overall, across all states and from the perspective of national effects, for the commercial sector, **Alternative 11 (Preferred)** would be expected to result in the greatest average annual increase in total social benefits (across all states) while **Alternative 5** would be expected to result in the smallest average annual increase in total social benefits (**Tables 4-9 through 4-12**), not all states, and associated communities, would be expected to receive increased social or economic

benefits from any of the alternatives. As discussed in Amendment 17A, the prohibition of harvest of snapper grouper species off Georgia and Florida would be expected to benefit fishermen, and associated communities and businesses, in North Carolina and South Carolina as a result of expected lengthening of the season for these species and an increased opportunity of harvest and sale of these species by fishermen in these two states at the expense of fishermen and associated shoreside entities that operate in closer geographic proximity to the closed areas. Therefore, based on this expectation, it is logical that reducing the severity of these prohibitions would reverse these effects; entities in North Carolina and South Carolina would be expected to lose the benefits that they were previously expected to gain, while entities in Georgia and Florida would be expected to lose. Overall, however, across all states, a net increase in social benefits would be expected because the gains in social benefits in Georgia and Florida would be expected to exceed the losses in social benefits in North Carolina. These results and the rankings of **Alternatives 2-11** can be seen in **Tables 4-8 through 4-12**.

For the recreational sector, the ranking of alternatives would similarly be expected to follow the expected changes in recreational effort (rather than changes in ex-vessel revenues) and resultant potential effects on business activity. Projections of these changes are provided in **Table 4-13**. Overall, while all of **Alternatives 2-11** would be expected to result in increased short term social benefits relative to **Alternative 1 (No Action)** because each would result in a reduction in snapper grouper harvest prohibitions, **Alternative 5** would be expected to result in the smallest total increase in social benefits because it would be expected to result in the smallest increase in recreational angler trips, while **Alternative 11 (Preferred)** would be expected to result in the largest total increase in social benefits. Unlike the expected effects on the commercial sector, these alternatives are not expected to have any substantial effects on anglers or associated businesses or communities in North Carolina or South Carolina. As a result, all the expected social effects of these alternatives would be expected to occur in Georgia and Florida, specifically northeast Florida due to the proximity to the affected waters.

4.3.2 Business Activity Associated with Estimated Economic Effects on the Commercial and Recreational Sectors

This section provides estimates of the business activity associated with the potential changes in commercial ex-vessel revenues and recreational angler trips that may occur as a result of the proposed management changes. Business activity is characterized in the form of FTE jobs, income impacts (wages, salaries, and self-employed income), output (sales) impacts (gross business sales), and value-added impacts (difference between the value of goods and the cost of materials or supplies). Job and output (sales) impacts are equivalent metrics across both the commercial and recreational sectors. Income and value-added impacts are not equivalent, though similarity in the magnitude of multipliers may result in roughly equivalent values. Neither income nor value-added impacts should be added to output (sales) impacts because this would result in double counting. Job and output (sales) impacts, however, may be added across sectors.

These estimates of business activity are provided to inform the decision process of the potential consequences of the proposed management changes. However, it should be emphasized that these estimates should not be confused with the estimated changes in economic value (CS or PS/NOR) provided above as business activity and economic value are not equivalent concepts.

While business activity and economic value are not equivalent concepts, the calculation of the change in business activity utilizes variables that were used in the calculation of the expected change in economic value, specifically ex-vessel revenues in the commercial sector and angler trips in the recreational sector. Because both assessments (change in economic value and change in business activity) use these common variables, the ranking of alternatives based on the magnitude of these effects is unaffected by the metric examined; the greater the estimated change in economic value, the greater the estimated change in business activity. While this outcome may not be true for all proposed management changes, it is true for the proposed management changes in this amendment.

The estimates of the change in business activity should be interpreted and used with caution. As stated in **Section 4.3.1**, the proposed measures in this amendment are expected to result in increases in commercial revenues and recreational trips relative to the status quo because they reduce the management restrictions adopted in Amendment 17A. While some change of business activity would be expected to result from any change in commercial revenues or recreational trips, the full gain of the estimates provided below should not be expected to occur as a result of the proposed management changes. The primary reason for this is the calculation of these results does not account for behavioral changes that would be expected to occur in response to the proposed management changes. The nature of these behavioral changes varies by sector. In the commercial sector, an estimated loss in ex-vessel revenues may be overstated if fishermen are able to re-direct their fishing effort to substitute species, while an estimated gain in ex-vessel revenues may come at the expense of reduced harvests of, and revenues from, other species. Parallels exist in the recreational sector: an estimated reduction in angler trips may be overstated if fishermen re-direct their effort to substitute species, while an estimated gain in angler trips for one species may come at the expense of reduced trips for other species.

For the commercial sector, fishing revenues generate business activity in multiple sectors of the economy. These sectors are combined and summarized in the business activity model as harvester, dealer/processor, wholesaler/distributor, grocer, and restaurant sectors. If harvests and ex-vessel revenues increase as a result of management change, then improved employment conditions through greater job stability and improved incomes for current workers may occur instead of increased employment in the harvester and dealer/processor sectors. In the grocer and restaurant sectors, increased purchases of the subject species may occur at the expense of other products. In this event, these increased purchases would represent transferred business activity and not new business activity.

For the recreational sector, the primary behavioral change not captured in the analysis is the potential to shift fishing trips and associated expenditures to alternative target species or recreational activities. In the event of less restrictive management, taking advantage of new fishing opportunities may entail platform or location switching (fishing from a different mode or port), resulting in new expenditure patterns; anglers may spend less money and/or make their

purchases from different vendors and/or in different communities. As a result, expenditure patterns may change and businesses with reduced activity would suffer losses in business activity while businesses with increased activity would experience gains. All the business activity, however, would not be lost by the fishing industry or associated businesses as a whole in the event of more restrictive management, nor would all business activity be expected to be new activity in the event of less restrictive management. Alternatively, substitution of new recreational activities in lieu of fishing, either in the same or different communities, while economically harmful to the fishing industry, would represent gains in business activity to these alternative sectors. As a result, while the extent to which a community retains its character as a fishing destination may change, all of the business activity associated with any reduced fishing would not necessarily be lost to the community or region as a whole.

The previous two paragraphs may seem confusing with respect to the current amendment because they are general summaries of things to consider with respect to management change. In the current situation, confusion may arise due to the fact that the proposed actions are expected to lessen the restrictions of an amendment yet to be fully implemented. As such, the benefits (increased revenues in the commercial sector and increased trips in the recreational sector) are not new per se, i.e., the benefits are not expected additions/increases to the historic fishery, but represent, instead, historic average annual revenues and trips that would not be expected to be lost. Thus, they represent continuations of historic performance. Stated an alternative way, the changes in business activity provided below are less gains than they are expectations of avoided losses. As such, the discussion of "uncaptured" behavioral change provided above reduces, for this amendment, to caution that the benefits (avoided losses) of the proposed actions are likely overstated because their original tabulation as expected losses as a result of Amendment 17A was likely overstated. Or, stated a different way, the full amount of these business activity effects should not be expected to be "retained" as a result of the proposed alternatives because they were unlikely to be lost as a result of Amendment 17A.

The following discussion focuses on the potential change in business activity associated with the estimated changes in commercial ex-vessel revenues for Action 1 Alternatives 2-11, as provided in **Tables 4-8 through 4-12**. As stated in **Section 4.3.1**, the effects of Alternatives 2-10 were assessed in tandem with the black sea bass pot and spearfish gear exemptions implemented as a result of Amendment 17A. The results represent the expected potential effect of the alternative area prohibitions for 2011 and 2012. However, as discussed in **Section 4.3.1**, the assessment does not include the effects of the delayed implementation of the area prohibition on the harvest of other snapper grouper species in 2011.

Finally, although the assessment covered a two-year period, 2011 and 2012, the results provided in the tables represent the average annual effects for the two years, meaning, on average these changes, with respect to **Alternative 1 (No Action)**, would be expected to occur each year in 2011 and 2012. For **Alternatives 2-5**, the average annual effect over the two-year period would be expected to be equal to the single-year effect because the prohibitions would not change in 2012 from those in 2011. For **Alternatives 6-10**, however, the effects in 2011 would be expected to be different in 2011 than in 2012 because of the reduced scope of the prohibition in 2012. As a fictional example, if a prohibition was projected to result in an increase of 20 harvester jobs in 2011 (relative to **Alternative 1 (No Action**)) and 30 harvester jobs in 2012, the 30 jobs in 2012 would not be expected to be all new jobs relative to 2011 but rather, continuation of the 20 jobs from 2011 and 10 new jobs in 2012. Therefore, from an average annual perspective, the expected change in business activity would be 25 harvester jobs per year for the two years (20 + 30 = 50, divided by 2). The average annual effects over the entire period beginning in 2013 and continuing into subsequent years would be equivalent to the average annual estimate for the first two years under **Alternatives 2-5**, because the prohibitions would remain fixed each year until changed, but would increase under **Alternatives 6-10** because of the persistence of a less restrictive prohibition (relative to 2011) in the subsequent years (20+30 equals an annual average of 25, whereas 20+30+30 equals an annual average of approximately 28, etc.).

It should be noted that the estimated changes in business activity for Georgia-northeast Florida may underestimate actual effects. The model used for this analysis is organized by state. whereas the estimated changes in ex-vessel revenues must combine Georgia with portions of Florida due to confidentiality considerations. Fish revenues flow through each state's economy differently. As an example, repeating the example discussed above, while \$1 million in reef fish (snapper grouper) ex-vessel revenues is estimated to support 79 FTE jobs in Florida (18 in the harvester sector), \$1 million in reef fish (snapper grouper) ex-vessel revenues is estimated to support 173 FTE jobs in Georgia (61 in the harvester sector). Total output (sales) impacts associated with these revenues are approximately \$4 million (2008 dollars) for Florida and \$7.7 million for Georgia. As a result, based on current model estimates, each dollar in ex-vessel reef fish (snapper grouper) revenues is estimated to support more business activity in Georgia than in Florida. The estimated potential change in business activity for Georgia-northeast Florida in this analysis is calculated using the Florida model because the majority of the changes occur in Florida. Because the Georgia portion of ex-vessel revenues in the combined Georgia-northeast Florida total are subjected to the lower Florida model parameters instead of the higher Georgia parameters, the estimates of business activity for the combined area will be lower than actual.

It is also noted that changes in business activity were also forecast for the Florida Keys. However, the expected changes in ex-vessel revenues, and associated business activity, for the Florida Keys are minor, amounting to, at most, a few thousand dollars over the two years, compared to the expected changes in the other portions of the South Atlantic. As a result, the associated changes in business activity for the Florida Keys are not included in the following discussion or tables. Also, while the expected changes in ex-vessel revenues in the commercial sector (and expected changes in trips in the recreational sector discussed below) are additive across states to produce estimates of the total expected effects across all four states, the estimated changes in business activity should not be similarly added. The reason for this is that in a state model, the sale of a product in one state that is manufactured in another state produces less business activity in the state of sale due to leakage to the state where manufacture occurred. In a regional model that includes both states, however, both points of sale would remain in the region, resulting in reduced leakage and a higher estimate of business activity. The model used for this assessment only supports analysis for an individual state and for the entire U.S. (all states combined). This assessment provides the expected potential change in business activity for the entire U.S. and for each state individually. A simple examination of the results will confirm that the sum of the effects of the individual states is less than the U.S. total.

For the combined effects, the estimated potential change in average annual ex-vessel revenues to the U.S. ranges from a gain of approximately \$105,000 (Alternative 5) to a gain of approximately \$183,000 (Alternative 11), with associated increases in FTE jobs for these alternatives of 3 harvester/20 total and 5 harvester/34 total, respectively (Table 4-8). The estimated potential change in average annual ex-vessel revenues in North Carolina ranges from a loss of approximately \$99,000 (Alternative 5) to a loss of approximately \$324,000 (Alternative 11), with associated reductions in FTE jobs for these alternatives of 2 harvester/14 total and 5 harvester/44 total, respectively (Table 4-9). The estimated potential change in average annual ex-vessel revenues in South Carolina ranges from a loss of approximately \$47,000 (Alternative 5) to a loss of approximately \$197,000 (Alternative 11), with associated reductions in FTE jobs for these alternatives of 2 harvester/5 total and 8 harvester/21 total, respectively (Table 4-10). For Georgia-northeast Florida, the estimated potential change in average annual ex-vessel revenues ranges from a gain of approximately \$229,000 (Alternative 5) to a gain of approximately \$575,000 (Alternative 11), with associated gains in FTE jobs for these alternatives of 4 harvester/18 total and 10 harvester/45 total, respectively (Table 4-11). Finally, the estimated potential change in average annual ex-vessel revenues in Central-southeast Florida ranges from a gain of approximately \$22,000 (Alternative 5) to a gain of approximately \$131,000 (Alternative 11), with associated losses in FTE jobs for these alternatives of 0 harvester/2 total and 2 harvester/10 total, respectively (Table 4-12).

		US Business Activity Effects				
	Revenue	Harvester	Total	Output	Income	
Alternative*	Change	Jobs	Jobs	Impacts	impacts	
2	\$143,285	4	27	\$1,886,490	\$803,972	
3	\$164,290	4	31	\$2,163,042	\$921,831	
4	\$136,970	3	26	\$1,803,347	\$768,539	
5	\$104,800	3	20	\$1,379,797	\$588,033	
6	\$118,980	3	22	\$1,566,491	\$667,597	
7	\$158,535	4	30	\$2,087,272	\$889,540	
8	\$160,410	4	30	\$2,111,958	\$900,061	
9	\$147,500	4	28	\$1,941,985	\$827,623	
10	\$131,410	3	25	\$1,730,144	\$737,342	
11	\$183,025	5	34	\$2,409,707	\$1,026,953	

Table 4-8. Potential change in U.S. business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

 Table 4-9.
 Potential change in North Carolina business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to Alternative 1 (No Action). All dollar values are in 2008 dollars.

		North Carolina Business Activity Effects				
Alternative*	Revenue Change	Harvester Jobs	Total Jobs	Output Impacts	Income impacts	
				-		
2	-\$289,720	-5	-39	\$1,708,769	-\$919,861	
3	-\$163,850	-3	-22	-\$966,387	-\$520,224	
4	-\$168,400	-3	-23	-\$993,223	-\$534,670	
5	-\$99,450	-2	-14	-\$586,556	-\$315,754	
				-		
6	-\$194,585	-3	-26	\$1,147,662	-\$617,807	
				-		
7	-\$302,840	-5	-41	\$1,786,150	-\$961,517	
				-		
8	-\$304,495	-5	-41	\$1,795,912	-\$966,772	
				-		
9	-\$239,710	-4	-33	\$1,413,810	-\$761,079	
				-		
10	-\$205,235	-3	-28	\$1,210,476	-\$651,621	
				-	-	
11	-\$323,515	-5	-44	\$1,908,091	\$1,027,160	

Table 4-10. Potential change in South Carolina business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1 (No Action)**. All dollar values are in 2008 dollars.

		South Carolina Business Activity				
			Ef	fects		
	Revenue	Harvester	Total	Output	Income	
Alternative*	Change	Jobs	Jobs	Impacts	impacts	
				-	-	
2	-\$156,860	-6	-17	\$729,242	\$351,994	
				-	-	
3	-\$84,815	-3	-9	\$394,305	\$190,325	
				-	-	
4	-\$112,525	-5	-12	\$523,129	\$252,506	
				-	-	
5	-\$47,470	-2	-5	\$220,688	\$106,523	
				-	-	
6	-\$99,425	-4	-11	\$462,227	\$223,110	
				-	-	
7	-\$173,520	-7	-18	\$806,694	\$389,379	
				-	-	
8	-\$173,985	-7	-18	\$808,856	\$390,422	
				-	-	
9	-\$151,960	-6	-16	\$706,462	\$340,998	
				-	-	
10	-\$119,435	-5	-13	\$555,253	\$268,012	
				-	-	
11	-\$197,515	-8	-21	\$918,247	\$443,224	

Table 4-11. Potential change in Georgia-northeast Florida business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1** (No **Action**). All dollar values are in 2008 dollars.

		Georgia-northeast Florida Business			
			Activ	vity Effects	
	Revenue	Harvester	Total	Output	Income
Alternative*	Change	Jobs	Jobs	Impacts	impacts
2	\$544,330	10	43	\$2,181,130	\$1,158,879
3	\$350,395	6	28	\$1,404,033	\$745,991
4	\$349,315	6	28	\$1,399,705	\$743,692
5	\$229,290	4	18	\$918,765	\$488,158
6	\$384,805	7	30	\$1,541,914	\$819,250
7	\$555,050	10	44	\$2,224,085	\$1,181,701
8	\$557,090	10	44	\$2,232,260	\$1,186,045
9	\$452,870	8	36	\$1,814,650	\$964,160
10	\$392,855	7	31	\$1,574,170	\$836,388
11	\$575,435	10	45	\$2,305,768	\$1,225,101

Table 4-12. Potential change in central-southeast Florida business activity associated with the estimated change in the commercial sector ex-vessel revenues relative to **Alternative 1** (No **Action**). All dollar values are in 2008 dollars.

		Central-southeast Florida Business				
			Activit	y Effects		
	Revenue	Harvester	Total	Output	Income	
Alternative*	Change	Jobs	Jobs	Impacts	impacts	
2	\$46,345	1	4	\$185,704	\$98,669	
3	\$62,750	1	5	\$251,439	\$133,595	
4	\$69,420	1	5	\$278,166	\$147,795	
5	\$22,425	0	2	\$89,857	\$47,743	
6	\$28,580	1	2	\$114,520	\$60,847	
7	\$81,445	1	6	\$326,350	\$173,396	
8	\$83,395	2	7	\$334,164	\$177,548	
9	\$87,880	2	7	\$352,135	\$187,097	
10	\$64,385	1	5	\$257,991	\$137,076	
11	\$131,000	2	10	\$524,917	\$278,899	

Table 4-13 contains estimates of the potential change in business activity associated with the estimated change in recreational trips under Alternatives 2-11 relative to Alternative 1 (No Action). The gear exemptions implemented as a result of Amendment 17A are not relevant to the recreational sector. Because coefficients of the estimated change in business activity are not available for the headboat sector, estimates of the business activity associated with the potential changes in headboat target effort were not generated for this analysis and, as a result, only estimates for private and charter anglers are provided in Table 4-13. None of the proposed prohibitions would be expected to affect recreational angler trip demand by North Carolina or South Carolina anglers. As a result, no changes in job, output (sales), or value-added impacts are expected to occur. Because of confidentiality considerations, this assessment combines the expected effects for Georgia and Florida.

As seen in **Table 4-13**, overall, **Alternative 5** would be expected to result in the least gain in business activity associated with the recreational sector, while **Alternative 11** would be expected to result in the greatest gain. **Alternative 5** would be expected to result in an increase of 7,950 angler trips and 7 FTE jobs, while **Alternative 11** would be expected to result in an increase of 22,219 angler trips and 18 FTE jobs. These alternatives also would be expected to result in the fewest and most gains in business activity if evaluated by sector, private versus charter.

	Fishing	Target Trip	Total	Output	Value- added
Alternative	Mode	Change	Jobs	Impacts	Impacts
2	Private	13,380	6	\$505,967	\$302,342
	Charter	1,688	7	\$661,334	\$389,346
	Total	15,068	12	\$1,167,301	\$691,688
3	Private	11,422	5	\$431,925	\$258,098
	Charter	1,367	6	\$535,730	\$315,399
	Total	12,789	10	\$967,654	\$573,497
4	Private	11,241	5	\$425,080	\$254,008
	Charter	1,580	7	\$619,205	\$364,543
	Total	12,821	11	\$1,044,285	\$618,551
5	Private	6,834	3	\$258,410	\$154,414
	Charter	1,117	5	\$437,558	\$257,603
	Total	7,950	7	\$695,968	\$412,017
6	Private	9,716	4	\$367,412	\$219,548
	Charter	1,366	6	\$535,142	\$315,053
	Total	11,082	10	\$902,554	\$534,601
7	Private	15,823	7	\$598,330	\$357,534
	Charter	1,958	8	\$767,344	\$451,757
	Total	17,781	14	\$1,365,674	\$809,291
8	Private	15,904	7	\$601,393	\$359,365
	Charter	1,953	8	\$765,188	\$450,488
	Total	17,856	14	\$1,366,581	\$809,852
9	Private	12,645	5	\$478,173	\$285,734
	Charter	1,540	6	\$603,333	\$355,199
	Total	14,185	11	\$1,081,505	\$640,933
10	Private	10,441	4	\$394,828	\$235,931
	Charter	1,308	6	\$512,412	\$301,671
	Total	11,749	10	\$907,240	\$537,602
11	Private	19,797	8	\$748,627	\$447,344
	Charter	2,422	10	\$949,186	\$558,813
	Total	22 210	18	\$1 607 812	\$1,006,157

 Table 4-13.
 Two-year potential change in Georgia-northeast Florida business activity associated with the estimated change in the recreational target trips relative to Alternative 1 (No Action).

 All dollar values are in 2008 dollars.

4.3.3 Environmental Justice Considerations

Executive Order 12898 requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. In addition, and specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. This executive order is generally referred to as environmental justice (EJ).

Persons employed in the snapper grouper fishery and associated businesses and communities along the South Atlantic coast, particularly those in Georgia and northeast Florida, would be expected to be affected by this proposed action. Information on the race and income status for groups at the different participation levels (vessel owners, crew, dealers, processors, employees, employees of associated support industries, etc.) is not available. County level data, however, for certain communities have been assessed to examine potential EJ concerns. Because this proposed action would be expected to affect fishermen and associated industries in numerous communities along the South Atlantic coast and not just those profiled, it is possible that other counties or communities have poverty or minority rates that exceed the EJ thresholds.

In order to identify the potential for EJ concern, the rates of minority populations (non-white, including Hispanic) and the percentage of the population that was below the poverty line were examined. The threshold for comparison that was used was 1.2 times the state average such that, if the value for the community or county was greater than or equal to 1.2 times the state average, then the community or county was considered an area of potential EJ concern. Census data for the year 2000 was used Estimates of the state minority and poverty rates, associated thresholds, and community rates are provided in **Table 4-14**.

Among the communities examined, based on available demographic information, only the poverty rates for Daytona Beach and St. Augustine, Florida suggest potential EJ concern. As noted above, however, additional communities beyond those profiled would be expected to be affected by the actions in this proposed amendment. Because these communities have not been profiled, the absence of additional potential EJ concerns cannot be assumed and the total number of communities that exceed the thresholds is unknown.

However, while some communities expected to be affected by this proposed amendment may have minority or economic profiles that exceed the EJ thresholds and, therefore, may constitute areas of concern, no EJ issues have been identified or are expected to arise as a result of this proposed amendment. No adverse human health or environmental impacts are expected to accrue to this proposed amendment. The measures in this proposed amendment are expected to result in increased social and economic benefits and the environmental consequences of this proposed amendment are expected to be positive. While this proposed amendment is expected to reduce the mortality of an overfished species, red snapper, and result in the possible reduction in the mortality of other species, the reduction in mortality of these species would be expected to be less than would occur as a result of other management measures that have yet to be fully implemented, thereby reducing adverse consequences to the human environment while preserving necessary protection of red snapper. Protection of red snapper would be expected to assist in the rebuilding of this resource and the reduced mortality of additional species would be expected to increase the environmental benefits these species contribute to the marine environment and the general health and condition of this environment. These measures are also not expected to result in increased risk of exposure of affected individuals to adverse health hazards. Thus, the proposed actions are not expected to result in any negative environmental consequences.

Because the proposed actions are not expected to result in any negative environmental consequences, the EJ issues of fair treatment and meaningful involvement regardless of race, color, national origin, or income are not relevant.

		Minority	Minority	Poverty	Poverty
State	Community	Rate	Threshold*	Rate	Threshold*
Florida		34.60	41.52	12.50	15.00
	Cape Canaveral	8.10		11.60	
	Daytona Beach	39.7		23.6	
	Fernandina				
	Beach	20.0		10.2	
	Jacksonville				
	Beach	11.0		7.2	
	St. Augustine	20.7		15.8	
Georgia		37.40	44.88	13.00	15.60
	Townsend**	39.10		14.60	
South					
Carolina		33.90	40.68	14.10	16.92
	Little River	9.10		7.50	
North					
Carolina		29.80	35.76	12.30	14.76
	Atlantic City	2.60		7.30	
	Beaufort	25.40		16.60	
	Hatteras Village	6.60		10.00	
	Morehead City	19.20		14.60	
	Sneads Ferry	9.70		13.50	
	Wanchese	3.30		8.10	

TADIC 4-14. Environmental justice Thresholds (2000 U.S. Census (

*Calculated as 1.2 times the state rate.

**Values are for all of McIntosh County.

4.4 Administrative Effects

4.4.1 Snapper Grouper Area Closure

Alternative 1 (No Action) would maintain the administrative burden associated with implementing and enforcing the area closure provisions promulgated through Amendment 17A. Under **Alternative 1 (No Action)**, extensive coordination between the enforcement divisions of NOAA Fisheries Service and the U.S. Coast Guard is required to enforce the 4,827 mi² closure. However, under **Alternative 1 (No Action)**, there would be no need to continually issue notices to remind fishermen when the area is closed since it would be closed year-round. Complexities associated with enforcement of the black sea bass pot, spearfishing gear, and transit exemptions would persist. An indirect effect of all the area closure alternatives being considered is possible effort shifting into different fisheries, which may increase processing volume for permit transfers, new permit applications, and could require subsequent long-term effort-limiting actions. The red snapper monitoring program, and all associated administrative elements, would continue to develop and operate as outlined in Amendment 17A regardless of whether or not the Council decides to modify the current snapper grouper area closure. Therefore, no new administrative impacts are expected to affect monitoring efforts already in place.

Alternatives 2-5 are all variations on the same basic area closure concept and would therefore, result in comparable impacts relative to administrative time, cost, and enforcement burdens. Because each of the snapper grouper area closure options under consideration have a seasonal and temporal component, public outreach materials would need to be developed to inform constituents of the revised area boundaries and time period. Regulations will also need to be modified to reflect new waypoints and closure time period(s) for the updated provision to be enforceable. Though the enforcement burden may not increase as a result of changing the size and or seasonality of the snapper grouper area closure, it could potentially make enforcement officers would not only be responsible for enforcing the boundary component of the area closure but also the temporal component, which may be difficult if some fishermen claim they did not receive prior notice the area was closed at a certain time.

Alternatives 6-10 would be likely to be more difficult to enforce and may require more extensive outreach to the fishing community because they include a built-in step-down mechanism for the size and duration of the area closure. Alternatives 6-10 are designed to account for the expected increase in red snapper biomass in the first year of rebuilding by stepping down the size and/or duration of the snapper grouper area closure in the following year. Therefore, constituents would need to be made aware of the next year's updated waypoints and the time during which the closure would be effective. Because snapper grouper fishery participants are not required to use vessel monitoring systems in the South Atlantic, there is no way to enforce or prosecute area closure violators through dockside methods. Most if not all enforcement would depend on at-sea intercepts.

Alternative 11 (Preferred) would permanently suspend implementation of the snapper grouper area closure approved in Amendment 17A. Therefore, only the red snapper prohibitions would remain in effect. The administrative impacts associated with this alternative are directly related to the duration of its implementation; however, when compared to all the other alternatives considered under this action, Alternative 11 (Preferred) would incur the least administrative impacts over the status quo. Under Alternative 11 (Preferred), no monitoring and enforcement of a closed area would be required. Therefore, no additional impact on enforcement efforts would be expected beyond the resources allocated to the enforcement of the red snapper prohibitions already in place.

4.5 Council Conclusions

The Acceptable Biological Catch (ABC) for red snapper is determined by the Council's rebuilding strategy of $F_{REBUILD}$ equal to 98% of $F_{30\% SPR}$. At their November 2010 meeting, the SSC recommended evaluating the rebuilding strategy for the short term (10 years) using a range of alternative headboat weights explored by the SEDAR 24 Review Panel as described in **Section 1.5**. Updated projections and $F_{REBUILD}$ values based on SSC recommendations, presented to the Council at the December 2010 meeting, suggested that a 70-75% reduction in red snapper mortality is required to end overfishing and meet the rebuilding strategy of 98% of $F_{30\%SPR}$. According to initial ICE model evaluations of the moratorium and area closure alternatives, reflecting estimated reductions in effort due to regulations in Amendments 16, 17A, and 17B, the moratorium alone provides a 66% reduction in mortality, which falls short of the 70 to 75% reduction required to meet the rebuilding strategy.

Examination of recreational data available from the Marine Recreational Fisheries Statistics Survey (MRFSS) program for January - August 2010 was used to evaluate predicted moratorium effectiveness. The data show a 33% decline in total trips in 2010 when compared to the 2007-2009 baseline period, which is consistent with fishermen's reports that effort has decreased significantly. In fact, reports from fishermen indicate a decline in trips targeting red snapper in the core north Florida area of up to 50%. Further examination of MRFSS data indicates that red snapper encounters also declined substantially, by as much as 80% in some sectors. Given the strong indications of large reductions in both effort and red snapper encounters for the first 8 months of 2010, the area evaluation model (ICE) was updated to incorporate the observed reductions in the private and charter recreational segments. These new results suggest that the moratorium may provide as much as a 77% reduction in total mortality, which is adequate to meet the Council's rebuilding strategy and to end overfishing. It is important to note that this conclusion is predicated upon substantial effort reductions, some of which are not induced by regulations but are instead widely attributed to other factor such as economic conditions, and therefore may not remain adequate if the downward trend in effort reverses.

The Snapper Grouper Advisory Panel (AP) did not discuss Regulatory Amendment 10 at their November 2010 meeting because the document became available on December 5, 2010. However, the AP received a presentation from Council staff on results of SEDAR 24 and had the

opportunity to ask questions regarding the assessment. An AP representative was present at the December 2010 Council meeting when the Council discussed Regulatory Amendment 10. The AP representative supported the Council's preferred alternative to remove the area closure established through Snapper Grouper Amendment 17A.

During the December 2010 Council meeting, the Southeast Fisheries Science Center (SEFSC) director stated that the analyses conducted for Regulatory Amendment 10 were fair and the Council's choice of management measures depended on their level of risk tolerance. The SEFSC stated that effort on red snapper appeared to be down at least 10% and declines are observed in reported takes of red snapper.

Despite the decline in effort, both the Council and the SEFSC received substantial anecdotal information from fishermen that would indicate there has not been a decline in catch per unit effort during the moratorium. This information would indicate that catches of red snapper are also on the decline since effort has decreased. While anecdotal information is not scientifically verified, the Council does consider it in their management decisions. Moreover, the SEFSC agreed that anecdotal information has been consistent throughout the moratorium.

In deciding how to proceed with this action, the Council considered the most recent evaluations on the effectiveness of the moratorium and the reductions in mortality required to end overfishing and meet the rebuilding strategy based upon the findings of the new benchmark assessment conducted through SEDAR 24. Furthermore, the Council acknowledged the significant economic downturn of recent years and the economic impacts resulting from fishery management actions. In choosing not to impose a snapper grouper fishing area closure, the Council acted to minimize economic and social impacts while meeting the mandate to end overfishing immediately. The Council also acknowledged the high level of uncertainty in both the assessment of current stock status and the evaluations of regulatory effectiveness, as well as the difficulty in predicting how participants will modify behavior in response to regulatory changes. While uncertainty is unavoidable and any action carries a level of risk, the Council concluded that the options were carefully analyzed and evaluated and that the Council could reasonably expect the red snapper moratorium to end overfishing of red snapper. In taking this action, the Council is responding to the mandate to end overfishing while also relying on adaptive management approaches since information on this and other fisheries will continue to be obtained and evaluated in the future, and management may need to be adjusted accordingly.

In addition, the Council reasoned that eliminating the closed area would help to restore faith and goodwill among fishermen in the Council process. The Council's goal is to try to build the red snapper fishery back up to a high level of sustainable harvest and not to put fishermen out of business. Goodwill will enhance voluntary compliance and enhance support for future management of this fishery. The latter will likely continue to be restrictive, however, so it will be important to get buy-in from the fishing community.

The SEFSC will monitor the effectiveness of the regulations in reducing fishing mortality prior to the next red snapper assessment scheduled for 2013. Based on preliminary data, the SEFSC's Fishery-Independent Survey (FIS) strongly corroborates the age distribution estimated in the SEDAR 24 assessment and observed in intensive age sampling conducted in 2009. All sources

indicate two strong year classes currently moving through the fishery. The FIS proposes to focus sampling on those two year classes so that changes in their abundance over time can be used to measure population mortality. This will provide a means to estimate mortality in the absence of directed harvest and enable evaluation of the management strategy and rebuilding progress. The Council requested that the SEFSC deliver an interim progress report on their FIS in early 2012 to be reviewed by the SSC and be available to the Council at their March 2012 meeting.

The Council concluded the proposed action best meets the objectives of the Snapper Grouper FMP, as amended, and ends overfishing of red snapper immediately.