FINAL
SNAPPER GROUPER AMENDMENT 16
(GAG AND VERMILION SNAPPER)
INCLUDING A FINAL ENVIRONMENTAL IMPACT STATEMENT, INITIAL REGULATORY FLEXIBILITY ANALYSIS, FINAL REGULATORY IMPACT REVIEW, AND FINAL SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT

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ABBREVIATIONS AND ACRONYMS

ABC	Allowable biological catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACL	Annual Catch Limits
ALS	NMFS Landings
APA	Administrative Procedures Act
ASMFC	Atlantic States Marine Fisheries Commission
B	A measure of stock biomass in either weight or other appropriate unit
B_{MSY}	The stock biomass expected to exist under equilibrium conditions when fishing at F_{MSY}
B_{OY}	The stock biomass expected to exist under equilibrium conditions when fishing at F_{OY}
B_{CURR}	The current stock biomass
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CPUE	Catch per unit effort
CRP	Cooperative Research Program
CZMA	Coastal Zone Management Act
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFH-HAPC	Essential Fish Habitat - Habitat Area of Particular Concern
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973
F	A measure of the instantaneous rate of fishing mortality
$F_{30\%SPR}$	Fishing mortality that will produce a static SPR = 30%.
$F_{45\%SPR}$	Fishing mortality that will produce a static SPR = 45%.
F_{CURR}	The current instantaneous rate of fishing mortality
F_{MSY}	The rate of fishing mortality expected to achieve MSY under equilibrium conditions and a corresponding biomass of B_{MSY}
F_{OY}	The rate of fishing mortality expected to achieve OY under equilibrium conditions and a corresponding biomass of B_{OY}
FEIS	Final Environmental Impact Statement
FL	Fork Length
FMP	Fishery management plan
FMU	Fishery management unit
FONSI	Finding of No Significant Impact
GFMC	Gulf of Mexico Fishery Management Council
IFQ	Individual fishing quota
M	Natural mortality rate
MARFIN	Marine Fisheries Initiative
MARMAP	Marine Resources Monitoring Assessment and Prediction Program
MBTA	Migratory Bird Treaty Act

MFMT	Maximum Fishing Mortality Threshold
MMPA	Marine Mammal Protection Act of 1972
MRFSS	Marine Recreational Fisheries Statistics Survey
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuary Act
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
OY	Optimum Yield
PQBM	Post Quota Bycatch Mortality
R	Recruitment
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE Report	Stock Assessment and Fishery Evaluation Report
SAMFC	South Atlantic Fishery Management Council
SDDP	Supplementary Discard Data Program
SEDAR	Southeast Data, Assessment, and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SFA	Sustainable Fisheries Act
SIA	Social Impact Assessment
SSC	Scientific and Statistical Committee
TAC	Total allowable catch
TL	Total length
T_{MIN}	The length of time in which a stock could rebuild to B_{MSY} in the absence of fishing mortality
USCG	U.S. Coast Guard

Note: Additional details are provided in **Appendix B**.

ECONOMIC TERMS

Producer Surplus

Producer surplus is the amount that producers benefit by selling at a market price that is higher than they would be willing to sell for. In Snapper Grouper Amendment 16, for the recreational (charter and for-hire) fishery, producer surplus was proxied by the net operating revenue of for-hire vessels, or more specifically by the net revenue to captain and crew per individual passenger trip. Values of $150 for charterboats and $67 for headboat per angler per trip were used. Another value obtained from Snapper Grouper Amendment 15A was the keep rate elasticity of 1.46, which specifies the percent change in target trip demand relative to the percent change in keep rate.

To estimate a change in producer surplus, the projected percent change in catch rate was first translated into a percent change for target trip demand via the keep rate elasticity. The percent change in target trip demand was then applied to target trips to arrive at the change in target trips. This latter value was subsequently multiplied by the corresponding producer surplus for charterboat and headboat to arrive at the change in charterboat and headboat producer surplus.

Consumer Surplus

Consumer surplus is the amount that consumers benefit by being able to purchase a product for a price that is less than they would be willing to pay. In the recreational fishery (private angler), consumer surplus is the satisfaction that anglers experience over and above their fishing costs in monetary terms. In Snapper Grouper Amendment 16, the value for consumer surplus was set at $3.03 per fish based on economic analyses completed. Another value obtained from Snapper Grouper Amendment 15A was the keep rate elasticity of 1.46, which specifies the percent change in target trip demand relative to the percent change in keep rate. Estimating the change in consumer surplus followed a similar procedure to that used in estimating producer surplus except that estimation proceeded in determining the change if demand for fish with the latter multiplied by consumer surplus per fish. To do this, catches in pounds were converted to catches in number of fish using the 2001-2006 gag average weight of 12.42 pounds for charterboats, 9.41 pounds for headboat, and 12.42 pounds for private boats (McGovern pers. comm. 2008).

Why not use angler expenditures or economic activity generated by anglers when trying to assess impacts? These consumer surplus valuation estimates should not be confused with angler expenditures or economic activity. While expenditures for a specific good or service may represent a proxy or lower bound of value (a person would not logically pay more for something than it was worth to them), they do not represent the net value (benefits minus cost), nor the change in value associated with a change in the fishing experience which is the number desired when trying to assess the impact of a specific regulation. However, angler expenditures benefit a number of sectors that provide goods and services for saltwater sport fishing and these are estimated in Section 3 ofSnapper Grouper Amendment 16.

AMENDMENT 16 TO THE FISHERY MANAGEMENT PLAN FOR THE SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION

INCLUDING A FINAL ENVIRONMENTAL IMPACT STATEMENT, INITIAL REGULATORY FLEXIBILITY ANALYSIS, FINAL REGULATORY IMPACT REVIEW, AND FINAL SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT

Proposed actions:	SFA parameters and measures to end overfishing of gag and vermilion snapper.
Lead agency:	FMP Amendment – South Atlantic Fishery Management Council EIS - NOAA Fisheries Service
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FEIS Comments received by:	DATE TO BE FILLED IN

RESPONSES TO COMMENTS

The following section satisfies NEPA's requirement for responding to comments on the draft and supplemental environmental impact statements (DEIS and SDEIS). NEPA requires that a federal agency shall respond to comments on the DEIS by one or more of the following means: (1) Modify an existing alternative; (2) develop and analyze a new alternative; (3) supplement, improve, or modify the analyses; (4) make factual corrections; or (5) explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position. In an effort to satisfy the fifth requirement mentioned above, the following section responds to written comments generated during the comment period for the Fishery Management Plan (FMP) and DEIS, in addition to those received as verbal testimony during the public hearings. Comments on the SDEIS have also been included.

The first section summarizes and responds to Environmental Protection Agency (EPA) comments on the DEIS, which received an LO (Lack of Objections) rating from that agency. The remaining sections summarize and respond to comments received from the Ocean Conservancy and the general public.

A. DEIS COMMENTS

I. EPA Comments

Comment 1: *The FEIS should discuss why the overfished status of vermilion snapper is unknown.*

Response: Section 3.2.2.2 discusses the 2007 update of the vermilion snapper stock assessment and indicates the high degree of uncertainty in recruitment and spawning stock biomass prevented the development of reliable biomass based benchmarks assessment, and this was found to be the case for the update assessment as well.

In Purpose and Need and Section 4.2.3.1, it states the overfished status of the vermilion snapper stock is unknown because the SSC does not have confidence in the biomass reference points from the Southeast Data Assessment and Review (SEDAR) assessment. It also indicates NMFS and the state of South Carolina began sampling available vermilion snapper otoliths to enable an age-based assessment and completed this task in early 2008. The new benchmark assessment is ongoing and will be completed in fall 2008.

Comment 2: *We assume that interim management (allocations, etc.) are being offered at this time since updated SEDAR fishery data are not yet gathered and analyzed. The EIS provides for RA management adjustment options (six alternatives) for vermilion snapper that range from 10-60% harvest reductions once the new data are evaluated. We suggest that the FEIS indicate when the new SEDAR data would be available and why it was determined that an EIS amendment was necessary at this time using older data and when species are technically not overfished or are of unknown status. Although we generally support early implementation of management methods for the benefit of rapid resource* *recovery, the FEIS should further discuss the basis of such interim management, how long it would take for updated data to be available, how critical the need for modification is at this time, and the reliability of the older dataset. It is also unclear if updated SEDAR data are being pursued for both species or only the vermilion snapper since RA alternatives are only provided for the snapper (Table A: pg. XXVI). It is therefore unclear why interim management measures are also provided for the gag grouper or why RA alternatives are not also provided for the grouper. The FEIS should discuss this.*

Response: The establishment of allocations by the Council is unrelated to the SEDAR stock assessment process. The Council's intent is to establish the interim allocations in Amendment 16 for gag and vermilion snapper until the implementation of more permanent allocations in the future. The Council has formed an Allocation Committee that will develop recommendations for future use by the Snapper Grouper Committee. The Allocation Committee will investigate ways to divide allowable future harvest among the commercial and recreational sectors for all species currently managed by the Council. Allocations within the recreational (e.g., for-hire and private) and commercial (e.g., hook-and-line, black sea bass pots, and longlines) sectors are also being considered.

The EIS provides for management adjustments by the Regional Administrator should the outcome of the new age-based vermilion snapper benchmark assessment indicate reductions in harvest are different from what was determined from the 2007 update to the length-based assessment. The assessment is ongoing, the review workshop will be conducted in October 2008, and the Council's SSC will review the assessment in December 2008. The purpose and need as well as Section 4.2.5.1 indicates the results of the new age-based assessment could be different from the previous length-based assessment but also states the Council is legally obligated to develop measures to end overfishing because it was notified in June 2007 vermilion snapper is experiencing overfishing. Allowing the Regional Administrator to make management adjustments is not an interim measure. It is an action intended to end overfishing of vermilion snapper if the results of the new benchmark assessment are different from the previous length-based update. Since efforts to reassess vermilion snapper are proceeding, NMFS would have the opportunity to review the new assessment results prior to implementing any vermilion snapper regulations proposed by the Council for Snapper Grouper Amendment 16 to address the June 2007 overfishing notification. In order to proceed with an amendment, while recognizing the new assessment may alter the type of actions required to end overfishing, the Council has developed scenarios that would allow the NMFS Regional Administrator (RA) to alter current management measures, as per the Council's instruction outlined in this amendment, if the assessment results require a harvest reduction different from that proposed in Snapper Grouper Amendment 16.

While the EIS indicates a new benchmark assessment is ongoing for vermilion snapper, it also indicates in several places in the document including Section 3.2.2.1 that the gag age-based, benchmark assessment has been completed and determined by the Council's SSC to be based upon the best available science. Therefore, similar management actions for gag from the Regional Administrator as proposed for vermilion snapper are not required in this amendment.

Comment 3. *It is unclear why allocations are based on 1999-2003 data when apparently (Alt. 1) more recent data (2004-2005) exist. We defer to NOAA and the Council regarding a preference for the 51% allocation to commercial sector and 49% allocation to the recreational sector versus the significantly different percentages offered in Alternatives 3 and 4.*

<u>Response:</u> The rationale for the Council's selection of allocation Alternative 2 is provided in Section 4.1.4.1. Alternative 2, which includes data from 1999-2003, results in the same allocation as would occur if 2004-2005 (Alternative 1) were used and therefore reflects proportions taken most recently by the commercial and recreational sectors. Preferred Alternative 2 (51% commercial/49% recreational) is the closest to the September 2007 Snapper Grouper Advisory Panel's (AP) recommendation for a 50/50 allocation. Alternative 1 is based on recent 2004-2005 data but it would not specify a commercial or recreational allocation for gag. If an allocation were not specified then it would not be possible to identify the allowable catch in the recreational sector.

Comment 4. *Gag Preferred Alternative 5a (now Preferred Alternative 7a, Recreational Measures) This alternative would "…exclude the captain and crew of for-hire vessels from possessing a bag limit for groupers." The FEIS should clarify if "excluding" captain and crew from possessing a bag limit means that they are excluded from catching any gag at all or they are excluded from having any bag limit and therefore could catch as many gag as desired. EPA would favor 5a over 5b (now Alternative 7b) (if the 36% vs. 42% harvest reduction, respectively, is still adequate for rapid species recovery) since only a reduction in catch (bag limit) would be instituted for recreational fishers rather than a potentially harsher time closure (December) of no fishing at all. Preference input from the recreational sector would be useful in choosing between 5a and 5b, since both management measures have similar restoration results.*

<u>Response:</u> The proposed action cannot prevent captain and crew from engaging in fishing activities. Since grouper species are part of a multi-species fishery, they would likely be caught incidentally if the intent of a fisherman, captain, or crew were to target other species. Therefore, all this action can do is prevent captain and crew from retaining the bag limit. The language in the FEIS has been clarified to indicate captain and crew could still catch grouper species but would not be allowed to retain the bag limit.

While Alternative 7b would have a greater biological benefit for grouper species, the Council felt adding December to the proposed January through April closure for the shallow water grouper was not necessary. The reduction in harvest obtained through a four-month closure and reduced bag limit would not only end overfishing but also achieve the yield associated with OY for the recreational sector. Therefore, Alternative 5b would provide a reduction in harvest greater than what is needed to achieve OY and could have greater negative social and economic negative impacts that would be necessary to improve the biological status of the stock.

Comment 5. *Preferred Alternative 2 (Directed Commercial Quota). Use of the above interim allocations year-round versus further subdivision into seasons (Alternatives 3a [preferred], 3b and 3c) should be further discussed in the FEIS. EPA will defer to NOAA and the Council regarding the benefits of the various offered timeframes; however, inclusion of the total reductions in harvest by alternative would be beneficial in the public's gauging the effects of these options. We also suggest that use of seasonal allocations would be more difficult to enforce. If used, however, we agree that any leftover allocation should not rollover into the next calendar year, but rather remain unharvested to further benefit stock recovery.*

<u>Response:</u> The rational for dividing the quota into two time periods is provided in Section 4.2.5.1. The Council is concerned that under Alternative 2, which does not divide the quota seasonally, the quota is very small and fishermen in southern areas with better weather during winter could have an advantage in catching the quota early in the fishing year. The Council felt alternatives dividing the quota into two time periods would allow for a greater opportunity among all areas to catch vermilion snapper. Furthermore, dividing the quota into two seasons would allow fishermen to target vermilion snapper in late summer when historical catches of vermilion snapper have been the greatest.

Comment 6. *Alternative 4 (Bag/Size Limits). Changes in bag and size limits are often useful fishery management measures to recover a species. For deepwater reef fishes like vermilion snapper, however, regulatory increases in minimum size could be counterproductive if "shorts" are caught and brought to the surface and then discarded in a physiological state of shock from rapid pressure changes. Use of reduced bag limits for fish of the current minimum length may have more merit if many regulatory discards would die anyway after release (this may still occur despite the proposed bycatch options below). However, we appreciate that Alternative 4 presents the percentages of total harvest reductions for each sub-alternative. Editorially, in the Alternative 1 description, we suggest that fish lengths be specified as total length (TL) or fork length (FL). We assume the metric is "TL" as in a 12 inch TL minimum size.*

<u>Response:</u> The Council's preferred Alternative 4 would not increase the 12" total length minimum size limit. This has been clarified in the alternative. There was some concern from the Council and the public that an increased size limit could increase the magnitude of discards if a large portion of vermilion snapper taken by recreational fishermen are less than 12" total length. Amendment 13C increased the recreational size limit for vermilion snapper from 11" total length to 12" total lengths. Examination of Waves 1 through 5 (January through October) during 2007 relative to 2006 reveals an increase in the number of discards during Waves 3, 4, and 5 (March through August) when most of the vermilion snapper are caught. Fish length has been specified as total length throughout the text to clarify that TL means total length..

Comment 7*. Alternative 2c (Preferred) EPA strongly supports the implementation and enforcement of techniques to reduce bycatch of non-target species (or immature target species) for both the commercial and recreational sectors. We therefore concur that Alternative 2c was identified as a preferred alternative. We particularly favor the use*

of circle hooks, venting techniques, and dehooking tools (preferably long-handled dehooking tools that allow some dehooking in the water). If not already the case, we suggest that the circle hooks also be sized to be larger than the mouth size of sub-minimum length fish to reduce the number of regulatory discards (i.e., illegal-sized fish could therefore not swallow the bait, J, or, circle hook). We note, however, that circle hooks may not be as popular with recreational fishers since anglers cannot set the hook like a J-hook (i.e., the fish would have to essentially catch itself by swallowing the bait and attempting to escape). The FEIS might provide an estimate as to how many gag grouper and vermilion snapper are fished with live bait (circle hooks) as opposed to artificial bait (J-hooks) to provide a perspective as to the potential for success by using circle hooks to reduce bycatch. Also, are fishers aware of venting techniques and, if not, how would they become skilled (programs, pamphlets, website, demos)?

<u>Response:</u> At their June 2008 meeting, the Council elected to change their preferred alternative for this action by requiring venting tools, dehooking devices, and encourage rather than require the use of circle hooks. The SSC passed a motion requesting that this requirement be removed from the amendment because of poor documentation of the benefits relative to those species outlined in Snapper Grouper Amendment 16. It was suggested by members of the SSC that this particular management measure be considered as a stand-alone amendment.
Some literature exists suggesting there is a benefit but for other species, the effect of using circle hooks is unknown. Websites providing information on venting techniques and devices have been added to the FEIS.

II. The Ocean Conservancy Comments

Comment 8: *The Ocean Conservancy supports: the Council's preferred alternatives for setting the MSY and OY status determination criteria for gag (Alternatives 2 and 2b) and vermilion snapper (Alternatives 2 and 2b) as defined by SEDAR; the Council's preferred alternatives for setting TAC for gag (Alternative 2) and vermilion snapper (Alternative 2) at the F(oy) level; the Council's preferred alternatives for management measures to achieve the commercial portion of the TAC for gag (Alternative 3) and vermilion snapper (Alternative 2) and to implement a commercial and recreational gag spawning closure (Alternative 2); and the Council's preferred alternative to require gear to reduce bycatch. We strongly oppose raising the size limit of vermilion snapper any further. Specific attention must be paid to using size limits as a management tool.*

<u>Response</u>: The Council's preferred Alternative 4 would not increase the 12" total length minimum size limit. There was some concern from the Council and the public that an increased size limit could increase the magnitude of discards since a significant portion of vermilion snapper can be assumed to be less than 12" total length.

III. Other Comments

Comment 9: *One group indicated the harvest reduction from Amendment 16 could cause significant hardship on North Carolina fishermen. Amendment 16 references stock assessments that indicate overfishing is occurring for vermilion snapper and gag. These* *assessments have undergone extensive review concluding they are based on the best available science and are suitable for management. However, the group remains concerned that due to data limitations the assessments may not provide an accurate estimation of stock status.*

Response: Status determinations for gag and vermilion snapper were derived from the Southeast Data, Assessment, and Review (SEDAR) process. The gag stock assessment determined the species was experiencing overfishing but was not overfished. The update to the length-based assessment for vermilion snapper indicated the stock was experiencing overfishing but it could not be determined if the stock was overfished due to the high degree of uncertainty in recruitment and spawning stock biomass.

The SSC agreed with the results of the gag assessment at its June 2008 meeting and recommended harvest levels based on the yield associated with OY in accordance with the new mandates specified by the reauthorized Magnuson-Stevens Fishery Conservation and Management Act, which require Annual Catch Limits be set at a level to ensure overfishing does not occur. The SSC feels the fishing mortality estimates from the vermilion snapper assessment are reliable but does not have confidence in the biomass reference points from the SEDAR assessment. The SSC also recommended harvest levels for vermilion snapper based on the yield at OY. The Council was notified in June 2007 that gag and vermilion snapper were experiencing overfishing. Therefore, the Council is legally required to develop management measures to end overfishing of these species.

The SEDAR process involves a series of three workshops designed to ensure each stock assessment reflects the best available scientific information. The findings and conclusions of each SEDAR workshop are documented in a series of reports, which are ultimately reviewed and discussed by the Council and their SSC. SEDAR participants, Council advisory panels, the Council, and NOAA Fisheries Service staff reviewed and considered these and other concerns about the adequacy of the data. The Council's Snapper Grouper Committee and Council acknowledged, while stock assessment findings are uncertain, there is no reason to assume such uncertainty leads to unrealistically pessimistic conclusions about stock status. Rather, the stocks could be in worse shape than indicated by the stock assessment. Therefore, uncertainty should not be used as a reason to avoid taking action.

This issue with data was a subject of a recent civil action, NORTH CAROLINA FISHERIES ASSOCIATION, INC., *et al.* v. CARLOS GUTIERREZ, Secretary, United States Department of Commerce, where the plaintiffs claimed actions taken in Amendment 13C was inconsistent with National Standard 2, which requires that all FMPs and plan amendments "be based upon the best scientific information available". The Judge concluded "the Secretary was not obliged to 'sit idly by' when faced with overfishing and overfished stocks simply because the data available to him may have been less than perfect. In sum, the Secretary's decision to act on the basis of the existing information easily meets the standard of rationality required of him." The NOAA Fisheries Service's Southeast Fisheries Science Center (SEFSC) reviewed and certified

Amendment 13C (SAFMC 2006) and its supporting analyses as being based on the best available scientific information in April 2006. Finally, the amendment also was subject to a pre-dissemination review in May 2006 in compliance with the Information Quality Act (IQA). The Council's SSC has determined Amendment 16 is based on the best available science. Amendment 16 is being reviewed by the SEFSC and will be subject to a pre-dissemination review in compliance with the IQA.

Recognizing the need for a new benchmark assessment, NMFS and the state of South Carolina began sampling available vermilion snapper otoliths to enable an age-based assessment. This was completed in early 2008. A new benchmark assessment is ongoing and will be completed in fall 2008. Should the new assessment indicate less restrictive harvest reductions are needed to end overfishing, Amendment 16 includes an action that allows the Regional Administrator to make the necessary management adjustments.

Comment 10. *One group suggested North Carolina fishermen would be best served by state by state quotas for gag or if this was not possible, then regional quotas.*

Response: The Council considered an alternative that would allocate 63.3% of the commercial quota to North and South Carolina, and 36.7% to Georgia and Florida. The rationale for having regional quotas is fishermen off Florida could have an advantage and catch part of the quota early in the year when bad weather would prevent fishermen from catching gag off North Carolina and South Carolina. However, the Council felt regional quotas were not needed if a January through April seasonal closure was implemented since by May the weather would allow fishing in all regions. The Council examined monthly gag landings and found the percentage of annual gag landings among states was similar after the proposed January through April spawning season closure would take place.

Comment 11. Form letters (e-mail) were submitted by 131 individuals who suggested the no-action alternatives for gag and vermilion snapper be adopted to retain the current regulations. The individuals were opposed to the proposed January through April closure for shallow water grouper and reduction in the bag limits suggesting there were no reliable recreational data to support this position. They supported regional management for gag, with Florida as a separate management area. A suggestion was made to ban all longlining and restrict shrimping activities to depths greater than 30 fathoms.

Response: The Council was notified in June 2007 that gag and vermilion snapper were experiencing overfishing. The Magnuson-Stevens Fishery Conservation and Management Act requires the Council to prepare a plan amendment or proposed regulations to end overfishing within one year. Little reduction in harvest of gag is provided by reducing the 2 fish bag limit to 1 fish per trip and reducing the 5 fish grouper aggregate to 3 fish per trip. Additional reductions in harvest could be provided by a seasonal closure.

Gag and other shallow water grouper species are vulnerable to fishing pressure because they change sex, most are long-lived, and many form spawning aggregations where the largest and oldest individuals can be selectively removed by fishing gear. The Council felt a January through April seasonal closure was appropriate for both the commercial and recreational sectors since gag and other shallow water groupers species including black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney are known to spawn during January-April. In addition gag, scamp, and black grouper aggregate annually in the same locations to spawn during January through April, making them particularly available for fishermen to target and to remove in large numbers. The Council concluded that a January through April spawning season closure for gag and other shallow water groupers could have positive biological effects including protecting spawning aggregations, increasing the percentage of males, enhancing reproductive success, and increasing the magnitude of recruitment.

The Council considered an alternative that would allocate 63.3% of the commercial quota to North and South Carolina, and 36.7% to Georgia and Florida. The Council examined monthly gag landings and found the percentage of annual gag landings among states was similar after the proposed January through April spawning season closure would take place. The Council did not consider regional allocations for the recreational sector since there are no actions included in the amendment that would close harvest of gag if the recreational allocation was met.

Comment 12: *Four individuals supported the use of venting tools and dehooking devices, but were opposed to requiring the use of circle hooks. Some individuals indicated circle hooks could increase mortality of undersized fishes, others cited concerns with enforcing the regulations, and several individuals stated some species such as yellowtail snapper, which are targeted with J hooks would no longer be available if fishermen could only use circle hooks.*

<u>Response:</u> At their June 2008 meeting, the Council changed their preferred alternative in response to concerns from the SSC and AP. The SSC felt that the effect of circles hooks on all 73 species within the fishery management unit should be analyzed in a separate amendment. The AP was concerned the use of circle hooks would reduce harvest of yellowtail snapper, a species that is neither overfished nor undergoing overfishing.

Some literature exists suggesting there is a benefit for some species but for other species, the effect of using circle hooks is unknown. Websites providing information on venting techniques and devices have been added to the FEIS.

Comment 13: *Three individuals did not support any seasonal closure for gag but indicated the bag limit for gag and other groupers should be reduced instead.*

<u>Response:</u> Little reduction in harvest of gag is provided by reducing the 2 fish bag limit to 1 fish per trip and reducing the 5 fish grouper aggregate to 3 fish per trip. The Council did not support an increase in the size limit of gag and other shallow water groupers because the discard rate is already high and an increase in the size limit would likely increase the discard rate and the number of fish thrown back dead. The Council

supported a January through April closure for gag and other shallow water grouper because this is a known spawning period for these species. Furthermore, many of the grouper species form spawning aggregations at known locations increasing their vulnerability to fishing pressure.

Comment 14: *One individual did not support the alternative for vermilion snapper that would allocate 68 percent of the TAC to the commercial sector and 32% to the recreational sector. The individual suggested a 50/50 allocation be considered instead.*

Response: The allocation for vermilion snapper is based on historical landings. The AP and Council examined the complete time series and noticed there was little difference in the percentage of commercial and recreational landings when any time series was examined. The AP and Council concluded the longest time series of landings (Alternative 2) was the best approach for estimating allocations. In addition, the Council discussed whether an additional alternative was necessary but given the similar distribution of commercial and recreational landings over the years, the Council concluded two alternatives were appropriate for this action. Using historical landings, there was no basis for an alternative that would allocate 50% of the TAC to the commercial and recreational sectors.

Comment 15: *Five individuals indicated no action of any kind should be taken to reduce harvest of gag or vermilion snapper for the recreational sector. Some of these individuals indicated increased fuel costs would likely decrease effort. Another individual supported the actions proposed for gag including the four month closure and reduction in the bag limit. However, the individual suggested no action be taken on vermilion snapper to reduce harvest. Another individual suggested that all needed reduction in harvest of vermilion snapper should be taken from the commercial sector and no recreational limits be placed on vermilion snapper because recreational fishing is not the real source of fishing pressure.*

Response: The Council was notified in June 2007 that gag and vermilion snapper were experiencing overfishing. The Magnuson-Stevens Fishery Conservation and Management Act legally requires the Council to prepare a plan amendment or proposed regulations to end overfishing within one year. This amendment intends to end overfishing of gag and vermilion snapper. In addition, actions in Snapper Grouper Amendment 16 would reduce harvest of shallow water grouper species which are experiencing overfishing (red grouper and black grouper) or whose status is unknown. A new benchmark assessment is being conducted for vermilion snapper and will be completed in October 2008. Should the assessment indicate less restrictive management measures are needed, Amendment 16 includes an action that would allow the Regional Administrator to make the necessary management adjustments. The Council continues to investigate the impacts of rising fuel prices and its effect on fishing effort.

Vermilion snapper are targeted by commercial and recreational fishermen. Management measures imposed by the Council are intended to reduce harvest in proportion to the total landings from each sector.

Comment 16: *One individual suggested four month shallow water grouper spawning season should be adopted for the commercial and recreational sectors but the size limit should be increased to 28" rather than decrease the bag limit. The same individual also suggested the four month closure should allow for spearfishermen since they can select different grouper species.*

Response: The Council did not support an increase in the size limit of gag and other shallow water groupers because the discard rate is already high and an increase in the size limit would likely increase the discard rate and the number of fish thrown back dead. The Council supported a January through April closure for gag and other shallow water grouper because this is a known spawning period for these species. Many of the grouper species form spawning aggregations at known locations increasing their vulnerability to fishing pressure. Furthermore, gag, red grouper, and black grouper are experiencing overfishing and the overfishing status of most of the other shallow water grouper species is unknown. Therefore, the Council felt a spawning season closure for all shallow water grouper species was warranted.

Comment 17: *One individual indicated that groupers have become scarce and regulations are necessary. However, the individual was concerned about the effect regulations for vermilion snapper would have on the headboat industry. The individual requested that a boat limit be considered for vermilion snapper rather than seasonal closure and reductions in the bag limit.*

Response: The Council considered but rejected alternatives for boat limits. The Council believes that a boat limit could reduce a fishermen's satisfaction received from a fishing trip. Some people might feel rushed to catch fish before the aggregate limit is met. Furthermore, this alternative could be considered unfair to some individuals on larger party boats if some fishers were able to retain a larger portion of the boat limit compared to others.

Comment 18: *Two individuals felt the management actions for grouper species were not appropriate for Southern Florida since gag are not caught in large numbers relative to other shallow water grouper species.*

Response: At their September 2008 meeting, the Council discussed this alternative and did not select it as their preferred. The Council was concerned the action would result in a very small harvest reduction for shallow water grouper species in Monroe County, compared to areas north of Monroe County. The Council was also concerned fishing pressure in Monroe County could increase due to fishermen from areas north moving into Monroe County during January through April when harvest of shallow water grouper species excluding gag, would be allowed in Monroe County but not the rest of the South Atlantic.

B. SDEIS COMMENTS
At the June 2008 Council meeting, the Snapper Grouper Advisory Panel suggested three additional management alternatives for gag and one for the vermilion snapper. The Council reviewed these alternatives and felt they should be analyzed. A supplement to the DEIS (SDEIS) for Snapper Grouper Amendment 16 was published on August 1, 2008, with a comment period that ended on September 15, 2008. Many of the comments received addressed other actions in Amendment 16 or issues unrelated to Amendment 16. The Council reviewed all comments received at their September 2008 meeting. The response to comments below address comments specific to new alternatives analyzed in the SDEIS.

I. EPA Comments
Comment 1: *It is therefore unclear why the DEIS was issued before the Council's June 2008 meeting if new alternatives were still plausible. While issuance of the SDEIS was appropriate under the circumstances, it would seem that a slightly later issuance of a more inclusive DEIS could have avoided the need to issue the present SDEIS.*

Response: The Notice of Availability (NOA) for the DEIS was published on April 25, 2008, with a comment period ending June 9, 2008. The Council's Snapper Grouper Advisory Panel (AP) met during the week of June 9 – 13, 2008 and suggested additional alternatives to end overfishing of gag and vermilion snapper not previously considered by the Council. The Council indicated the AP's alternatives were reasonable and should be analyzed. Therefore, a supplement to the DEIS was produced providing biological, social, and economic analysis for new alternatives not considered in the DEIS.

Comment 2: *Also relative to the issuance of the SDEIS, it is unclear if updated SEDAR fishery data were used in the SDEIS (as referenced in our DEIS comments, the DEIS was issued before pending SEDAR data updates for vermilion snapper were compiled). It is unclear why the DEIS was issued before the pending statistics were available for vermilion snapper, and furthermore unclear why its SDEIS would be also so-issued. The FEIS should discuss when the pending SEDAR data can be expected and the rationale for the current issuance of the EIS with interim vermilion snapper data before collection and compilation of the updated data.*

Response: The SDEIS did not include updated information from the new benchmark assessment for vermilion snapper. The assessment is ongoing and will be completed in October 2008. The Council's SSC will review the assessment in December 2008. The Council was notified in June 2007 that vermilion snapper is experiencing overfishing. As a result, the Council is legally obligated to develop a plan to end overfishing within one year of being notified. In order to meet its legal obligations, while recognizing the new assessment may alter the type of actions required to end overfishing, the Council has developed specific scenarios in Snapper Grouper Amendment 16 that would allow the NMFS Regional Administrator to alter current management measures, as per the Council's instruction outlined in this amendment, should the new benchmark assessment results require a harvest reduction different from that proposed in Amendment 16.

Comment 3: *In regard to the alternatives, we appreciate that the SDEIS highlights modifications made to the alternatives. That is, modifications such as the addition of a new alternative or change in the Council's preferred alternative were generally identified. However, there were exceptions for the gag alternatives. Page 9 indicates that Alternative 5 "…is old Alternative 4 renumbered." However, the presented Alternative 4, which is presumably new Alternative 4, was not identified as such. In addition, there are now two alternatives numbered as "Alternative 4" on page 8, one identified as preferred and one not. The Final EIS (FEIS) should discuss this.*

Response: With the addition of the two new alternatives proposed in the SDEIS for gag, it became necessary to renumber all the alternatives. Preferred Alternative 3 from the DEIS became Preferred Alternative 4 (Directed Commercial Quota) after the new alternatives were added. To be consistent with what was done elsewhere, it should have stated "This is old Alternative 3 renumbered". Alternative 5, which would divide the commercial quota into two regions was the old Alternative 4 from the DEIS. This has been clarified in the FEIS in Sections 2.1.1.4 and 4.1.5.

Comment 4: *It appears that the only change in the Council's preferred alternatives is found in Section 2.1.3 (pg. 15). The Council no longer prefers Alternative 2c under Alternative 2 (which requires "(a) use of venting and dehooking tools and (2) as non-offset non-stainless steel circles hooks when using natural baits to fish for snapper grouper species" for the three listed subalternatives for commercial (2a), recreational (2b) or both commercial and recreational (2c) snapper grouper fisheries. Instead, the Council now prefers new Alternative 3, which does not require the use of circle hooks. EPA suggests that the required use of circle hooks where practical – at least for commercial snapper grouper fisheries – be further considered. EPA supports the use of circle hooks over traditional J hooks whenever feasible to reduce mortalities of bycatch, including discards of target species (however, we understand that the use of circle hooks may be less "entertaining" for recreational fishers since the fish – as opposed to the fisher – must set a circle hook). EPA provided similar supportive comments for the use of circle hooks in our NEPA letter on the DEIS (see comments for DEIS Alternative 2c).*

Response: The only change to the preferred alternatives in Snapper Grouper Amendment 16 at their June 2008 meeting was adopting Alternative 3, which would require dehooking devices and venting tools but not circle hooks. At their June 2008 meeting, the SSC passed a motion requesting the circle hook requirement be removed from the amendment because of poor documentation of the benefits relative to species in Amendment 16 and the snapper grouper fishery management unit. The SSC felt reductions in harvest and bycatch mortality would need to be quantified for each of the 73 species in the snapper grouper fishery management unit and the economic effects for all species in the unit would need to be analyzed. The effects of circle hooks have been examined for only a few snapper grouper species. Therefore, it was suggested by members of the SSC that this particular management measure be considered in a stand-alone amendment. The Snapper Grouper AP also requested this action be removed from Amendment 16 because they felt a requirement for circle hooks could reduce the ability to catch yellowtail snapper, a species that is neither overfished or experiencing overfishing. The SSC and Snapper Grouper AP felt requiring the use of venting tools and dehooking devices would likely have positive impacts on reducing mortality of discarded snapper grouper species. Therefore, the change in the preferred alternative to require venting tools and dehooking devices but not circle hooks was based on recommendations from the AP and SSC.

II. Other Comments

Comment 5: *One individual indicated that the alternative closing gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney during June through December would not protect spawning aggregations and a number of individuals indicated the alternative would have negative economic effects on fishermen in Monroe County, FL.*

Response: The Council did not select this alternative as their preferred in Snapper Grouper Amendment 16 because it would result in different seasonal closures for gag and other shallow
water groupers for areas north of Monroe County than those proposed for Monroe County. If this alternative had been selected when shallow water grouper are closed in Monroe County during June through December, fishermen might move north to target grouper species. Similarly, fishermen from areas north might move into Monroe County during January through April when harvest of shallow water grouper species excluding gag, would be allowed in Monroe County but not the rest of the South Atlantic. The degree to which effort would shift is unknown, but it could result in some localized depletion. Furthermore, the Council felt the alternative would not protect shallow water grouper species in spawning condition, many of which are known to form spawning aggregations during January through April.

Comment 6: *One individual stated red grouper and black grouper should not be closed in Monroe County, FL because there are few data to indicate stock status and no SEDAR stock assessments have been conducted on these species.*

Response: The Status of Stocks Report to Congress indicates red grouper and black grouper have been experiencing overfishing since 1998. The Council recognizes there is no recent information to indicate stock status; however, given that the reauthorized Magnuson-Stevens Act requires the Council to end overfishing of all species, the Council felt it was appropriate to take actions to reduce harvest of these species. However, the Council felt there was a need to protect shallow water grouper species in spawning condition including black grouper and red grouper. In addition, the Council felt spawning aggregations, which form during January through April for many shallow water grouper species, should be protected. Black grouper and red grouper are scheduled for SEDAR stock assessments in 2009/2010.

The intent of Snapper Grouper Amendment 16 is to improve the status of all shallow water grouper species, some of which are taken incidentally when targeting gag and vermilion snapper. Like gag, the other shallow water grouper species including black grouper and red grouper are vulnerable to overfishing because they change sex, are long lived, and some species (e.g., gag, black grouper, scamp, red hind, and tiger grouper) form spawning aggregations at locations known to fishermen (Section 3.2.1). Therefore, management measures proposed for gag, red grouper, and black grouper are expected to have positive biological effects including protecting spawning aggregations, increasing the percentage of males, enhancing reproductive success, and increasing the magnitude of recruitment.

Comment 7: *Several individuals stated there should be different management measures for Monroe County, FL than for other portions of the South Atlantic because so few gag are caught in Monroe County. One alternative suggested by these individuals would close gag all year in Monroe County, FL but allow harvest of all other shallow water grouper species including black grouper and red grouper. One of the individuals who suggested this alternative also pointed out the majority of grouper species in the Florida Keys are spawning during March, April, and May and are aggregated in shallow water where they are highly susceptible to spearfishing.*

Response: In September 2007, the Snapper Grouper Advisory Panel (AP) stated that 15 to 18 years ago gag were caught in the Florida Keys and were targeted during their spawning season in January, February, and March. The AP indicated there have been serious reductions in the numbers and size of gag in the Florida Keys and suggested more stringent management measures were needed in the area. A four month closure for all shallow water grouper species in the Florida Keys and areas north would help protect gag as well as red grouper and black grouper. Gag is part of a multispecies fishery. Therefore, some bycatch of gag would be expected during a seasonal closure when fishermen target co-occurring species. However, since the Council's preferred alternative would close all shallow water groupers during January through April, bycatch of gag, red grouper, and black grouper would likely be decreased since fishermen would not be targeting co-occurring grouper species.

The Council discussed the suggestion of closing gag all year but allowing harvest of other shallow water grouper species in Monroe County, FL. The Council was concerned the action would not protect black grouper and red grouper during their spawning season as well as spawning aggregations of black grouper and other shallow water grouper species. Furthermore, the action would result in a very small harvest reduction for shallow water grouper species in Monroe County, compared to areas north of Monroe County. The Council was also concerned fishing pressure in Monroe County could increase due to fishermen from areas north moving into Monroe County during January through April when harvest of shallow water grouper species excluding gag, would be allowed in Monroe County but not the rest of the South Atlantic.

Comment 8: *One individual suggested an alternative for shallow water grouper that would establish a May 1 start date for the fishing year and a 1,000 lb gutted weight trip limit for gag for the commercial sector but would allow a 1 fish bag limit for shallow water grouper species during February through April.*

Response: The Snapper Grouper AP suggested two alternatives with a 1,000 lb gutted weight trip limit for gag that were analyzed in the SDEIS. One alternative would maintain the January 1 start date and close all shallow water grouper during March and April. The second alternative would establish a May 1 start date and close shallow water grouper species during February through April. The Council and the AP felt the same months should be closed for both sectors to protect grouper species in spawning condition and did not consider an alternative that would close the commercial sector and have a reduced bag limit for the recreational sector as suggested by the commenter.

The January 1 start date with a February-April closure was suggested by the AP because there were some fishermen who indicated gag are available on a seasonal basis during January in South Florida. Tagging work indicate gag can move large distances from South Carolina and North Carolina to areas off of South Florida presumably to spawn. Therefore, a seasonal appearance of gag off of South Florida could be related to spawning activity. The Council did not support this alternative because they felt gag, black grouper, red grouper, and other shallow water grouper species could be vulnerable to capture in large numbers, particularly if they are in aggregations. Similarly, the Council did not support the alternative with the May 1 start date and March-April closure because if the quota for gag was not met, fishing would be occurring when gag and other shallow water grouper species are in spawning condition and aggregated during January and February.

Comment 9: *One set of comments from 156 individuals provided statements on all the alternatives for shallow water grouper species proposed in Amendment 16. The individuals supported the new alternatives from the SDEIS, which would establish a 1,000 pound commercial trip limit and close shallow water grouper species when the gag quota is met. The individuals opposed the alternative for Monroe County, which would close gag all year and all shallow water grouper species during June through December. Personalized comments on the form letters cited inadequate data on recreational landings to support any action in the recreational sector. In addition, a reduction in fishing effort due to gas prices, habitat destruction caused by commercial sector, overexploitation by commercial sector, unfair regulation on the recreational sector, and rebounding fish populations were additional justification for their comments.*

Response: The Council did not select the Monroe County alternative as their preferred in Snapper Grouper Amendment 16 because it would result in different seasonal closures for gag and other shallow water groupers for areas north of Monroe County than those proposed for Monroe County. Furthermore, the Council was concerned the alternative would not protect black grouper, red grouper, and other shallow water grouper species during their spawning season in Monroe County. The Council examined trends in fuel prices and effort at their June and September 2008 meetings. While fuel prices were increasing, effort did not appear to be declining through the end of 2007. The Council stated declines in effort might not yet be reflected in the data and could become apparent in 2008.

Recreational data for stock assessments were from the NMFS Headboat survey and the Marine Recreational Fisheries Statistical Survey (MRFSS). These data were reviewed through the SEDAR process that involves a series of three workshops designed to ensure each stock assessment reflects the best available scientific information. The findings and conclusions of each SEDAR workshop are documented in a series of reports, which are ultimately reviewed and discussed by the Council and their SSC. SEDAR participants, Council Advisory Panels, the Council, and NOAA Fisheries Service staff reviewed and considered these and other concerns about the adequacy of the data.

The Council's SSC reviewed the stock assessments and data supporting the assessment. The SSC deemed the results of the gag assessment at its June 2008 meeting to be based on the best available science and recommended harvest levels at the yield associated with OY in accordance with the new mandates specified by the reauthorized Magnuson-Stevens Fishery Conservation and Management Act, which require Annual Catch Limits be set at a level to ensure overfishing does not occur. The assessment showed an improved condition of the gag stock relative to the mid 1990s but indicated overfishing was occurring and the stock was approaching an overfished condition. The SSC also recommended harvest levels for vermilion snapper based on the yield at OY. The Council was notified in June 2007 that gag and vermilion snapper were experiencing overfishing. Therefore, the Council is legally required to develop management measures to end overfishing of these species. The Council's SSC has determined Snapper Grouper Amendment 16 is based on the best available science. Amendment 16 is being reviewed by the SEFSC and will be subject to a pre-dissemination review in compliance with the Information Quality Act.

Alternatives proposed by the Council are intended to reduce harvest by an equal amount in the recreational and commercial sector and prevent unfair regulation for either sector. For example the preferred alternatives for gag and the shallow water groupers would impose a four month closure for both sectors and a gag quota for the commercial sector, which would close all shallow water grouper species when the quota was met. There would also be a reduction in the bag limit in the recreational sector.

The amount of fishing pressure by either the commercial or recreational sector varies by species. In recent years approximately 50% of gag was harvested by both the commercial and recreational sectors. However, prior to the imposition of the March-April spawning season closure for the gag commercial sector in 1998, gag harvest was dominated by the commercial sector. Gag landings in the commercial sector have been stable since 1998 while landings in the recreational sector have increased.

The Council has proposed a number of measures over the years to lessen the impacts of fishing gear on habitat. Some these actions include: Prohibiting trawl gear to harvest fishes; gear limitations on the use of traps and powerhead; prohibiting the use of poisons; prohibiting fishing within the *Oculina* closed area; and restricting fishing with bottom longline gear to depths greater than 50 fathoms and north of St. Lucie Inlet. The Secretary of Commerce has approved the Council's Amendment 14 to the Snapper Grouper FMP, which would protect the species and habitat contained within eight MPAs in the South Atlantic. The Council is also developing a Comprehensive Ecosystem-Based Amendment, which would establish deepwater Habitat Areas of Particular Concern (HAPCs).

Comment 10: *A set of comments provided by 13 individuals indicated they did not support the alternatives proposed in Amendment 16, including the new alternative from the SDEIS, which would close gag all year and all shallow water grouper species during June through December. The lack of support for alternatives focused on the reliability of the gag assessment including the use of MRFSS survey data and an estimate of the natural mortality believed to be too low. They further indicated data from the assessment are old and effort has likely decreased to the point that overfishing is no longer occurring.*

Response: Status determinations for gag were derived from the SEDAR process. All data including MRFSS and estimates of natural mortality rates were reviewed through the SEDAR process, which involves a series of three workshops designed to ensure each stock assessment reflects the best available scientific information. The findings and conclusions of each SEDAR workshop are documented in a series of reports, which are ultimately reviewed and discussed by the Council and their SSC. SEDAR participants, Council Advisory Panels, the Council, and NOAA Fisheries Service staff reviewed and considered concerns about the adequacy of the data.

The stock assessment estimated natural mortality using a number of different methods. The gag stock assessment determined the species was experiencing overfishing but was not overfished. At their June 2008 meeting, the SSC indicated results of the gag assessment are based on the best available science. The SSC recommended harvest levels at the yield associated with OY in accordance with the new mandates specified by the reauthorized Magnuson-Stevens Fishery Conservation and Management Act, which require Annual Catch Limits be set at a level to ensure overfishing does not occur.

The Council examined trends in fuel prices and effort at their June and September 2008 meetings. While fuel prices were increasing, effort did not appear to be declining through the end of 2007. The Council stated declines in effort might not yet be reflected in the data and could become apparent in 2008.

Note: Scoping comments are summarized in **Appendix D**.

ABSTRACT

The need for action through Snapper Grouper Amendment 16 is to end overfishing of gag and vermilion snapper. The gag spawning closure January through April will reduce overfishing of black and red grouper. Species in the fishery management unit are assessed on a routine basis and stock status may change as new information becomes available. In addition, changes in management regulations, fishing techniques, and social/economic structure can result in shifts in the percentage of harvest between user groups over time. More specifically, these proposed actions would:

- Implement measures to end overfishing of gag and vermilion snapper;
- Implement measures to reduce overfishing of red and black grouper;
- Allow the Regional Administrator to adjust management measures pending the outcome of a new benchmark assessment for vermilion snapper;
- Specify the total allowable catch and define interim allocations for gag and vermilion snapper;
- Update management reference points for gag and vermilion snapper; and
- Reduce bycatch of snapper grouper species.

This Final Environmental Impact Statement (FEIS) has been prepared to analyze the effects of implementing regulations as listed above. An interim rule to implement regulations for gag, red grouper, and black grouper by January 1, 2009 has been requested by the Council. These regulations, if implemented, will reduce fishing mortality of red grouper and black grouper while the Council continues work on Snapper Grouper Amendment 17.

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SUMMARY

Purpose and Need

The purpose of this amendment is to either alter current management measures or implement new management measures that would reduce current harvest levels to yields associated with the optimum yield (OY) and end overfishing of gag and vermilion snapper in the South Atlantic. Since a new benchmark assessment for vermilion snapper is ongoing, this amendment includes an action that would allow the NMFS Regional Administrator (RA) to make needed adjustments to management measures to end overfishing. The amendment includes alternatives that specify interim allocations between the commercial and recreational sectors for the gag and vermilion snapper fisheries. This amendment also would implement new status determination criteria for gag and vermilion snapper, including Maximum Sustainable Yield (MSY), Optimum Yield (OY), and Minimum Stock Size Threshold (MSST), which reflect current scientific information as provided by the assessments and approved by the Scientific and Statistical Committee (SSC). In addition, Snapper Grouper Amendment 16 includes alternatives that would require devices to reduce bycatch of snapper grouper species.

Actions proposed in Amendment 16 would:

- Implement measures to end overfishing of gag and vermilion snapper;
- Implement measures to reduce overfishing of red and black grouper;
- Allow the Regional Administrator to adjust management measures pending the outcome of a new benchmark, age-based, SEDAR assessment for vermilion snapper;
- Specify total allowable catch and define interim allocations for gag and vermilion snapper;
- Update management reference points for gag and vermilion snapper; and
- Reduce bycatch of snapper grouper species.

Alternatives Being Considered

The Council's current alternatives are listed below. Alternatives to the proposed actions the Council considered in developing this amendment but decided not to pursue are described in **Appendix A**.

Gag

Gag is not overfished but biomass is less than B_{MSY}. The Council's SSC recommended a restriction in harvest to F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a TAC of 694,000 pounds gutted weight for all sectors. The Council recommended catch level remains at 694,000 pounds gutted weight until modified by future action. Setting harvest levels at the catch associated with F_{OY} would decrease the probability that overfishing will occur.

MSY and OY alternatives for Gag

Alternatives	Equation	F_{MSY} & F_{OY} Values	MSY & OY Values
Alternative 1 (no action)	MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{45\%SPR}$ is used as the F_{OY} proxy.	**F_{MSY}** = 0.18* **F_{OY}** = 0.11*	Not specified Not specified
Alternative 2 (preferred)	MSY equals the yield produced by F_{MSY}. MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by F_{OY}. If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. Gag are not overfished.	0.237** See subalts. Below	1,238,000 lbs gutted weight
Alternative 2a		(65%)(F_{MSY})	1,188,000 lbs gutted weight**
Alternative 2b (preferred)		(75%)(F_{MSY})	1,217,000 lbs gutted weight**
Alternative 2c		(85%)(F_{MSY})	1,230,000 lbs gutted weight**
*Source: Powers 1999 ** Source: Table 36. SEDAR 10 (2006)			

Interim Gag Allocation Alternatives and Resulting Commercial Quota & Recreational Allocation

Alternative 1 (no action). Do not define interim allocations for gag. Status quo based on landings from 2004-2005.

Alternative 2 (preferred). Define interim allocations for gag based upon landings from the ALS, MRFSS, and headboat databases. The allocation would be based on landings from the years 1999-2003. The allocation would be 51% commercial and 49% recreational (Table 2-4). This alternative would establish a commercial quota of 353,940 pounds gutted weight and a recreational allocation of 340,060 pounds gutted weight.

		Alternative 2 (preferred)		Alternative 3		Alternative 4	
Year	**Catch Level**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**
2009 Onwards	694,000	353,940	340,060	458,040	235,960	423,340	270,660

Alternative 3. Define interim allocations for gag based upon landings from the ALS, MRFSS, and headboat databases. The allocation would be based on landings from the years 1986-1998. The allocation would be 66% commercial and 34% recreational (Table 2-4). This alternative would establish a commercial quota of 458,040 pounds gutted weight and a recreational allocation of 235,960 pounds gutted weight.

Alternative 4. Define allocations for gag based upon landings from the ALS, MRFSS, and headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 61% commercial and 39% recreational (Table 2-4). This alternative would establish a commercial quota of 423,340 pounds gutted weight and a recreational allocation of 270,660 pounds gutted weight.

Management Alternatives for Gag

Alternative 1. No action. **Current Regulations:**

(i) Current gag commercial regulations = 24 inch total length size limit; March & April - no harvest above bag limit & no sale; vessels with longlines may only possess deepwater species; limited entry program with 2 for 1provision.

(ii) Current gag recreational regulations = 24 inch total length size limit; within 5 grouper bag limit only 2 may be gag or black grouper; March & April – no sale.

Alternative 2 (Preferred). Establish a gag spawning season closure January through April that applies to both the commercial (20% reduction) and recreational (31% reduction) sectors; no fishing for and/or possession of gag would be allowed. In addition, no fishing for and/or possession of the following species would be allowed: black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 3. Establish a 1,000 pound gutted weight gag commercial trip limit.

Alternative 3a. Establish a 1,000 pound gag gutted weight commercial trip limit with a fishing year start date of May 1. In addition, during March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 3b. Establish a 1,000 pound gag commercial trip limit with a fishing year start date of January 1. In addition, during February, March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 4 (Preferred). Directed Commercial Quota. Establish the following directed quota (quota after Post Quota Bycatch Mortality [PQBM] has been subtracted) for 2009 onwards until modified. After the commercial quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession is limited to the bag limit: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM.

With Jan-April Gag Seasonal Closure			
	Preferred Allocation Alternative 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	1,000	0	0
Directed quota	**352,940**	**458,040**	**423,340**
With no Jan-April Gag Seasonal Closure			
	Preferred Allocation Alternative 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	7,000	1,000	1,000
Directed quota	**346,940**	**457,040**	**422,340**

Notes: **Allocation Alternative 2 is preferred.** Different values of PQBM could be used in the future. PQBM is rounded to the nearest 1,000 lbs. Weight is in pounds gutted weight.

Alternative 5. Divide the directed commercial quota into two regions: Allocate 63.3% to North and South Carolina (223,411 pounds gutted weight) and 36.7% to Georgia and Florida (129,529 pounds gutted weight). Each region's directed quota (after adjustment for PQBM) would be tracked by dealer reporting. After the commercial quota is met in either region, all purchase and sale is prohibited in that region and harvest and/or possession is limited to the bag limit in that region.

Alternative 6. South of the Miami-Dade/Monroe County line, no fishing for and/or possession of the following species would be allowed during June 1-December 31: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. No fishing for and/or possession of gag would be allowed year-round south of the Miami-Dade/Monroe County line. Fishing for black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney would be allowed January 1 – May 31 for the Southern region. Note: This alternative would apply to both the recreational and commercial fisheries.

Alternative 7. Recreational measures:

Alternative 7a (Preferred). Reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black grouper to 1 gag or black grouper within the grouper aggregate bag limit, and exclude the captain and crew on for-hire vessels from possessing a bag limit for **groupers**. This plus the January through April spawning closure would result in a 36% reduction in harvest.

Alternative 7b. Close the month of December to recreational harvest and/or possession of gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. This alternative would retain the existing 5-grouper aggregate bag limit and 2 gag or black grouper bag limit. The December through April closure plus the reduction in bag limits would result in a 42% reduction in harvest.

Vermilion Snapper

Vermilion snapper is experiencing overfishing but the overfished status is unknown. The Council's Scientific and Statistical Committee (SSC) recommended a restriction in harvest to F_{OY} equal to the yield associated with 75% of F_{MSY}. The would correspond to a TAC of 566,179 pounds gutted weight for all sectors. Note: Values based on SEDAR Update #3 (2007). A new age-based benchmark assessment is being conducted for vermilion snapper and will be completed in late 2008.

MSY and OY Alternatives for Vermilion Snapper

Alternatives	Equation	F_{MSY} & F_{OY} Values	MSY & OY Values
Alternative 1 (no action)	MSY equals the yield produced by $F_{MSY.}$ $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{40\%SPR}$ is used as the F_{OY} proxy.	$\mathbf{F_{MSY}}$ = 0.35* $\mathbf{F_{OY}}$ = 0.25*	Not specified Not specified
Alternative 2 (preferred)	MSY equals the yield produced by $F_{MSY.}$ MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by $F_{OY.}$ If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. The overfished status of vermilion snapper is unknown.	$\mathbf{F_{MSY}}$ = 0.355** See subalts. Below	2,699,957 lbs whole weight (2.432.394 lbs gutted weight)
Alternative 2a		(65%)(F_{MSY})	547,887 lbs whole weight** (493,592 lbs gutted weight)
Alternative 2b (preferred)		(75%)(F_{MSY})	628,459 lbs whole weight** (566,179 lbs gutted weight)
Alternative 2c		(85%)(F_{MSY})	692,916 lbs whole weight** (624,249 lbs gutted weight)
*Source: Powers 1999 **Source: Recommendation from SEFSC based on the results from SEDAR Update (2007). OY values represent the current yield at F_{OY} and do not represent OY at equilibrium. F_{MAX} used as a proxy for F_{MSY}. *** The Council's SSC did not endorse the estimate of MSY from the vermilion snapper SEDAR Update (2007). This value would represent the MSY at equilibrium.			

Interim Vermilion Snapper Allocation Alternatives
Alternative 1 (no action). Do not define interim allocations for vermilion snapper.

Alternative 2 (preferred). Define interim allocations for vermilion snapper based upon landings from the NMFS landings (ALS), NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 68% commercial and 32% recreational. This alternative would establish a commercial quota of 385,002 pounds gutted weight (427,352 pounds whole weight) and a recreational allocation of 181,177 pounds gutted weight (201,107 pounds whole weight).

Vermilion Snapper		**Allocation Alternative 1. 64%C/36%R**		**Allocation Alternative 2. 68%C/32%R**	
	Annual	**Commercial**	**Recreational**	**Commercial**	**Recreational**
Year	**TAC*** (gutted weight)	**Quota**** (gutted weight)	**Allocation**** (gutted weight)	**Quota** (gutted weight)	**Allocation** (gutted weight)
2009 Onwards	566,179	362,355	203,824	385,002	181,177

Management Alternatives for Vermilion Snapper
Alternative 1. No action. **Current Regulations:**

(i) Current vermilion snapper <u>commercial</u> regulations = 12 inch size limit; commercial quota = 1,100,000 pounds gutted weight (1,221,000 pounds whole weight); vessels with longlines may only possess deepwater species; limited entry program with 2 for 1 provision.

(ii) Current vermilion snapper <u>recreational</u> regulations = 12 inch size limit; 10 vermilion snapper bag limit.

Alternative 2 (Preferred). Directed Commercial Quota. Establish a directed commercial quota based on an interim allocation of 68% commercial and 32% recreational. After the commercial quota is met, all purchase and sale is prohibited and harvest and/or possession is limited to the bag limit.

Commercial quota	385,002
PQBM	57,000
Directed quota	**328,002**

Alternative 3. Divide the directed commercial quota into seasons.

Alternative 3a (Preferred). Allocate the directed commercial quota 50% to the period January 1st through June 30th and 50% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Commercial quota	385,002
Jan-June 50%	192,501
PQBM	24,000
Directed quota Jan-June	**168,501**
July-Dec 50%	192,501
PQBM	37,000
Directed quota July-Dec	**155,501**

Alternative 3b. Allocate the directed commercial quota 40% to the period January 1st through June 30th and 60% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Alternative 3c. Allocate the directed commercial quota 50% to the period January 1st through August 31th and 50% to the period September 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward

Alternative 4. Manage the commercial quota with a fishing year beginning May 1 and a 1,000 pound trip limit (gutted weight).

Alternative 5. Adjust recreational bag/size limit and establish a recreational closed season; no fishing for and/or possession of vermilion snapper would be allowed during the closed season; and captain crew on for-hire vessels would not be able to retain vermilion snapper.

Alternative 5a. Increase the recreational size limit to 14" total length and reduce the bag limit to 3 vermilion snapper (Total Reduction = 71%).

Alternative 5b. Increase the recreational size limit to 13" total length and reduce the bag limit to 1 vermilion snapper (Total Reduction = 73%).

Alternative 5c. Increase the recreational size limit to 13" total length and reduce the bag limit to 6 vermilion snapper (53% reduction) and close September & October (16% reduction) (Total Reduction = 61%).

Alternative 5d (Preferred). Reduce the bag limit from 10 to 4 vermilion snapper (45% reduction) and a season closure (no fishing for and/or possession) of October through May 15th (38% reduction) (Total reduction = 66%). Size limit remains at 12" total length.

Reduce Bycatch of Snapper Grouper Species

Alternative 1. No Action. Do not require use of venting tools, dehooking devices, and circle hooks to reduce bycatch.

Alternative 2. Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools and (b) use of non-offset, non-stainless steel circle hooks when using natural baits to fish for snapper grouper species in one of the following South Atlantic EEZ fisheries:

Alternative 2a. Commercial snapper grouper fishery.
Alternative 2b. Recreational snapper grouper fishery.
Alternative 2c. Both commercial and recreational snapper grouper fisheries.

Alternative 3 (Preferred). Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools.

Allow NMFS Regional Administrator (RA) to Make Adjustments to Management Measures after pending Vermilion Snapper SEDAR Assessment

Alternative 1. No Action. Do not allow the Regional Administrator (RA) to adjust the management measures based on the outcome of the new vermilion snapper SEDAR benchmark assessment.

Alternative 2 (Preferred). Allow the RA to adjust the management measures as specified in Table A based on the outcome of new vermilion snapper SEDAR benchmark assessment.

Table A. Commercial and recreational management measures to be employed by NMFS Regional Administrator (RA) based on reduction harvest needed to achieve the yield at F_{OY}.

%REDUCTION	COMMERCIAL	RECREATONAL
Alternative 2A. 10% (5.0 – 14.9%)	**QUOTA ALLOCATED BY SEASON**	**12”, 10 FISH & NO CLOSURE**
Alternative 2B. 20% (15.0 – 24.9%)	**QUOTA ALLOCATED BY SEASON**	**12”, 10 FISH & NO CLOSURE**
Alternative 2C. 30% (25.0 – 34.9%)	**QUOTA ALLOCATED BY SEASON**	**12”, 9 FISH & NO CLOSURE**
Alternative 2D. 40% (35.0 – 44.9%)	**QUOTA ALLOCATED BY SEASON**	**12”, 9 FISH & NOV-MARCH CLOSURE**
Alternative 2E. 50% (45.0 – 54.9%)	**QUOTA ALLOCATED BY SEASON**	**12”, 5 FISH & NOV-MARCH CLOSURE**
Alternative 2F. 60% (55.0 – 64.9%)	**QUOTA ALLOCATED BY SEASON**	**12”, 5 FISH & OCT – APRIL CLOSURE**

Note: The commercial quota will be determined from an assessment projection. The preferred commercial allocation (68% commercial) will be applied to the Total Allowable Catch (TAC) from the yield at 75% Fmsy specified in the projection. Therefore, the commercial quota will correspond to 68% of the TAC specified by the yield associated with 75% F_{MSY}.

Affected Environment
The immediate impact area would be the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West. A larger area could be affected. In light of the available information, the extent of the boundaries would depend upon the degree of fish immigration/emigration and larval transport. Tagging work conducted by the MARMAP program indicates there is movement of gag between the Gulf of Mexico and South Atlantic. Large-scale movement of vermilion snapper has not been documented; however, vermilion snapper, gag, and many other snapper grouper species have pelagic eggs and larvae that may remain in the water column for extended periods and travel long distances before late stage larvae or juveniles assume a demersal existence. For example, eggs and larvae from spawning fish in the Gulf of Mexico or Caribbean may be passively transported into the South Atlantic. Alternatively, early life stages of fishes spawned in the South Atlantic could be transported by currents to other areas such as the mid-Atlantic. Furthermore, some fishermen may fish in and out of the federal 200-mile limit off North Carolina, South Carolina, Georgia, and east Florida.

Sections 3.1 provides a description of the essential fish habitat. The biological environment is described in Section 3.2. Descriptions of the administrative and human environments are described in Sections 3.3 and 3.4, respectively.

Environmental Consequences
Gag Management Reference Point Alternatives
Biological Impacts
There are no direct effects from redefining and/or updating MSY, OY, and MSST because these parameters simply provide fishery managers with targets and thresholds that will be used to assess the status and performance of the fishery. However, these management reference points indirectly benefit the biological and ecological environments by influencing the development of fishery management measures, which directly affect gag and other species.

Economic Impacts
Defining the MSY and OY for gag does not alter the current harvest or use of the resource. Specification of these measures merely establishes benchmarks for fishery and resource evaluation from which additional management actions for the species would be based, should comparison of the fishery and resource with the benchmarks indicate that management adjustments are necessary. Since there would be no direct effects on resource harvest or use, there would be no direct effects on fishery participants, associated industries or communities. Direct effects only accrue to actions that alter harvest or other use of the resource. Specifying MSY and OY, however, establishes the platform for future management, specifically from the perspective of bounding allowable harvest levels. In this sense, MSY and OY may be considered to have indirect effects on fishery participants.

Social Impacts
Defining the MSY, OY, or MSST for a species or species complex would not cause direct social impacts because it would not place specific controls on the amount or

manner in which the resources are harvested. These parameters simply provide management targets and thresholds needed to assess the status and performance of the fishery. All current direct, indirect, consumptive, and non-consumptive uses of the resources will be unaffected. Designation of these benchmarks, therefore, establishes the foundation for subsequent regulatory change.

Gag Allocation Alternatives

Biological Impacts

Specifying an allocation makes it possible to identify the allowable catch in the recreational and commercial sectors. **Allocation Alternatives 2-4** for gag would range from 51% commercial/49% recreational (**Alternative 2**) to 66% commercial/34% recreational (**Alternative 3**). **Preferred Alternative 2** reflects proportions taken most recently by the commercial and recreational sectors and is the closest to the September 2007 Snapper Grouper Advisory Panel's (AP) recommendation for a 50/50 allocation.

Economic Impacts

The various allocation alternatives for gag would determine the distribution of harvest reductions to the commercial and recreational sector due to the proposed catch level to address overfishing of gag. These alternatives were generated through an examination of sector harvests for different harvest years rather than an attempt to identify the allocation that maximized net benefits, or in the present case minimized net losses, because application of the maximum benefit analysis is not possible at this time with available data.

Under **Alternative 1** (no action), each sector would be expected to experience an equal percent reduction in harvests regardless of the base period chosen although the absolute amount of harvests would depend on the sector's harvest during the base period. The percent reductions to each sector under **Alternatives 2 to 4** as presented in Table 4-12 above are: 35 percent commercial, 37 percent recreational for **Alternative 2**; 16 percent commercial, 56 percent recreational for **Alternative 3**; and 23 percent commercial, 50 percent recreational for **Alternative 4**. These reductions were computed relative to the average 2004-2006 harvests of the commercial and recreational sectors. The harvest reduction under **Alternative 1** for each sector would be about 40 percent each. **Alternatives 2 to 4** would favor the commercial sector because all reductions would be below the 40 percent mark. The farther away the commercial percent reduction is from 40 percent, the greater the harvest reduction would be for the recreational sector. Thus **Alternative 3**, which would reduce commercial harvest the least, would result in the greatest reduction for the recreational sector. **Alternatives 2 to 4** would also imply that if allowable catch levels were increased over time, the commercial sector would gain more than the recreational sector.

To the extent that **Alternatives 2 to 4** would favor the commercial sector, each alternative would be expected to reduce economic losses to this sector but only at the expense of the recreational sector. Whether the trade-offs in benefits/losses would result in net gain to society cannot be determined in the absence of better data and a more appropriate model. Also in the absence of such a model, it would not be possible to rank the various alternatives based on net economic benefits to society. At any rate, some quantitative implications of the various alternatives have been estimated to provide some insights into the magnitude of effects.

Social Impacts
Each gag allocation alternative to the status quo would result in economic losses to both the commercial and recreational sectors. No alternative allocation has been identified that would benefit one sector while not harming the other sector.

In addition to the expected adverse economic effects on the commercial sector, any allocation would be accompanied with effects that cannot be quantified. If these unquantifiable effects are compounded as the magnitude of the allocation increases, substantially increased adverse social impacts could accrue to the commercial sector because of **Preferred Alternative 2** relative to the other alternatives. Allocation away from historical distributions is a particularly divisive issue in fisheries, regardless of the amount of quantitative justification the allocation may appear to have. This is particularly true when incomes and livelihoods become affected. While appropriate data on business failure/exit does not exist, anecdotal information point to the increasing difficulty commercial fishermen have remaining in fisheries in general due to increased fuel costs, stagnant or declining ex-vessel prices, decreasing dock space and numbers of fish houses, fewer or more restrictive species options, and generally more restrictive management measures. Similar pressures exist for for-hire business operators. However, all of the allocation alternatives, while mitigating the effects of some of these pressures on the recreational sector, would exacerbate these pressures on the commercial sector. While none of the allocation alternatives to the status quo would be neutral to the commercial sector, lower adverse social impacts to the commercial sector and associated industries and communities would be expected to accrue to those alternatives that result in the lowest allocation away from the commercial sector.

Gag Management Measure Alternatives
Biological Impacts
Management actions proposed in this amendment would reduce fishing mortality, end overfishing of gag, and would be expected to have a beneficial, cumulative effect on the biophysical environment. These measures include quotas, reduced bag limits, seasonal closures, and closing shallow water groupers during a seasonal closure or when a quota is met for gag.

A January-April spawning season closure (**Preferred Alternative 2)** for the commercial and recreational sectors would provide greater protection for gag, black, and red grouper, which are all experiencing overfishing, as well as, other shallow water groupers, than the current March-April closure. Although gag spawn during December through May, aggregations are in place before and after spawning activity (Gilmore and Jones 1992). Therefore, males can be removed from spawning aggregations early in the spawning season and this could affect the reproductive output of the aggregation if there were not enough males present in an aggregation for successful fertilization of eggs. **Preferred Alternative 2** would also close the fishery for other shallow water groupers including black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney, which are also known to spawn during January-April. Like gag, the other shallow water groupers are vulnerable to overfishing because they change sex, many are long lived, and some species (e.g., gag, black grouper, scamp, red hind, and tiger grouper) form spawning aggregations at locations known to fishermen. Currently, gag, red grouper, and black grouper are experiencing overfishing. The status of red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney is unknown (http://www.nmfs.noaa.gov/sfa/domes_fish/StatusoFisheries/2007/2007StatusofUSFisheries_Report_to_Congress.pdf). Therefore, extending the spawning season closure to other shallow water groupers could have positive biological effects including protecting spawning aggregations, increasing the percentage of males, enhancing reproductive success, and increasing the magnitude of recruitment.

Alternative 3 would establish a 1,000 pound gutted weight trip limit for gag and would close the commercial fishery for gag and other shallow water groupers (black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney) after a quota was met. There are different quotas associated with **Alternative 3a** and **Alternative 3b** depending on which allocation alternative the Council selects. Currently the Council's preferred **Alternative 2** would allocate 51% of the total allowable catch to the commercial sector and 49% to the recreational sector.

Alternatives 3a and 3b differ in when the fishing year would start and the length of the spawning season closure for gag and other shallow water groupers. Under **Alternative 3a**, gag and shallow water groupers would be closed during March-April but the fishing year would start on May 1. Assuming there would be no decrease in fishing effort, the biological effects of **Alternative 3a** would be similar to **Alternative 2** because it is expected with a May 1 fishing year start date, the quota would be met sometime in December. Therefore, the commercial fishery for gag and other shallow water groupers would likely be closed during January through April. If effort were reduced, the biological benefits of **Alternative 3a** would be less than **Alternative 2** because fishing would be occurring when gag and other shallow water grouper species are in spawning condition and more vulnerable to fishing gear than during other times of the year.

Alternative 3b would maintain the January 1 start date but close all shallow water groupers during February through April. Work conducted by McGovern *et al.* (2005) indicate gag can move large distances from South Carolina and North Carolina to areas off of South Florida presumably to spawn. Therefore, the seasonal appearance of gag off of South Florida could be related to spawning activity. These fish could be vulnerable to capture in large numbers, particularly if they are in aggregations (Gilmore and Jones 1992). As a result, the biological benefits of **Alternative 3b** would be less than **Alternative 2** since gag and other shallow water species in spawning condition could be targeted by commercial fishermen. The biological benefits of **Alternative 3b** would also be less than **Alternative 3a** under the current level of effort since it is anticipated the fishery would close sometime in November or December with the May 1 start date being considered in **Alternative 3a**. However, if effort were to decrease, the biological effects of **Alternatives 3a** and **3b** could be similar.

The biological effects of **Alternatives 3a and 3b** could be different if combined with **Alternative 5**, which would establish regional quotas. **Alternative 5** would allocate 63.3% of the commercial quota to North and South Carolina, and 36.7% to Georgia and Florida. The rationale for having regional quotas is fishermen off Florida could have an advantage and catch part of the quota early in the year when bad weather would prevent fishermen from catching gag off North Carolina and South Carolina. The Council examined monthly gag landings and found the percentage of annual gag landings among states was similar after the proposed January-April spawning season closure (**Alternative 2**) would take place. However, if the fishing year started on January 1, with a February through April closure (**Alternative 3b**), fishermen in Florida could begin catching gag sooner than fishermen off of North Carolina and South Carolina due to better weather conditions. Therefore, under **Alternative 3b** it might be reasonable to combine it with a regional quota to prevent fishermen in Florida and Georgia from catching more than their historic proportion of the quota.

Preferred Alternative 4 would establish a directed quota, after PQBM has been subtracted, of 352,940 pounds gutted weight for 2009 onwards until modified. After the commercial quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession would be limited to the bag limit for gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. A reduction in fishing mortality and subsequent increase in biomass would be expected to restore the natural population structure of the stock, reverse the trends of decreasing males and mean length documented in recent studies, and benefit the ecosystem in which gag occur. Since **Preferred Alternative 4** would close all shallow water groupers when the gag quota is met, this action is expected to reduce mortality of incidentally caught gag and benefit other shallow water grouper species.

Alternative 6 would allow no take of gag through the year south of the Miami-Dade/Monroe County line, and would prohibit fishing for and/or possession of gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney during June 1-December 31 for both the recreational and commercial fisheries. While the proposed management measures would represent a substantial reduction in harvest of shallow water grouper species from Monroe County, the overall reduction in harvest of gag would be minor in relation to total harvest from the South Atlantic. Furthermore, fishermen could still target shallow water grouper species during January through June when some of the species would be in spawning condition. Black grouper and red grouper dominate commercial and MRFSS catches in Monroe County. However, at their September 2007 meeting, the AP indicated gag were much more common 15 to 18 years ago than they are now. Species most commonly caught in Monroe County in the headboat fishery are red grouper, gag, and black grouper. Black grouper, gag, and scamp form spawning aggregations with peak spawning of females occurring from January to March for black grouper and gag (Crabtree and Bullock 1998; McGovern *et al.* 1998). The Southeast Fisheries Science

Center has evidence of spawning aggregations for black grouper and gag that were fished out in the upper Florida Keys by the early 1990s. Red grouper do not appear to form spawning aggregations but spawning in the South Atlantic occurs during February-June, with a peak in April (Burgos 2001). Therefore, **Alternative 6** would allow fishermen to harvest black grouper from spawning aggregations making them vulnerable to capture. Further, this alternative would allow capture of red grouper in spawning condition.

Preferred Alternative 7a would reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black grouper to 1 gag or black grouper within the grouper aggregate bag limit, and exclude the captain and crew on for-hire vessels from possessing a bag limit for groupers. This action is supported by the Snapper Grouper Advisory Panel at their September 2007 meeting. Because gag, black grouper, red grouper, and to a certain extent vermilion snapper, are upper level predators preying primarily on fish, benthic invertebrates, and squid, the degree of competition for food resources between these species and other co-occurring species, may increase as stock abundance increases. In addition gag and vermilion snapper, and other co-occurring species may begin to compete for habitat as their respective stocks rebuild.

Restrictions in the catch of gag, vermilion snapper, and shallow water grouper species could result in fishermen shifting effort to co-occurring species. Therefore, restricted species are likely to be caught incidental to other fisheries. Incidental catch is considered in analyses that adjust bag limits through adjustments for release mortality. Seasonal closures consider incidental catch and are assumed to be less than 100% effective in reducing mortality. Quotas are adjusted for incidental catch that could occur after a quota is met and fishermen target co-occurring species. Closing all shallow water groupers when a quota is met or during a seasonal closure is likely to reduce the magnitude of incidental catch. Furthermore, actions are being taken in this amendment to reduce bycatch through alternatives that would require venting tools and dehooking devices, and encourage use of circle hooks.

Economic Impacts

Preferred Alternative 2 would add two more months to the current two-month closure for the commercial fishery and would establish a four month closure for the recreational fishery. If effectively enforced, a fishery closure would protect spawning gag and reduce harvest in both the commercial and recreational sectors. These effects are quantified below in conjunction with **Alternatives 3a** and **3b**. A closure affects the commercial and recreational sectors in different ways although both sectors are prohibited from harvesting gag. Without harvest, the commercial sector is essentially shut out of the fishery for that species, although some vessels could still make the trips if revenues from other species were still sufficient to cover costs. On the other hand, recreational trips, with the possible exception of for-hire trips that may solely target gag, can still occur albeit with potentially reduced quality of the fishing experience because any gag that may be caught may no longer be kept. Due to the differences in how a closure affects the different user groups, a closure may be more burdensome to the commercial than to the recreational sector.

As a result of the trip limit specified by **Alternative 3a,** this alternative is expected to result in an annual reduction in net operating revenues from the status quo of approximately $388,000-$737,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of snapper grouper. The largest reductions in absolute dollars are projected to occur in South Carolina ($175,000-$300,000) and North Carolina ($74,000-$138,000). In terms of percentage reductions, South Carolina (8-14%) and Georgia-Northeast Florida (5-10%) are projected to experience the largest reductions in annual net operating revenues. **Alternative 3b** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $621,000-$755,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($254,000-$305,000) and North Carolina ($114,000-$156,000). In terms of percentage reductions, South Carolina (12-14%) and Georgia-Northeast Florida (9-10%) are projected to experience the largest reductions in annual net operating revenues.

Alternative 4 would impose a single overall quota on the commercial sector. The effects of this alternative are quantified in conjunction with **Alternatives 3a** and **3b** above. Even under the current controlled access management system of the fishery, a derby can still occur especially with low and strictly binding quota levels such as the ones contemplated in this amendment. A major consequence of a derby is the increase in cost and possible reduction in ex-vessel price when large quantities of gag (or any species) are landed within a short period.

Alternative 5 would divide the commercial quota into North/South Carolina and Georgia/Florida sub-quotas. This subdivision of the commercial quota would not eliminate the potential derby problem that may occur in the fishery, although it may alleviate certain disparities among vessels located in one or the other region in harvesting gag. Because regional sub-quotas would be monitored based on area of landing, regional sub-quotas raise the possibility of vessels altering where they land their catch. This may involve additional production costs.

Alternative 6 was evaluated as multiple sub-alternatives in combination with the alternative allocations, as well as the alternative spawning closures and trip limits that may occur north of Monroe County. For trips projected to harvest at least one pound of snapper grouper, under a January-April spawning closure (**Alternative 6a**), establishing separate management regulations for Monroe County is projected to result in an annual reduction in net operating revenues from the status quo of approximately $794,000-$864,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($262,000-$297,000) and Georgia-Northeast Florida ($145,000-$155,000). In terms of percentage reductions, South Carolina (12-13%) and Georgia-Northeast Florida (11-12%) are projected to experience the largest reductions in annual net operating revenues.

Under a February-April spawning closure (**Alternative 6b**), establishing separate management regulations for Monroe County is projected to result in an annual reduction in net operating revenues from the status quo of approximately $678,000-$800,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($254,000-$304,000) and Georgia-Northeast Florida ($116,000-$135,000). In terms of percentage reductions, South Carolina (12-14%) and Georgia-Northeast Florida (9-10%) are projected to experience the largest reductions in annual net operating revenues.

Under a March-April spawning closure (**Alternative 6c**), establishing separate management regulations for Monroe County is projected to result in an annual reduction in net operating revenues from the status quo of approximately $474,000-$771,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($174,000-$296,000) and the Florida Keys ($119,000), though Georgia-Northeast Florida is also projected to experience reductions of $72,000-$133,000. In terms of percentage reductions, South Carolina (8-13%) and Georgia-Northeast Florida (5-10%) are projected to experience the largest reductions in annual net operating revenues.

For the recreational sector, **Alternative 6** is expected to have minimal adverse economic effects due to the relatively small proportion that gag and SWG harvests amount to relative to total finfish recreational harvests in Monroe County (less than 3 percent of total fish harvested for the headboat sector and likely less than 2 percent for the shore, charter, and private sectors). Although some individual anglers fishing off Monroe County may target gag and other SWG species, these species are, in general, likely component species of general bottom fishing activities, with snappers the more common expected harvest, such that few trip cancellations, changes in fishing behavior and expenditures would be expected, and any reduction in recreational value would be expected to be minor.

Alternative 7a would reduce the aggregate recreational bag limit for grouper and the individual species bag limit within the aggregate bag limit. In addition, it would ban the for-hire captain and crew from possessing a grouper bag limit. **Alternative 7b** would add a December recreational harvest closure to the spawning closure under **Alternative 2**. The bag limit reduction would not necessarily result in trip cancellation but would reduce the quality of the fishing experience. Thus, the reduction in the bag limit would likely reduce consumer surplus more than producer surplus. The total reduction in economic value to the recreational sector is estimated to be $835,000 and $814,000 for **Alternative 7a** and **Alternative 7b**, respectively.

Social Impacts

In general, by ending overfishing and keeping gag at a sustainable status, long-term benefits are expected to accrue to all participants in the fishery, commercial, recreational, and the general public. Alternatives differ in how they would allow the stock to arrive at a long-term sustainable status. As a result, each of these alternatives differs in the degree and type of negative short- and long-term impacts imposed on each fishing and non-fishing sector. A more detailed analysis of the negative and positive short-term impacts of the proposed alternatives is provided in Section 4.1.5.3. Long-term benefits are discussed throughout the analysis but as there are sparse data to analyze long-term effects of management measures on communities, future conditions of communities cannot be predicted with confidence.

Vermilion Snapper Management Reference Point Alternatives

Biological Impacts

There are no direct effects from redefining and/or updating MSY, OY, and MSST because these parameters simply provide fishery managers with targets and thresholds that will be used to assess the status and performance of the fishery. However, these management reference points indirectly benefit the biological and ecological environments by influencing the development of fishery management measures, which directly affect vermilion snapper and other species.

Economic Impacts

Defining the MSY and OY for vermilion snapper does not alter the current harvest or use of the resource. Specification of these measures merely establishes benchmarks for fishery and resource evaluation from which additional management actions for the species would be based, should comparison of the fishery and resource with the benchmarks indicate that management adjustments are necessary. Since there would be no direct effects on resource harvest or use, there would be no direct effects on fishery participants, associated industries, or communities. Direct effects only accrue to actions that alter harvest or other use of the resource. Specifying MSY and OY, however, establishes the platform for future management, specifically from the perspective of bounding allowable harvest levels. In this sense, MSY and OY may be considered to have indirect effects on fishery participants.

Social Impacts

Defining the MSY, OY, or MSST for a species or species complex would not cause direct social impacts because it would not place specific controls on the amount or manner in which the resources are harvested. These parameters simply provide management targets and thresholds needed to assess the status and performance of the fishery. All current direct, indirect, consumptive, and non-consumptive uses of the resources will be unaffected. Designation of these benchmarks, therefore, establishes the foundation for subsequent regulatory change.

Vermilion Snapper Allocation Alternatives

Biological Impacts

Specifying an allocation makes it possible to identify the allowable catch in the recreational and commercial sectors. The Snapper Grouper Advisory Panel recommended **Preferred Alternative 2**. The Council examined the complete time series and noticed there was little difference in the percentage commercial and recreational when any time series was examined. The Council concluded the longest time series (**Preferred Alternative 2**) was the best approach. In addition, the Council discussed whether an additional alternative was necessary but given the similar distribution over the years of data, the Council concluded two alternatives were appropriate for this action.

Economic Impacts

Only one alternative allocation ratio was considered relative to the no action alternative. In general, the allocation alternatives for vermilion snapper would determine the distribution of harvest reductions to the commercial and recreational sector due to the proposed catch level to address overfishing of vermilion snapper. **Preferred Alternative 2** was generated through an examination of sector harvests for some harvest years rather than an attempt to identify the allocation that maximized net benefits, or in the present case minimize net losses, because application of the maximum benefit analysis is not possible at this time with available data.

Assuming that the commercial allocation would be managed by quota and quota closures, **Preferred Alternative 2** is expected to reduce commercial net operating revenues by 61.1% or about $2.8 million for vessel trips landing at least one pound of vermilion snapper. Diving and vertical line vessel trips would bear most of the revenue losses in terms of both percentage and absolute values. Vertical line vessel trips especially could experience net revenue losses of about $2.7 million, which is about 96.8%of total net revenue losses. Net revenue losses would be much less when considering vessel trips landing at least one pound of any snapper grouper species.

Assuming that the recreational harvest of vermilion snapper would be limited to the sector's allocation, **Preferred Alternative 2** is expected to result in recreational benefit losses of about $1.25 million. About 94% of all losses would be due to losses in consumer surplus. Losses in charterboat producer surplus ($38,000) would be slightly less than losses in headboat producer surplus ($43,000).

Social Impacts

The Council's vermilion snapper allocation alternative relative to the status quo would result in economic losses to both the commercial and recreational sectors. Appropriate changes in social benefits would be expected to similarly result. No alternative allocation has been identified that would benefit one sector while not harming the other sector.

In addition to the expected adverse economic effects on the commercial sector, any allocation would be accompanied with effects that cannot be quantified. If these unquantifiable effects are compounded as the magnitude of the allocation increases, substantially increased adverse social impacts could accrue to the commercial sector as a result of **Preferred Alternative 2** relative to the other alternative. Allocation away from historical distributions is a particularly divisive issue in fisheries, regardless of the amount of quantitative justification the allocation may appear to have. This is particularly true when incomes and livelihoods become affected. While appropriate data on business failure/exit do not exist, anecdotal information point to the increasing difficulty commercial fishermen have remaining in fisheries in general due to increased fuel costs, stagnant or declining ex-vessel prices, decreasing dock space and numbers of fish houses, fewer or more restrictive species options, and generally more restrictive management measures. Similar pressures exist for for-hire business operators. However, all of the allocation alternatives, while mitigating the effects of some of these pressures on the recreational sector, would exacerbate these pressures on the commercial sector. While none of the allocation alternatives to the status quo would be neutral to the commercial sector, lower adverse social impacts to the commercial sector and associated industries and communities would be expected to accrue to those alternatives that result in the lowest allocation away from the commercial sector.

Vermilion Snapper Management Measures

Biological Impacts

Preferred Alternative 2 would implement a commercial quota of 385,002 lbs gutted weight, which would then be reduced for dead discards that could occur when fishermen target co-occurring species. **Alternatives 3a, 3b, and 3c** would specify how the quota specified in **Preferred Alterative 2** would be allocated throughout the year. As in **Preferred Alternative 2**, **Alternatives 3a, 3b, and 3c** would adjust the quota for dead discards that could be incidentally caught when fishermen target co-occurring species (PQBM). **Preferred Alternative 3a** would allocate 50% of the directed commercial quota to January 1st through June 30th and 50% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward. Based on data from 1999-2005, the 168,501 pound gutted weight quota for period 1 would be met in March or April and the 155,501 pound gutted weight quota for period 2 would be achieved sometime between July and September, at which time the fishery for vermilion snapper would be closed.

The biological effects of **Alternatives 3a, 3b, and 3c** are very similar. The Council selected **Alternative 3a** as the preferred alternative because it has the largest quota and the least amount of PQBM. **Preferred Alternative 3a** would allow the season to extend longer during the January-June period than would **Alternative 3b** and would be less likely to cause a derby fishery during a period of bad weather to fill the first quota in the spring. Further, the Council felt **Alternative 3c** would result in the vermilion snapper fishery being closed from March through August and would begin the second season in September during the peak hurricane season.

The Snapper Grouper AP recommended vermilion snapper **Alternative 4** be combined with the May 1 start date and 1,000 lb gutted weight trip limit for the gag commercial fishery. Many snapper grouper fishermen target gag and vermilion snapper on the same trip and in the same area. Analysis of logbook data indicates gag is the most common species taken on trips where at least one pound whole weight of vermilion snapper was caught. With a May 1 start date for the vermilion snapper fishing year and a 1,000 lb gutted weight trip limit, it is expected a 334,502 lb gutted weight quota would be met sometime between August and December. Thus, with the current level of effort, gag and vermilion snapper would likely be closed during January through April if the fishing year for both species started on May 1.

A May 1 start date for vermilion snapper and gag could reduce bycatch of both species and benefit gag during its January-April spawning season when it forms aggregations and is particularly vulnerable to capture. In addition, it is anticipated effort would decrease for other snapper grouper species since vermilion snapper and gag are among the top fish targeted by snapper grouper fishermen. Thus, many co-occurring snapper grouper species could benefit from a May 1 start date for both vermilion snapper and gag.

A May 1 start date would also provide more equitable access among regions to a limited amount of vermilion snapper quota. Weather during winter months can prevent fishermen from northern areas of the South Atlantic from engaging in fishing activities, while fishers to the south generally enjoy greater weather during January through April and can participate in a greater proportion of trips.

Along with the May 1 start date for vermilion snapper, the Snapper Grouper AP also recommended the Council consider a 1,000 pound gutted weight trip limit. The AP's intent of the 1,000 pound gutted weight trip limit is to extend the duration of the fishing year and reduce the chance of a market disruption from an early closure of the fishery. Logbook data indicate approximately 12% of the trips exceeded 1,000 pounds gutted weight of vermilion snapper; therefore a 1,000 pound gutted weight trip limit would be expected to extend the fishing season to some degree. Trip limits have the potential to increase discards if fishermen continue to pursue co-occurring species after achieving the trip limit; however, the quota takes into consideration the increase in dead discards that could be expected to occur with the 1,000 lb gutted weight trip limit.

Alternatives 5a, 5b, 5c, and 5d would adjust the bag limit in combination with other management measures for the recreational sector. **Alternatives 5a, 5b, and 5c** would also increase the minimum size limits. An increase in the minimum size limit under **Alternatives 5a, 5b, and 5c** would be expected to increase the number of regulatory discards. The number of discarded vermilion snapper spiked when the recreational size limit was increased to 11 inches TL in 1999 and again in 2007, when the recreational size limit was increased to 12 inches TL. **Alternative 5c and Preferred Alternative 5d** would include management measures to establish a recreational seasonal closure in combination with other measures. **Alternative 5c** would increase the minimum size limit, adjust the recreational bag limit and establish a recreational season closure. **Preferred Alternative 5d** would adjust the bag limit in combination with a recreational closure. The length of the closed season may influence its effectiveness in reducing fishing mortality on vermilion snapper due to effort shifting weeks before and after the closure. A longer closed season, as proposed in **Preferred Alternative 5d**, may be more effective in reducing harvest, as it would be more difficult for fishermen to shift all their effort.

Alternatives 5a, 5b, 5c, and Preferred Alternative 5d would not allow captain and crew on for-hire vessels to retain vermilion snapper. It is estimated that eliminating captain and crew from retaining vermilion snapper will provide slight reductions in the harvest of vermilion snapper. These reductions could help reduce bycatch and prevent captain and crew from supplementing their client's catch once their client's daily bag limits have been met. Reductions in landings resulting from a zero captain and crew bag limit in combination with management alternatives considered in **Alternative 5** will directly benefit the biological environment by helping to reduce vermilion snapper directed fishery landings.

All the alternatives to status quo management evaluated for vermilion snapper are intended to reduce fishing mortality and end overfishing. Ending overfishing of vermilion snapper is expected to increase stock biomass and promote a more natural population structure by helping to reverse any trends in decreasing mean length and size/age at sexual maturity that could occur. These effects would benefit the vermilion snapper stock and associated species by protecting the stock against recruitment overfishing and reducing its vulnerability to adverse environmental conditions. The indirect effects of these alternatives on the ecological environment are less certain. Improving the status of the vermilion snapper stock would likely promote more natural ecological functions.

Economic Impacts

A single quota (**Preferred Alternative 2**) would reduce net operating revenues by 61.1% whereas the seasonal partitioning of the quota would result in reductions ranging from 63.8% for **Preferred Alternative 3a** to 68% for **Alternative 3c**. A possible implication of the results is that delaying the opening of the second season with equal allocation with the first season would tend to constrain the activities of some vessels such that potential “losses” in the first season could not be made up in the second season. It would appear that an equal division of the fishing year into two seasons, with possibly equal quota allocation to each season, would provide better fishing conditions than an unequal division of the fishing year.

From the standpoint of distributional effects by area, North Carolina and South Carolina would experience the largest losses in terms of both absolute and percentage values under any of the quota alternatives. The seasonal quota alternatives would only worsen the situation for South Carolina but not necessarily for North Carolina. The Georgia/Northeast Florida area would also experience large losses in terms of both absolute and percentage values in all quota alternatives. The situation for this area would be worse under any of the seasonal quota alternatives than under a single quota.

Alternative 4 is expected to result in an annual reduction in net operating revenues from the status quo of approximately $1.66 million for trips projected to harvest at least one pound of snapper grouper. South Carolina and Georgia/Northeast Florida would be expected to experience the greatest reductions, followed by North Carolina.

The overall economic impacts of **Alternatives 5a and 5b** would not significantly differ from each other, but these impacts would be substantially higher than those of **Alternative 5c** and slightly higher than those of **Preferred Alternative 5d**. Total economic impacts would be about $1.3 million for **Alternatives 5a and 5b**. Total economic impacts for **Alternative 5c** would be about $1.1 million and for **Preferred Alternative 5d**, $1.2 million. In terms of area distribution, South Carolina would incur the largest total losses, followed by Florida, North Florida, and Georgia. This distribution of losses mimics the distribution of baseline producer/consumer surplus by state. Similar distributional impacts by area would hold for consumer but not for producer surplus. Florida would lose more producer surplus than other areas, followed by South Carolina, North Carolina, and then Georgia.

Social Impacts
In general, by ending overfishing and keeping vermilion snapper at a sustainable status, long-term benefits are expected to accrue to all participants in the fishery, commercial, recreational, and the general public. Alternatives differ in how they would allow the stock to arrive at a long-term sustainable status. As a result, each of the alternatives differs in the degree and type of negative short- and long-term impacts imposed on each fishing and non-fishing sector. Section 4.2.5.3 contains a detailed analysis of the negative and positive short-term impacts of the proposed alternatives. Long-term benefits are discussed throughout the analysis but as there are sparse data to analyze long-term effects of management measures on communities, future conditions of communities cannot be predicted with confidence.

Reduce Bycatch of Snapper Grouper Species
Biological Impacts
Alternative 2 would require the use of circle hooks, venting tools, and dehooking devices, which would reduce discard and bycatch mortality in the snapper grouper fishery. The mandatory use of circle hooks specified in **Alternative 2** has the potential to reduce the magnitude of regulatory discards, hooking mortality, and help stressed snapper grouper species return to a healthy sustainable level. Venting, when properly executed, is believed to increase survival of released fish. The use of venting tools may also reduce predation on reef fish species by allowing rapid return to depth making them less vulnerable to predators. The use of dehookers to remove hooks and lines would likely reduce serious injury and post-release mortality of fishes and other incidentally caught species. Dehooking devices can allow fishermen to remove hooks with greater ease and more quickly from snapper grouper species without removing the fish from the water. Leaving a fish in the water while removing the hook can reduce physiological stress.

Alternatives 2a and 2b would require only the commercial or recreational sector to use circle hooks, venting tools, and dehooking devices, respectively; whereas, **Alternative 2c** would require both sectors to comply with these requirements. Similarly, **Preferred Alternative 3** would require venting tools and dehooking devices for both the commercial and recreational sectors but not circle hooks. Therefore, **Alternative 2c**, and to a lesser extent **Preferred Alternative 3**, would be the most effective for reducing bycatch mortality of snapper grouper species. Additionally the Council approved Snapper Grouper Amendment 15B which would require all vessels with commercial and for-hire snapper grouper vessel permits carrying hook-and-line gear onboard to have sea turtle release equipment, a long-handled dehooker for ingested hooks, and a long-handled dehooker for external hooks. These dehooking devices may be effective in removing hooks from some fish species.

Economic Impacts
Vertical line fishermen accounted for about 79% of total snapper grouper harvests. In the Gulf of Mexico, many fishermen fishing with vertical lines use circle hooks, and if

the same were to hold true for the South Atlantic, then the economic effect of requiring circle hooks on many commercial fishermen (**Alternative 2a** and **Alternative 2c**) may be relatively low. However, due to the morphology of their mouths and biting habits, some important species may not be able to take circle hooks and, as a result, the harvests and economic value associated with these species may be reduced. Depending on fishing location and species availability, some fishermen may be substantially dependent on these species. The use of circle hooks has gained in popularity among Gulf for-hire operators and private anglers, and if this were also true among for-hire operators and private anglers in the South Atlantic, then the economic effects of requiring circle hooks for use by the recreational sector (**Alternative 2b** and **Alternative 2c**) would also be relatively low. However, the issue of catchability arises for the recreational sector as well. Fishing equipment suppliers and large-scale retailers currently offer a wide variety of comparably priced hooks, including circle hooks. **Preferred Alternative 3** would retain the requirement to possess de-hooking and venting tools. While this would reduce the potential reduction of bycatch relative to **Alternative 2**, the adverse economic effects of lower targeted harvests would be avoided. Ready-made dehooking devices and venting tools are available for purchase from various sources for less than $15 each. Hence, the economic impacts of requiring dehooking tools and venting devices on either the commercial or recreational sector would be relatively low.

Social Impacts
Preferred Alternative 3 offers ways to reduce the recreational bycatch mortality by requiring the use of venting and dehooking tools. These measures will impose some short-term negative social impacts but the long-term social impacts should be positive as the stock recovers.

Allow NMFS Regional Administrator (RA) to Make Adjustments to Management Measures Pending new Vermilion Snapper SEDAR Assessment
Biological Impacts
A new vermilion snapper benchmark assessment is ongoing, which will incorporate ages from over 9,000 fish. A data workshop was held in May 2008, an assessment workshop in August 2008, and a review workshop in October 2008. If the outcome of the assessment is different than the 2007 vermilion snapper assessment update, **Preferred Alternative 2** would allow the RA to make adjustments to the management measures as specified by the Council in Table 4-79. The commercial quota in **Preferred Alternative 2** would be based on **Preferred Alternative 3a** in Section 4.2.5 where 50% of the directed commercial quota would be allocated to January 1st through June 30th and 50% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Preferred Alternative 2 would implement two seasonal commercial quotas, which would then be reduced for PQBM. The length of time the fishery remains open would depend on the magnitude of reduction harvest needed. **Preferred Alternative 2** would also allow the RA to make adjustments to the bag limit and length of a seasonal closure to achieve the reduction in harvest needed to achieve the yield at F_{OY} specified by the new vermilion snapper benchmark assessment.

Ending overfishing of vermilion snapper is expected to increase stock biomass and promote a more natural population structure by helping to reverse any trends in decreasing mean length and size/age at sexual maturity that could occur. These effects would benefit the vermilion snapper stock and associated species by protecting the stock against recruitment overfishing and reducing its vulnerability to adverse environmental conditions.

Economic Impacts
Although the economic effects associated with the various sub-alternatives under **Preferred Alternative 2** would increase with the severity of the required adjustment, the actual level of adjustment would be determined by biological necessity, so comparison of these effects is not relevant. The relevant comparison is the cost of any adjustment accomplished through the RA decision relative to the cost of the equivalent adjustment accomplished through framework action or plan amendment, as would be required under **Alternative 1**. Since adjustment could occur more quickly under **Preferred Alternative 2** than under **Alternative 1**, the costs of adjustment would be less. Further, the delay in adjustment under **Alternative 1** may require more severe management correction, with associated increased costs. Thus, **Preferred Alternative 2** is expected to result in lower costs than **Alternative 1**.

Social Impacts
If the results of the new stock assessment necessitate only small changes in quotas and other management measures, **Alternative 1** would not allow the fishing participants to experience immediately smaller reductions in benefits than those that would accompany the management measures established in other sections of this amendment. If the stock status worsened, then establishment of new management measures could take more time. While the short-term effects on fishing participants would be less negative in this situation, the long-term effects could prove to be more negative as more stringent measures would have to be instituted.

Preferred Alternative 2 would allow the RA to choose a set of commercial quota and recreational bag limit/seasonal closures with the level of harvest reductions dependent on the results of the new stock assessment. In this scenario, the short-term negative or positive effects on fishing participants could take place within a short period. More importantly, the long-term sustainability of the stock would be directly addressed and thus the long-term positive effects would be more likely realized within a shorter period of time.

1 Introduction

Management of the Federal snapper grouper fishery located off the South Atlantic in the 3-200 nautical mile (nm) U.S. Exclusive Economic Zone (EEZ) is conducted under the Fishery Management Plan (FMP) for the Snapper Grouper Fishery (SAFMC 1983) (Figure 1-1). The fishery management plan (FMP) and its amendments are developed under the Reauthorized Magnuson-Stevens Fishery Conservation and Management Act (RMSA), other applicable Federal laws and executive orders (E.O.s), and affect the management of 73 species (Table 1-2). The purpose of the FMP is to manage the snapper grouper fishery for optimum yield (OY) and to allocate harvest among user groups while preventing overfishing and conserving marine resources.

Stock assessments in the South Atlantic are performed through the Southeast Data, Assessment, and Review (SEDAR) program. The assessments provide an evaluation of stock health and directionality of overall stock health under the current management regime and other potential future harvest conditions. More specifically, the assessments provide an estimation of the Maximum Sustainable Yield (MSY) and a determination of the stock status (whether overfishing is occurring and whether the stock is overfished). Following the assessment, the Council's Scientific and Statistical Committee (SSC) reviews the stock assessment information and advises the Council on whether the stock assessment was performed utilizing the best available data and whether the outcome of the assessment is suitable for management purposes.

Between 2006 and 2007, gag and vermilion snapper stocks in the South Atlantic were assessed through the SEDAR process (Table 1-1). The assessments provided an estimation of MSY for each stock and determined that both stocks were undergoing overfishing. On June 12, 2007, the SSC approved both assessments as being based upon the best available science. On the same date, the Council received notification from the NMFS Southeast Regional Office Regional Administrator that both stocks were undergoing overfishing and that the Council is required to prepare a plan amendment or proposed regulations to end overfishing within one year of the notification.

Table 1-1. Assessment information for the subject stocks.

	Source & Year Completed	**Data Thru**	**Date SSC Approved**	**Overfishing?**	**Overfished?**
Gag	SEDAR #10 (2006)	2004	6/12/07	Yes	No
Vermilion snapper	SEDAR Update #3 (2007)	2006	6/12/07	Yes	Unknown

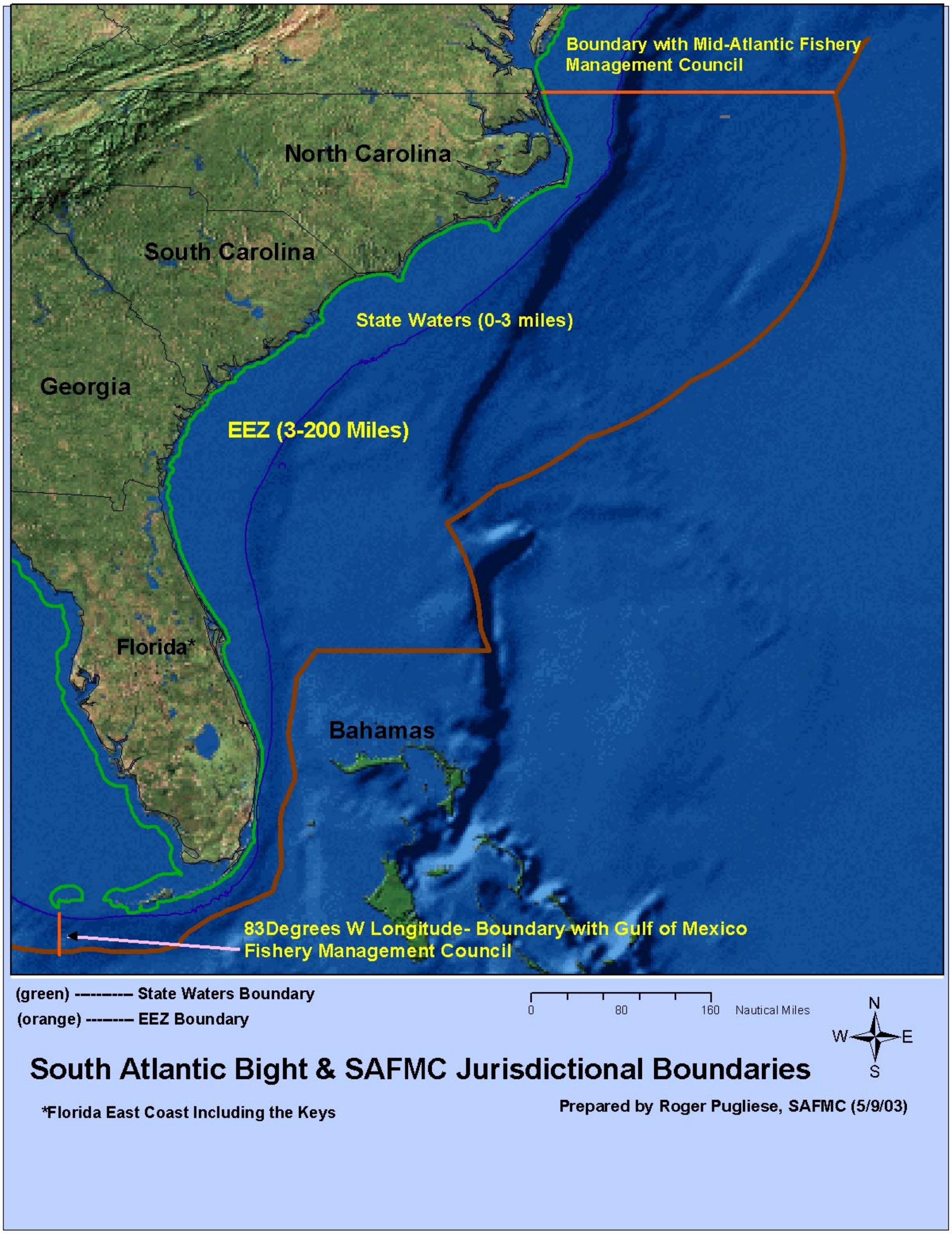


Figure 1-1. Jurisdictional boundaries of the South Atlantic Fishery Management Council.

Table 1-2. Species in the Snapper Grouper Fishery Management Unit (FMU).

Almaco jack, *Seriola rivoliana*
Atlantic spadefish, *Chaetodipterus faber*
Banded rudderfish, *Seriola zonata*
Bank sea bass, *Centropristis ocyurus*
Bar jack, *Caranx ruber*
Black grouper, *Mycteroperca bonaci*
Black margate, *Anisotremus surinamensis*
Black sea bass, *Centropristis striata*
Black snapper, *Apsilus dentatus*
Blackfin snapper, *Lutjanus buccanella*
Blue runner, *Caranx crysos*
Blueline tilefish, *Caulolatilus microps*
Bluestriped grunt, *Haemulon sciurus*
Coney, *Cephalopholis fulva*
Cottonwick, *Haemulon melanurum*
Crevalle jack, *Caranx hippos*
Cubera snapper, *Lutjanus cyanopterus*
Dog snapper, *Lutjanus jocu*
French grunt, *Haemulon flavolineatum*
Gag, *Mycteroperca microlepis*
Golden tilefish, *Lopholatilus chamaeleonticeps*
Goliath grouper, *Epinephelus itajara*
Grass porgy, *Calamus arctifrons*
Gray (mangrove) snapper, *Lutjanus griseus*
Gray triggerfish, *Balistes capriscus*
Graysby, *Cephalopholis cruentata*
Greater amberjack, *Seriola dumerili*
Hogfish, *Lachnolaimus maximus*
Jolthead porgy, *Calamus bajonado*
Knobbed porgy, *Calamus nodosus*
Lane snapper, *Lutjanus synagris*
Lesser amberjack, *Seriola fasciata*
Longspine porgy, *Stenotomus caprinus*
Mahogany snapper, *Lutjanus mahogoni*
Margate, *Haemulon album*
Misty grouper, *Epinephelus mystacinus*
Mutton snapper, *Lutjanus analis*
Nassau grouper, *Epinephelus striatus*
Ocean triggerfish, *Canthidermis sufflamen*
Porkfish, *Anisotremus virginicus*
Puddingwife, *Halichoeres radiatus*
Queen snapper, *Etelis oculatus*
Queen triggerfish, *Balistes vetula*
Red grouper, *Epinephelus morio*
Red hind, *Epinephelus guttatus*
Red porgy, *Pagrus pagrus*
Red snapper, *Lutjanus campechanus*
Rock hind, *Epinephelus adscensionis*
Rock Sea Bass, *Centropristis philadelphica*
Sailors choice, *Haemulon parra*
Sand tilefish, *Malacanthus plumieri*
Saucereye porgy, *Calamus calamus*
Scamp, *Mycteroperca phenax*
Schoolmaster, *Lutjanus apodus*
Scup, *Stenotomus chrysops*
Sheepshead, *Archosargus probatocephalus*
Silk snapper, *Lutjanus vivanus*
Smallmouth grunt, *Haemulon chrysargyreum*
Snowy grouper, *Epinephelus niveatus*
Spanish grunt, *Haemulon macrostomum*
Speckled hind, *Epinephelus drummondhayi*
Tiger grouper, *Mycteroperca tigris*
Tomtate, *Haemulon aurolineatum*
Yellow jack, *Caranx bartholomaei*
Yellowedge grouper, *Epinephelus flavolimbatus*
Yellowfin grouper, *Mycteroperca venenosa*
Yellowmouth grouper, *Mycteroperca interstitialis*
Yellowtail snapper, *Ocyurus chrysurus*
Vermilion snapper, *Rhomboplites aurorubens*
Warsaw grouper, *Epinephelus nigritus*
White grunt, *Haemulon plumieri*
Whitebone porgy, *Calamus leucosteus*
Wreckfish, *Polyprion americanus*

1.1 Purpose and Need

The purpose of this amendment is to alter current management measures and implement new management measures that would reduce current harvest levels to yields associated with the Optimum Yield (OY) and end overfishing of gag and vermilion snapper in the South Atlantic. This amendment includes an action that would allow the NMFS Regional Administrator (RA) to make needed adjustments to management measures to end overfishing based on the results of an ongoing vermilion snapper SEDAR benchmark assessment and alternatives that specify interim allocations between the commercial and recreational sectors for the gag and vermilion snapper fisheries. This amendment also would implement new status determination criteria for gag and vermilion snapper, including Maximum Sustainable Yield (MSY), Optimum Yield (OY), and Minimum Stock Size Threshold (MSST) that reflect current scientific information as provided by the assessments and approved by the Scientific and Statistical Committee (SSC).

Implement Measures to End Overfishing

The underlying need for the proposed actions in this amendment is to achieve OY on a more consistent basis by either altering current management measures or implementing new management measures to end overfishing of gag and vermilion snapper based upon new scientific information. Furthermore, red grouper and black grouper are experiencing overfishing and the overfishing status of rock hind, red hind, coney, graysby, yellowmouth grouper, yellowfin grouper, and tiger grouper is unknown. Therefore, the intent of Snapper Grouper Amendment 16 is to improve the status of all shallow water grouper species, some of which are taken incidentally when targeting gag and vermilion snapper. Overfishing, as stated in the Magnuson-Stevens Act, "occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce maximum sustainable yield (MSY) on a continuing basis." In a fishery where MSY is not being achieved on a consistent basis, the full extent of social and economic benefits is not realized. For example, in the snapper grouper fishery, low stock levels translate into a loss of catch possibilities for commercial and recreational fishermen. Revenues are reduced when fishermen have to fish longer and harder, which may eventually cause participants to exit the fishery. Ending overfishing and rebuilding overfished stocks would allow fishermen to catch more fish with less effort, resulting in higher economic returns in the long-term as long as effort in the fishery is limited.

Allow the NMFS Regional Administrator (RA) to Make Adjustments to Management Measures

In 2007, the vermilion snapper stock in the South Atlantic was assessed through the SEDAR process. The assessment indicated the stock is undergoing overfishing but its overfished status is unknown because the SSC did not have confidence in the biomass reference points from the SEDAR assessment. Since the assessment was considered an "Update", the scope of the assessment was limited in comparison to the more rigorous "Benchmark-type" assessment. In an Update, for example, participants are limited to using the same type model utilized in the previous benchmark assessment. Recommendations from the update assessment workshop included those to investigate a new model type for the vermilion snapper assessment based on age (the original SEDAR assessment and SEDAR update assessment used a length-structured model).

Recognizing the need for a new SEDAR benchmark assessment, NMFS and the State of South Carolina began sampling available vermilion snapper otoliths from the South Atlantic to enable an age-based assessment. Further, the SEDAR steering committee replaced white grunt in the SEDAR schedule with vermilion snapper. A new age-based SEDAR benchmark assessment for vermilion is ongoing and results will be reviewed by the Council's Scientific and Statistical Committee (SSC) during their November 30 – December 3, 2008 meeting.

The Council was notified in June 2007 that vermilion snapper was undergoing overfishing. Therefore, the Council is obligated to develop an amendment to end overfishing. Since efforts to reassess vermilion snapper are proceeding, NMFS should have the opportunity to review the new assessment results prior to implementing any vermilion snapper regulations proposed by the Council to address the June 2007 overfishing notification. In order to proceed with an amendment, while recognizing the new assessment may alter the type of actions required to end overfishing, the Council has developed specific scenarios that would allow the NMFS Regional Administrator (RA) to alter current management measures, as per the Council's instruction outlined in this amendment, if the assessment results require a harvest reduction different from that proposed in Snapper Grouper Amendment 16.

Define Interim Allocations

The specification of an allocation for a stock is needed to divide the total allowable catch (TAC) between the commercial and recreational sectors. Without the designation of an allocation, the Council is unable to identify the allowable catch in the recreational sector. The Council's objective when setting an allocation is to ensure the adverse socioeconomic impacts of ending overfishing and rebuilding overfished stocks are fairly and equitably distributed. The Council is basing allocations on the historical commercial and recreational landings. The Council is specifying these allocations as interim because allocations for all managed species will be considered in a future amendment.

Management Reference Points

Definitions
MSST. The biomass level below which a stock is considered overfished
MFMT. The maximum level of fishing mortality that a stock or complex can withstand, while still producing MSY on a continuing basis.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires each FMP define four **management reference points.** Reference points are biological signposts against which the status of a stock can be judged and allow managers to measure fishery status and performance. More specifically, by evaluating the current stock biomass (B) and fishing mortality rate (F) in relation to these reference points, fishery managers can determine whether a fishery is overfished or undergoing overfishing, and whether current management measures are sufficient to prevent overfishing and achieve the Optimum Yield (OY).

The four reference points are **MSY, OY, minimum stock size threshold (MSST),** and **maximum fishing mortality threshold (MFMT)**. MSY and OY were described in the previous section. MSST and MFMT are benchmarks used by fishery managers to indicate if a fishery is overfished and if overfishing is occurring, respectively (see box for definitions). When the rate of mortality on a stock caused by fishing activities exceeds MFMT, overfishing is occurring. When the stock biomass is below MSST, the stock is considered overfished.

In the past for snapper grouper species, the Council has specified either numeric values, or proxies for, or ways to calculate (when data became available) the four reference points described above. Recent stock assessments have provided numerical values for the benchmarks. The Council is proposing the following changes based on the gag and vermilion snapper assessments.

- Biomass-based management reference points based on the best available scientific information, and
- OY definitions to be more consistent with the National Standard Guidelines related to that parameter.

For more detail on the Council's reference points…
The Secretary approved the numerical MSY, MSST, and MFMT estimates proposed in Snapper Grouper Amendments 11 (SAFMC 1999) and 12 (SAFMC 2000) for black sea bass and red porgy, respectively. Snapper Grouper Amendment 15A (SAFMC 2008a) specified MSY, MSST, MFMT, and OY for black sea bass, snowy grouper, and red porgy. Amendment 15B has alternatives that would specify management reference points for golden tilefish. Snapper Grouper Amendment 16, completed by the Council at their September 2008 meeting, would specify management reference points for gag and vermilion snapper. Snapper Grouper Amendment 17, which is under development, would specify management reference points for red snapper. The Snapper Grouper FMP currently defines MSY and OY for all other snapper grouper stocks as the yield produced by fishing at fixed exploitation rates (F_{MSY} and F_{OY}, respectively), which are designed to remove a constant fraction of the stocks each year. When F_{MSY} has not been estimated by a stock assessment, it is approximated as the fishing mortality rate that would reduce the long-term average level of spawning per recruit (static SPR) to 30-40% of the long-term average that would be expected in the absence of fishing. Similarly, F_{OY} is estimated as a rate of fishing that would reduce the long-term average level of static SPR to 40-50% of that which would be expected for a virgin stock. The MSST of snapper grouper stocks except snowy grouper and golden tilefish is defined as one-half of the stock biomass at MSY (B_{MSY}), or the product of that biomass and one minus the natural mortality rate, whichever is greater. This definition is designed to specify a higher overfished threshold for less productive stocks relative to those stocks that are highly productive and capable of increasing in biomass more quickly. However, when the estimate of the natural mortality rate is small (i.e., snowy grouper and golden tilefish), the overfished threshold can be very close to the rebuilding goal of B_{MSY}. Snapper Grouper Amendment 15A (SAFMC 2008a) defined MSST = 0.75 X B_{MSY} for snowy grouper. The preferred alternative in Snapper Grouper Amendment 15B (SAFMC 2008b) would also define MSST = 0.75 X B_{MSY} for golden tilefish. The Council currently defines MFMT as F_{MSY} or fishing mortality that will produce the MSY.

Reduce Bycatch of Snapper Grouper Species

Vermilion snapper and gag are part of a multi-species fishery where many species occupy the same habitat at the same time. Therefore, when restrictions are placed on species such as vermilion snapper and gag, they may still be caught and suffer mortality when fishermen target co-occurring species. Snapper Grouper Amendment 16 proposes requiring the use of venting tools and dehooking devices to reduce bycatch mortality of all snapper grouper species. Discard mortality rates of snapper grouper stocks that are either overfished or are undergoing overfishing could decrease with the use of these devices. Therefore, this action could help stressed snapper grouper species return to a healthy, sustainable level and help achieve OY.

Actions proposed in Amendment 16 would:

- Implement measures to end overfishing of gag and vermilion snapper;
- Implement measures to reduce overfishing of red and black grouper;
- Allow the NMFS Regional Administrator (RA) to make adjustments to management measures pending the outcome of a new age-based SEDAR benchmark assessment for vermilion snapper;
- Specify total allowable catch and define interim allocations for gag and vermilion snapper;
- Update management reference points for gag and vermilion snapper; and
- Reduce bycatch of snapper grouper species.

1.2 *History of Management*

The snapper grouper fishery is highly regulated; some of the species included in this amendment have been regulated since 1983. The original Snapper Grouper Fishery Management Plan (SAFMC 1983) included size limits for black sea bass (8" TL). Trawl gear, primarily targeting vermilion snapper, was prohibited starting in January 1989. Fish traps (not including black sea bass pots) and entanglement nets were prohibited starting in January 1992. Bag limits (10 vermilion snapper; 5 groupers) and size limits (10" TL recreational vermilion snapper; 12" TL commercial vermilion snapper; 12" TL recreational & commercial red porgy) were also implemented in January 1992. Quotas and trip limits for snowy grouper and golden tilefish were implemented in July 1994; tilefish were also added to the 5-grouper aggregate bag limit. A controlled access program for the commercial fishery was implemented fully beginning in 1999. In February 1999, red porgy regulations were 14" TL size limit and 5 fish bag limit and commercial closure during March and April; black sea bass size limit increased to 10" TL and a 20-fish bag limit was included. All harvest of red porgy was prohibited from September 8, 1999 until August 28, 2000. Beginning on August 29, 2000 red porgy regulations included a January through April commercial closure, 1 fish bag limit, and 50 pound commercial bycatch allowance May through December.

Most recently, Snapper Grouper Amendment 15A (SAFMC 2008a) established rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy. Snapper Grouper Amendment 13C (SAFMC 2006) implemented the following regulatory actions to end or phase out overfishing of the snowy grouper, golden tilefish, vermilion snapper, and black sea bass stocks, and to increase catches of red porgy to a level consistent with the approved stock rebuilding plan in federal waters of the South Atlantic:

Snowy Grouper:	Decrease the annual commercial quota over three years (Year 1 = 2006) from 151,000 pounds gutted weight (lbs gw) to 84,000 lbs gw in year 3; decrease the commercial trip limit over three years from 275 lbs gw to 100 lbs gw in year 3; and limit possession to 1 per person per day within the 5-grouper per person per day aggregate recreational bag.
Golden Tilefish:	Reduce the annual commercial quota to 295,000 lbs gw; reduce the commercial trip limit to 4,000 lbs gw, which would decrease to 300 lbs gw if 75 percent of the quota were taken by September 1; and limit possession to 1 per person per day within the 5-grouper per person per day aggregate recreational bag limit.
Vermilion Snapper:	Establish an annual commercial quota of 1,100,000 lbs gw; and increase the recreational minimum size limit from 11-inch total length (TL) to 12-inch TL.
Black Sea Bass:	Establish and decrease an annual commercial quota, over three years from 477,000 lbs gw to 309,000 lbs gw in year 3; require the use of at least 2-inch mesh for the entire back panel of pots; remove pots from the water once the commercial quota is met; change

	commercial and recreational fishing years from the calendar year to June 1 through May 31; establish a recreational allocation which would decrease over three years from 633,000 lbs gw to 409,000 lbs gw in year 3; increase the recreational size limit from 10-inch TL to 12-inch TL over two years; and reduce the recreational bag limit from 20 to 15 per person per day.
Red Porgy:	Increase the commercial trip limit during May through December to 120 fish; establish a commercial quota of 127,000 lbs gw; and increase the recreational bag limit from 1 to 3 red porgy per person per day.

Specific details on these and all the other regulations implemented in the snapper grouper fishery are shown below in Table 1-3.

Table 1-3. History of management.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
FMP (1983)	08/31/83	PR: 48 FR 26843 FR: 48 FR 39463	-12" limit – red snapper, yellowtail snapper, red grouper, Nassau grouper -8" limit – black sea bass -4" trawl mesh size -Gear limitations – poisons, explosives, fish traps, trawls -Designated modified habitats or artificial reefs as Special Management Zones (SMZs)
Regulatory Amendment #1 (1986)	03/27/87	PR: 51 FR 43937 FR: 52 FR 9864	-Prohibited fishing in SMZs except with hand-held hook-and-line and spearfishing gear. -Prohibited harvest of goliath grouper in SMZs.
Amendment #1 (1988)	01/12/89	PR: 53 FR 42985 FR: 54 FR 1720	-Prohibited trawl gear to harvest fish south of Cape Hatteras, NC and north of Cape Canaveral, FL. -Directed fishery defined as vessel with trawl gear and ≥200 lbs s-g on board. -Established rebuttable assumption that vessel with s-g on board had harvested such fish in EEZ.
Regulatory Amendment #2 (1988)	03/30/89	PR: 53 FR 32412 FR: 54 FR 8342	-Established 2 artificial reefs off Ft. Pierce, FL as SMZs.
Notice of Control Date	09/24/90	55 FR 39039	-Anyone entering federal wreckfish fishery in the EEZ off S. Atlantic states after 09/24/90 was not assured of future access if limited entry program developed.
Regulatory Amendment #3 (1989)	11/02/90	PR: 55 FR 28066 FR: 55 FR 40394	-Established artificial reef at Key Biscayne, FL as SMZ. Fish trapping, bottom longlining, spear fishing, and harvesting of Goliath grouper prohibited in SMZ.
Amendment #2 (1990)	10/30/90	PR: 55 FR 31406 FR: 55 FR 46213	-Prohibited harvest/possession of goliath grouper in or from the EEZ -Defined overfishing for goliath grouper and other species

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Emergency Rule	8/3/90	55 FR 32257	-added wreckfish to the FM -fishing year beginning 4/16/90 -commercial quota of 2 million pounds -commercial trip limit of 10,000 pounds per trip
Fishery Closure Notice	8/8/90	55 FR 32635	-the fishery was closed because the commercial quota of 2 million pounds was reached
Emergency Rule Extension	11/1/90	55 FR 40181	-extended the measures implemented via emergency rule on 8/3/90
Amendment #3 (1990)	01/31/91	PR: 55 FR 39023 FR: 56 FR 2443	-Add wreckfish to the FMU; -Defined optimum yield and overfishing -Required permit to fish for, land or sell wreckfish; -Required catch and effort reports from selected, permitted vessels; -Established control date of 03/28/90; -Established a fishing year for wreckfish starting April 16; -Established a process to set annual quota, with initial quota of 2 million pounds; provisions for closure; -Established 10,000 pound trip limit; -Established a spawning season closure for wreckfish from January 15 to April 15; and -Provided for annual adjustments of wreckfish management measures;
Notice of Control Date	07/30/91	56 FR 36052	-Anyone entering federal snapper grouper fishery (other than for wreckfish) in the EEZ off S. Atlantic states after 07/30/91 was not assured of future access if limited entry program developed.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #4 (1991)	01/01/92	PR: 56 FR 29922 FR: 56 FR 56016	-Prohibited gear: fish traps except black sea bass traps north of Cape Canaveral, FL; entanglement nets; longline gear inside 50 fathoms; bottom longlines to harvest wreckfish**; powerheads and bangsticks in designated SMZs off S. Carolina. -defined overfishing/overfished and established rebuilding timeframe: red snapper and groupers ≤ 15 years (year 1 = 1991); other snappers, greater amberjack, black sea bass, red porgy ≤ 10 years (year 1 = 1991) -Required permits (commercial & for-hire) and specified data collection regulations -Established an assessment group and annual adjustment procedure (framework) -Permit, gear, and vessel id requirements specified for black sea bass traps. -No retention of snapper grouper spp. caught in other fisheries with gear prohibited in snapper grouper fishery if captured snapper grouper had no bag limit or harvest was prohibited. If had a bag limit, could retain only the bag limit. -8" limit – lane snapper -10" limit – vermilion snapper (recreational only) -12" limit – red porgy, vermilion snapper (commercial only), gray, yellowtail, mutton, schoolmaster, queen, blackfin, cubera, dog, mahogany, and silk snappers -20" limit – red snapper, gag, and red, black, scamp, yellowfin, and yellowmouth groupers. -28" FL limit – greater amberjack (recreational only) -36" FL or 28" core length – greater amberjack (commercial only) -bag limits – 10 vermilion snapper, 3 greater amberjack -aggregate snapper bag limit – 10/person/day, excluding vermilion snapper and allowing no more than 2 red snappers -aggregate grouper bag limit – 5/person/day, excluding Nassau and goliath grouper, for which no retention (recreational & commercial) is allowed -spawning season closure – commercial harvest greater amberjack > 3 fish bag prohibited in April south of Cape Canaveral, FL -spawning season closure – commercial harvest mutton snapper >snapper aggregate prohibited during May and June -charter/headboats and excursion boat possession limits extended

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #5 (1991)	04/06/92	PR: 56 FR 57302 FR: 57 FR 7886	-Wreckfish: established limited entry system with ITQs; required dealer to have permit; rescinded 10,000 lb. trip limit; required off-loading between 8 am and 5 pm; reduced occasions when 24-hour advance notice of offloading required for off-loading; established procedure for initial distribution of percentage shares of TAC
Emergency Rule	8/31/92	57 FR 39365	-Black Sea Bass (bsb): modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Emergency Rule Extension	11/30/92	57 FR 56522	-Black Sea Bass: modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Regulatory Amendment #4 (1992)	07/06/93	FR: 58 FR 36155	-Black Sea Bass: modified definition of bsb pot; allowed multi-gear trips for bsb; allowed retention of incidentally-caught fish on bsb trips
Regulatory Amendment #5 (1992)	07/31/93	PR: 58 FR 13732 FR: 58 FR 35895	-Established 8 SMZs off S. Carolina, where only hand-held, hook-and-line gear and spearfishing (excluding powerheads) was allowed.
Amendment #6 (1993)	07/27/94	PR: 59 FR 9721 FR: 59 FR 27242	-commercial quotas for snowy grouper, golden tilefish -commercial trip limits for snowy grouper, golden tilefish, speckled hind, and warsaw grouper -include golden tilefish in grouper recreational aggregate bag limits -prohibited sale of warsaw grouper and speckled hind -100% logbook coverage upon renewal of permit -creation of the *Oculina* Experimental Closed Area -data collection needs specified for evaluation of possible future IFQ system
Amendment #7 (1994)	01/23/95	PR: 59 FR 47833 FR: 59 FR 66270	-12" FL – hogfish -16" TL – mutton snapper -required dealer, charter and headboat federal permits -allowed sale under specified conditions -specified allowable gear and made allowance for experimental gear -allowed multi-gear trips in N. Carolina -added localized overfishing to list of problems and objectives -adjusted bag limit and crew specs. for charter and head boats -modified management unit for scup to apply south of Cape Hatteras, NC -modified framework procedure
Regulatory Amendment #6 (1994)	05/22/95	PR: 60 FR 8620 FR: 60 FR 19683	Established actions which applied only to EEZ off Atlantic coast of FL: Bag limits – 5 hogfish/person/day (recreational only), 2 cubera snapper/person/day > 30" TL; 12" TL – gray triggerfish
Notice of Control Date	04/23/97	62 FR 22995	-Anyone entering federal bsb pot fishery off S. Atlantic states after 04/23/97 was not assured of future access if limited entry program developed.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #8 (1997)	12/14/98	PR: 63 FR 1813 FR: 63 FR 38298	-established program to limit initial eligibility for snapper grouper fishery: Must demonstrate landings of any species in SG FMU in 1993, 1994, 1995 or 1996; and have held valid SG permit between 02/11/96 and 02/11/97. -granted transferable permit with unlimited landings if vessel landed ≥ 1,000 lbs. of snapper grouper spp. in any of the years -granted non-transferable permit with 225 lb. trip limit to all other vessels -modified problems, objectives, OY, and overfishing definitions -expanded Council's habitat responsibility -allowed retention of snapper grouper spp. in excess of bag limit on permitted vessel with a single bait net or cast nets on board -allowed permitted vessels to possess filleted fish harvested in the Bahamas under certain conditions.
Regulatory Amendment #7 (1998)	01/29/99	PR: 63 FR 43656 FR: 63 FR 71793	-Established 10 SMZs at artificial reefs off South Carolina.
Interim Rule Request	1/16/98		-Council requested all Amendment 9 measures except black sea bass pot construction changes be implemented as an interim request under MSA
Action Suspended	5/14/98		-NMFS informed the Council that action on the interim rule request was suspended
Emergency Rule Request	9/24/98		-Council requested Amendment 9 be implemented via emergency rule
Request not Implemented	1/22/99		-NMFS informed the Council that the final rule for Amendment 9 would be effective 2/24/99; therefore they did not implement the emergency rule

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #9 (1998)	2/24/99	PR: 63 FR 63276 FR: 64 FR 3624	-Red porgy: 14" length (recreational and commercial); 5 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, in March and April. -Black sea bass: 10" length (recreational and commercial); 20 fish rec. bag limit; required escape vents and escape panels with degradable fasteners in bsb pots -Greater amberjack: 1 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, during April; quota = 1,169,931 lbs; began fishing year May 1; prohibited coring. -Vermilion snapper: 11" length (recreational) Gag: 24" length (recreational); no commercial harvest or possession > bag limit, and no purchase or sale, during March and April -Black grouper: 24" length (recreational and commercial); no harvest or possession > bag limit, and no purchase or sale, during March and April. -Gag and Black grouper: within 5 fish aggregate grouper bag limit, no more than 2 fish may be gag or black grouper (individually or in combination) -All SG without a bag limit: aggregate recreational bag limit 20 fish/person/day, excluding tomtate and blue runners -Vessels with longline gear aboard may only possess snowy, Warsaw, yellowedge, and misty grouper, and golden, blueline and sand tilefish.
Amendment #9 (1998) resubmitted	10/13/00	PR: 63 FR 63276 FR: 65 FR 55203	-Commercial trip limit for greater amberjack
Regulatory Amendment #8 (2000)	11/15/00	PR: 65 FR 41041 FR: 65 FR 61114	-Established 12 SMZs at artificial reefs off Georgia; revised boundaries of 7 existing SMZs off Georgia to meet CG permit specs; restricted fishing in new and revised SMZs
Emergency Interim Rule	09/08/99, expired 08/28/00	64 FR 48324 and 65 FR 10040	-Prohibited harvest or possession of red porgy.
Emergency Action	9/3/99	64 FR 48326	-Reopened the Snapper Grouper Amendment 8 permit application process
Amendment #10 (1998)	07/14/00	PR: 64 FR 37082 and 64 FR 59152 FR: 65 FR 37292	-Identified EFH and established HAPCs for species in the SG FMU.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #11 (1998d)	12/02/99	PR: 64 FR 27952 FR: 64 FR 59126	-MSY proxy: goliath and Nassau grouper = 40% static SPR; all other species = 30% static SPR -OY: hermaphroditic groupers = 45% static SPR; goliath and Nassau grouper = 50% static SPR; all other species = 40% static SPR -Overfished/overfishing evaluations: BSB: overfished (MSST=3.72 mp, 1995 biomass=1.33 mp); undergoing overfishing (MFMT=0.72, F1991-1995=0.95) Vermilion snapper: overfished (static SPR = 21-27%). Red porgy: overfished (static SPR = 14-19%). Red snapper: overfished (static SPR = 24-32%) Gag: overfished (static SPR = 27%) Scamp: no longer overfished (static SPR = 35%) Speckled hind: overfished (static SPR = 8-13%) Warsaw grouper: overfished (static SPR = 6-14%) Snowy grouper: overfished (static SPR = 5=15%) White grunt: no longer overfished (static SPR = 29-39%) Golden tilefish: overfished (couldn't estimate static SPR) Nassau grouper: overfished (couldn't estimate static SPR) Goliath grouper: overfished (couldn't estimate static SPR) -overfishing level: goliath and Nassau grouper = F>F40% static SPR; all other species: = F>F30% static SPR Approved definitions for overfished and overfishing. MSST = [(1-M) or 0.5 whichever is greater]*Bmsy. MFMT = Fmsy
Amendment #12 (2000)	09/22/00	PR: 65 FR 35877 FR: 65 FR 51248	-Red porgy: MSY=4.38 mp; OY=45% static SPR; MFMT=0.43; MSST=7.34 mp; rebuilding timeframe=18 years (1999=year 1); no sale during Jan-April; 1 fish bag limit; 50 lb. bycatch comm. trip limit May-December; modified management options and list of possible framework actions.
Amendment #13A (2003)	04/26/04	PR: 68 FR 66069 FR: 69 FR 15731	-Extended for an indefinite period the regulation prohibiting fishing for and possessing snapper grouper spp. within the *Oculina* Experimental Closed Area.
Notice of Control Date	10/14/05	70 FR 60058	-The Council is considering management measures to further limit participation or effort in the commercial fishery for snapper grouper species (excluding Wreckfish).

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #13C (2006)	10/23/06	PR: 71 FR 28841 FR: 71 FR 55096	- End overfishing of snowy grouper, vermilion snapper, black sea bass, and golden tilefish. Increase allowable catch of red porgy. Year 1 = 2006. 1. Snowy Grouper Commercial: Quota (gutted weight) = 151,000 lbs gw in year 1, 118,000 lbs gw in year 2, and 84,000 lbs gw in year 3 onwards. Trip limit = 275 lbs gw in year 1, 175 lbs gw in year 2, and 100 lbs gw in year 3 onwards. Recreational: Limit possession to one snowy grouper in 5 grouper per person/day aggregate bag limit. 2. Golden Tilefish Commercial: Quota of 295,000 lbs gw, 4,000 lbs gw trip limit until 75% of the quota is taken when the trip limit is reduced to 300 lbs gw. Do not adjust the trip limit downwards unless 75% is captured on or before September 1. Recreational: Limit possession to 1 golden tilefish in 5 grouper per person/day aggregate bag limit. 3. Vermilion Snapper Commercial: Quota of 1,100,000 lbs gw. Recreational: 12" size limit. 4. Black Sea Bass Commercial: Commercial quota (gutted weight) of 477,000 lbs gw in year 1, 423,000 lbs gw in year 2, and 309,000 lbs gw in year 3 onwards. Require use of at least 2" mesh for the entire back panel of black sea bass pots effective 6 months after publication of the final rule. Require black sea bass pots be removed from the water when the quota is met. Change fishing year from calendar year to June 1 – May 31. Recreational: Recreational allocation of 633,000 lbs gw in year 1, 560,000 lbs gw in year 2, and 409,000 lbs gw in year 3 onwards. Increase minimum size limit from 10" to 11" in year 1 and to 12" in year 2. Reduce recreational bag limit from 20 to 15 per person per day. Change fishing year from the calendar year to June 1 through May 31. 5. Red Porgy Commercial and recreational 1. Retain 14" TL size limit and seasonal closure (retention limited to the bag limit); 2. Specify a commercial quota of 127,000 lbs gw and prohibit sale/purchase and prohibit harvest and/or possession beyond the bag limit when quota is taken and/or during January through April; 3. Increase commercial trip limit from 50 lbs ww to 120 red porgy (210 lbs gw) during May through December; 4. Increase recreational bag limit from one to three red porgy per person per day.
Notice of Control Date	3/8/07	72 FR 60794	-The Council may consider measures to limit participation in the snapper grouper for-hire fishery

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #14 (2007) Sent to NMFS 7/18/07	TBD	PR: 73 FR 32281 TBD	-Establish eight deepwater Type II marine protected areas (MPAs) to protect a portion of the population and habitat of long-lived deepwater snapper grouper species.
Amendment #15A (2007)	3/14/08	73 FR 14942	- Establish rebuilding plans and SFA parameters for snowy grouper, black sea bass, and red porgy.
Amendment #15B (2008b)	TBD	TBD	- Prohibit the sale of bag-limit caught snapper grouper species. -Reduce the effects of incidental hooking on sea turtles and smalltooth sawfish. - Adjust commercial renewal periods and transferability requirements. - Implement plan to monitor and assess bycatch, - Establish reference points for golden tilefish. - Establish allocations for snowy grouper (95% com & 5% rec) and red porgy (50% com & 50% rec).
Amendment #16 (SAFMC 2008c)	TBD	TBD	-Specify SFA parameters for gag and vermilion snapper -For gag grouper: Specify interim allocations 51%com & 49%rec; rec & com spawning closure January through April; directed com quota=348,440 pounds gutted weight; reduce 5-grouper aggregate to 3-grouper and 2 gag/black to 1 gag/black and exclude captain & crew from possessing bag limit. -For vermilion snapper: Specify interim allocations 68%com & 32%rec; directed com quota split Jan-June=168,501 pounds gutted weight and 155,501 pounds July-Dec; reduce bag limit from 10 to 4 and a rec closed season October through May 15. In addition, the NMFS RA will set new regulations based on new stock assessment. -Require venting and dehooking tools.
Amendment #17 (TBD)	TBD	TBD	- Establish annual catch limits and accountability measures for snapper grouper species currently experiencing overfishing. - Specify ABC Control Rules - Establish a rebuilding plan (rebuilding timeframe and rebuilding strategy) for red snapper. - Implement management measures to end overfishing and rebuild red snapper. - Establish allocations for species experiencing overfishing. - Reconsider OY for 10 species undergoing overfishing. - Specify management reference points for red snapper. - Extend the range of some snapper grouper species through the Mid-Atlantic or New England Council’s area of authority. - Promote fair and equitable regulations in the commercial fishery for snowy grouper.

1.3 *Management Objectives*

The Council's objectives for the snapper grouper fishery are shown below. These were last updated in Snapper Grouper FMP Amendment 8 (SAFMC 1997).

1. Prevent overfishing.
2. Collect necessary data.
3. Promote orderly utilization of the resource.
4. Provide for a flexible management system.
5. Minimize habitat damage.
6. Promote public compliance and enforcement.
7. Mechanism to vest participants.
8. Promote stability and facilitate long-rub planning.
9. Create market-driven harvest pace and increase product continuity.
10. Minimize gear and area conflicts among fishermen.
11. Decrease incentives for overcapitalization.
12. Prevent continual dissipation of returns from fishing through open access.
13. Evaluate and minimize localized depletion.

2 Alternatives

Alternatives considered by the Council in this amendment are outlined in Section 2.1 and their environmental consequences (environmental consequences of the alternatives are described in detail in Section 4.0) are outlined in Section 2.1. These alternatives were identified and developed through multiple processes, including the scoping process, public hearings and/or comments, interdisciplinary plan team meetings, and meetings of the Council, the Council's Snapper Grouper Committee, Snapper Grouper Advisory Panel, and Scientific and Statistical Committee. Alternatives the Council considered but eliminated from detailed study during the development of this amendment are described in **Appendix A**.

Each alternative retained for analysis is designed to accomplish one of the following general categories of actions:

- Specify management measures to end overfishing of gag and vermilion snapper (Note: these measures will reduce overfishing of red and black grouper.);
- Specify total allowable catch and define interim allocations for gag and vermilion snapper;
- Reduce bycatch mortality of snapper grouper species; and
- Update management reference points.

2.1 *Description of Alternatives*

2.1.1 Gag

2.1.1.1 Management Reference Point Alternatives

Maximum Sustainable Yield (MSY) for Gag
Alternatives are shown because the current definition for MSY is being replaced (Table 2-1). In the future, this will not be an action item unless the Council decides to change how MSY is calculated; the value will be updated from the most recent SEDAR assessment.

Optimum Yield (OY) for Gag
Alternatives are shown because the current definition for OY is being replaced (Table 2-1). In the future, this will not be an action item unless the Council decides to change the way OY is calculated; the value will be updated from the most recent SEDAR assessment.

Table 2-1. MSY and OY alternatives for gag.

Alternatives	Equation	F_{MSY} & F_{OY} Values	MSY & OY Values
Alternative 1 (no action)	MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{45\%SPR}$ is used as the F_{OY} proxy.	F_{MSY} = 0.18* F_{OY} = 0.11*	Not specified Not specified
Alternative 2 (preferred)	MSY equals the yield produced by F_{MSY}. MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by F_{OY}. If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. Gag are not overfished.	0.237** See subalts. below	1,238,000 lbs gutted weight
Alternative 2a		(65%)(F_{MSY})	1,188,000 lbs gutted weight**
Alternative 2b (preferred)		(75%)(F_{MSY})	1,217,000 lbs gutted weight**
Alternative 2c		(85%)(F_{MSY})	1,230,000 lbs gutted weight**
*Source: Powers 1999 ** Source: Table 36. SEDAR 10 (2006)			

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = (1-M)*SSB_{MSY}. This formula is recommended in the Technical Guidance Document developed by NMFS (Restrepo *et al.* 1998) and represents 1 minus the natural mortality multiplied by the spawning stock biomass at maximum sustainable yield. This value from Table 36 in SEDAR 10 (2006) is 6,816,000 pounds gutted weight (Table 2-2).

Table 2-2. Criteria used to determine the overfished and overfishing status of gag. Source: Tables 36 and 44 in SEDAR 10 (2006)SEDAR 10 (2006).

DETERMINATION	SSB_{2005}	MSST	F_{2004}	MFMT	STATUS
OVERFISHED?	7,470,000	6,816,000			Not Overfished (B_{2005}/MSST = 1.096)
OVERFISHING?			0.310	0.237	Overfishing (F_{2004}/MFMT = 1.309)

2.1.1.2 Gag Total Allowable Catch

The Council's Scientific and Statistical Committee (SSC) recommended the Council restrict harvest to F_{OY}, which is equal to the yield associated with 75% of F_{MSY}. This corresponds to a total allowable catch (TAC) of 694,000 pounds gutted weight for all sectors until modified by future action (Table 2-3). The preferred alternative is based on the yield at 75%Fmsy, which was the Council's preferred alternative for OY. The Council also considered OY alternatives for 65%Fmsy and 85%Fmsy, which could correspond to TACs above and below those specified in the preferred alternative.

Table 2-3. Gag total allowable catch (TAC).

Alternatives	TAC (pounds gutted weight)
Alternative 1 (no action)	Do not specify a TAC
Alternative 2 (preferred)	Set the TAC* = 694,000 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.
*Source: SEDAR 10 (2006)	

2.1.1.3 Interim Gag Allocation Alternatives and Resulting Commercial Quota & Recreational Allocation

Alternative 1 (no action). Do not define interim allocations for gag. Status quo based on landings from 2004-2005.

Alternative 2 (preferred). Define interim allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1999-2003. The allocation would be 51% commercial and 49% recreational (Table 2-4). This alternative would establish a commercial quota of 353,940 pounds gutted weight and a recreational allocation of 340,060 pounds gutted weight.

Alternative 3. Define interim allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-1998. The allocation would be 66% commercial and 34% recreational (Table 2-4). This alternative would establish a commercial quota of 458,040 pounds gutted weight and a recreational allocation of 235,960 pounds gutted weight.

Alternative 4. Define allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 61% commercial and 39% recreational (Table 2-4). This alternative would establish a commercial quota of 423,340 pounds gutted weight and a recreational allocation of 270,660 pounds gutted weight.

Table 2-4. Commercial quotas and recreational allocations for gag (pounds gutted weight) based on the TAC associated with the yield at 75% of F_{MSY}.

		Alternative 1		Alternative 2 (preferred)		Alternative 3		Alternative 4	
Year	**Catch Level**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**
2009 Onwards	694,000	353,940	340,060	353,940	340,060	458,040	235,960	423,340	270,660

Allocation Alternatives 2-4 are compared to the average 2004-2006 landings in Table 2-5 to determine the percentage reduction to each sector (Table 2-6).

Table 2-5. Historical gag landings.

Gag Landings (gutted weight)				Total	Total
Year	**Commercial**	**Headboat**	**MRFSS**	**Recreational**	**Landings**
2001	532,000	53,000	455,000	508,000	1,040,000
2002	534,000	51,000	266,000	317,000	851,000
2003	560,000	32,000	519,000	551,000	1,111,000
2004	551,000	82,000	517,000	599,000	1,150,000
2005	568,681	71,736	468,814	540,550	1,109,231
2006	520,824	46,537	437,493	484,031	1,004,854
Avg 04-06	546,835	66,758	474,436	541,194	1,008,028

Note: 2001-2004 data are from the SSC based on gutted weight in the SEDAR 10 (2006) Assessment; 2005 and 2006 data are from ALS and converted to gutted weight.

Table 2-6. Percentage reductions by sector across the alternative gag allocations.

Alternative	Commercial Reduction	Recreational Reduction
2 (**Preferred**)	35%	37%
3	16%	56%
4	23%	50%

2.1.1.4 Management Alternatives

Alternative 1. No action. **Current Regulations:**

(i) Current gag commercial regulations = 24 inch total length size limit; March & April - no harvest above bag limit & no sale; vessels with longlines may only possess deepwater species; limited entry program with 2 for 1 provision.

(ii) Current gag recreational regulations = 24 inch total length size limit; within 5 grouper bag limit only 2 may be gag or black grouper; March & April – no sale.

Alternative 2 (Preferred). Establish a gag spawning season closure January through April that applies to both the commercial (20% reduction) and recreational (31% reduction) sectors; no fishing for and/or possession of gag would be allowed. In addition, no fishing for and/or possession of the following species would be allowed: black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 3. Establish a 1,000 pound gutted weight gag commercial trip limit.

Alternative 3a. Establish a 1,000 pound gag gutted weight commercial trip limit with a fishing year start date of May 1. In addition, during March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. [See Table 2-7a.]

Table 2-7a. Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM and March and April closure.

	Preferred Allocation 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	5,500	0	0
Directed quota	**348,440**	**458,040**	**423,340**

Notes: **Allocation Alternative 2 is preferred.** PQBM is rounded to the nearest 500 lbs. Weight is in pounds gutted weight. Assumes after trip limit is met or after quota met there is no directed catch and incidental catch due to targeting co-occurring species. After quota met, assumed 20% of trips would not be made and fishermen can avoid 20% of gag.

Alternative 3b. Establish a 1,000 pound gag commercial trip limit with a fishing year start date of January 1. In addition, during February, March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. [See Table 2-7b.]

Table 2-7b. Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM and February, March and April closure.

	Preferred Allocation 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	3,500	0	0
Directed quota	**350,440**	**458,040**	**423,340**

Notes: **Allocation Alternative 2 is preferred.** PQBM is rounded to the nearest 500 lbs. Weight is in pounds gutted weight. Assumes after trip limit is met or after quota met there is no directed catch and incidental catch due to targeting co-occurring species. After quota met, assumed 20% of trips would not be made and fishermen can avoid 20% of gag.

Alternative 4 (Preferred). Directed Commercial Gag Quota. Establish the following directed gag quota (quota after Post Quota Bycatch Mortality or PQBM has been subtracted) for 2009 onwards until modified. After the directed commercial gag quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession is limited to the bag limit: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. [See Table 2-7c.]

Table 2-7c. Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM and impacts of the January through April closure.

With Jan-April Gag Seasonal Closure			
	Preferred Allocation Alternative 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	1,000	0	0
Directed quota	**352,940**	**458,040**	**423,340**
With no Jan-April Gag Seasonal Closure			
	Preferred Allocation Alternative 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	7,000	1,000	1,000
Directed quota	**346,940**	**457,040**	**422,340**

Notes: **Allocation Alternative 2 is preferred.** Different values of PQBM could be used in the future. PQBM is rounded to the nearest 1,000 lbs. Weight is in pounds gutted weight.

Alternative 5. Divide the directed commercial gag quota into two regions: Allocate 63.3% to North and South Carolina (223,411 pounds gutted weight) and 36.7% to Georgia and Florida (129,529 pounds gutted weight). Each region's directed quota (after adjustment for PQBM) would be monitored from state trip ticket and logbook data based on state of landing. After the commercial quota is met in either region, all purchase and sale is prohibited in that region and harvest and/or possession is limited to the bag limit in that region.

Alternative 6. South of the Miami-Dade/Monroe County line, no fishing for and/or possession of the following species would be allowed during June 1-December 31: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. No fishing for and/or possession of gag would be allowed year-round south of the Miami-Dade/Monroe County line. Fishing for black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney would be allowed January 1 – May 31 for the Southern region. Note: This alternative would apply to both the recreational and commercial fisheries.

Alternative 7. Recreational measures:

Alternative 7a (Preferred). Reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black grouper (combined) to 1 gag or black grouper (combined) within the grouper aggregate bag limit, and exclude the captain and crew on for-hire vessels from possessing a bag limit for **groupers**. This, plus the January through April spawning closure would result in a 36% reduction in harvest.

Alternative 7b. Close the month of December, in addition to January through April, to recreational harvest and/or possession of gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. This alternative would retain the existing 5-grouper aggregate bag limit and 2 gag or black grouper (combined) bag limit. The December through April closure would result in a 42% reduction in harvest.

(Note: Excluding captain and crew on for-hire vessels from possessing a bag limit for groupers applies to the aggregate bag limit and includes tilefish species.)

2.1.2 Vermilion Snapper

2.1.2.1 Management Reference Point Alternatives

Maximum Sustainable Yield (MSY) for Vermilion Snapper
Alternatives are shown because the current definition for MSY is being replaced (Table 2-8). In the future, this will not be an action item unless the Council decides to change how MSY is calculated; the value will be updated from the most recent SEDAR assessment.

Optimum Yield (OY) for Vermilion
Alternatives are shown because the current definition for OY is being replaced (Table 2-8). In the future, this will not be an action item unless the Council decides to change the way OY is calculated; the value will be updated from the most recent SEDAR assessment.

The value specified for MSY at equilibrium has not been endorsed by the SSC. OY Values for 65% and 85% F_{MAX} (Alternatives 2a and 2c) were determined using the Baranov equation just as the SSC did to calculate the yield at 75% of F_{MAX}. These MSY and OY values will be modified after the new assessment is completed in late 2008.

Table 2-8. MSY and OY alternatives for vermilion snapper.

Alternatives	Equation	F_{MSY} & F_{OY} Values	MSY & OY Values
Alternative 1 (no action)	MSY equals the yield produced by $F_{MSY.}$ $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{40\%SPR}$ is used as the F_{OY} proxy.	F_{MSY} = 0.35* F_{OY} = 0.25*	Not specified Not specified
Alternative 2 (preferred)	MSY equals the yield produced by $F_{MSY.}$ MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by $F_{OY.}$ If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. The overfished status of vermilion snapper is unknown.	F_{MSY} = 0.355** See subalts. below	2,699,957 lbs whole weight (2,432,394 lbs gutted weight)
Alternative 2a		(65%)(F_{MSY})	547,887 lbs whole weight** (493,592 lbs gutted weight)
Alternative 2b (preferred)		(75%)(F_{MSY})	628,459 lbs whole weight** (566,179 lbs gutted weight)
Alternative 2c		(85%)(F_{MSY})	692,916 lbs whole weight** (624,249 lbs gutted weight)

*Source: Powers 1999 **Source: Recommendation from SEFSC based on the results from SEDAR Update #3 (2007). OY values represent the current yield at F_{OY} and do not represent OY at equilibrium. F_{MAX} used as a proxy for F_{MSY}. *** The Council's SSC did not endorse the estimate of MSY from the vermilion snapper SEDAR Update #3 (2007). This value would represent the MSY at equilibrium.

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = (1-M)*SSB_{MSY}. This formula is recommended in the Technical Guidance Document developed by NMFS (Restrepo *et al.* 1998)and represents 1 minus the natural mortality multiplied by the spawning stock biomass at maximum sustainable yield. **This value is unknown at this time given the high level of uncertainty with the biomass values (Table 2-9).** A new age-based stock assessment will be available in late 2008 and that should provide an estimate of the MSST. The new value of MSST will be specified after completion of the SEDAR Stock Assessment in late 2008.

Table 2-9. Criteria used to determine the overfished and overfishing status of vermilion snapper.
Source: SEDAR Update #3 (2007).

DETERMINATION	SSB_{CURR}	MSST	F_{CURR} (Average of 2004-2006)	MFMT	STATUS
OVERFISHED?	Unknown	Unknown			Unknown (B_{CURR}/MSST = Unknown)
OVERFISHING?			0.729*	0.355**	Overfishing (F_{CURR}/MFMT = 2.05)
*F_{CURR} represents the geometric mean of the fishing mortality during 2004-2006. ** F_{MAX} is used as a proxy for F_{MSY} as recommended by the SSC for the SEDAR Assessment Update #3 (2007).					

2.1.2.2 Vermilion Snapper Total Allowable Catch

The Council's SSC recommended the Council restrict harvest to the F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a TAC of 566,179 pounds gutted weight for all sectors until modified by future action (Table 2-10). The preferred alternative is based on the yield at 75%Fmsy, which was the Council's preferred alternative for OY. The Council also considered OY alternatives for 65%F_{MSY} and 85%Fmsy, which could correspond to TACs above and below those specified in the preferred alternative.

Table 2-10. Vermilion snapper total allowable catch (TAC).

Alternatives	TAC
Alternative 1 (no action)	Do not specify a total allowable catch (TAC).
Alternative 2 (preferred)	Set the total allowable catch (TAC) = 628,459 pounds whole weight* (566,179 pounds gutted weight) for 2009 onwards based on the yield at F_{OY}).
*Source: SSC.	

2.1.2.3 Interim Vermilion Snapper Allocation Alternatives and Resulting Commercial Quota & Recreational Allocation

Alternative 1 (no action). Do not define interim allocations for vermilion snapper.

Alternative 2 (preferred). Define interim allocations for vermilion snapper based upon landings from the NMFS landings (ALS), NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 68% commercial and 32%

recreational. This alternative would establish a commercial quota of 385,002 pounds gutted weight (427,352 pounds whole weight) and a recreational allocation of 181,177 pounds gutted weight (201,107 pounds whole weight).

Allocation Alternative 2 (Table 2-11a) is compared to the average 2004-2005 landings in Table 2-11b to determine the percentage reduction to each sector (Table 2-11c). The commercial quota represents a 58% reduction from average 2004-06 landings and the recreational allocation represents a 69% reduction from average 2004-06 landings.

Table 2-11a. Vermilion snapper commercial quotas and recreational allocations (pounds gutted weight).

Vermilion Snapper		**Allocation Alternative 1. 64%C/36%R**		**Allocation Alternative 2. (Preferred) 68%C/32%R**	
	Annual	**Commercial**	**Recreational**	**Commercial**	**Recreational**
Year	**TAC*** (gutted weight)	**Quota**** (gutted weight)	**Allocation**** (gutted weight)	**Quota** (gutted weight)	**Allocation** (gutted weight)
2009 Onwards	566,179	362,355	203,824	385,002	181,177

*The harvest based on 75% of F_{MAX} is being used to determine TAC. This number may be modified based on the SSC's deliberations in June 2008.
**Alternative 1 would not specify a commercial or recreational allocation for vermilion snapper.

Table 2-11b. Historical vermilion snapper landings (gutted weight).

Vermilion Snapper Landings (pounds gutted weight)				**Total**	**Total**
Year	**Commercial**	**Headboat**	**MRFSS**	**Recreational**	**Landings**
2001	1,515,535	362,718	222,690	585,408	2,100,943
2002	1,228,928	294,094	159,450	453,544	1,682,472
2003	686,586	258,957	187,733	446,690	1,133,276
2004	1,001,297	342,138	247,219	589,357	1,590,654
2005	1,009,300	281,059	244,385	525,444	1,534,744
2006	765,216	362,476	262,328	624,804	1,390,021
Avg 04-06	925,271	328,558	251,311	579,868	1,505,139
Note: 2001 thru 2005 from SEDAR Update #3 (2007).					

Source: ALS, MRFSS Web site; Headboat survey. Data do not include dead discards and MRFSS data are A+B1; weight not converted from numbers.

Table 2-11c. Percentage reductions by sector across the alternative vermilion snapper allocations.

Alternative	**Commercial Reduction**	**Recreational Reduction**
1	61%	65%
2 (**Preferred**)	58%	69%

2.1.2.4 Management Alternatives

Alternative 1. No action. **Current Regulations:**

(i) Current vermilion snapper commercial regulations = 12 inch TL size limit; commercial quota = 1,100,000 pounds gutted weight (1,221,000 pounds whole weight); vessels with longlines may only possess deepwater species; limited entry program with 2 for 1 provision.

(ii) Current vermilion snapper recreational regulations = 12 inch TL size limit and 10 vermilion snapper bag limit.

Alternative 2 (Preferred). Directed Commercial Vermilion Snapper Quota. Establish a directed commercial vermilion snapper quota (quota after Post Quota Bycatch Mortality or PQBM has been subtracted) based on an interim allocation of 68% commercial and 32% recreational (Table 2-12). After the commercial quota is met, all purchase and sale is prohibited and harvest and/or possession is limited to the bag limit.

Table 2-12. Commercial quota taking into consideration estimate of PQBM.

Commercial quota	Pounds Gutted Weight 385,002
PQBM	57,000
Directed quota	**328,002**

Alternative 3. Divide the directed commercial vermilion snapper quota into the following seasons:

Alternative 3a (Preferred). Allocate the directed commercial vermilion snapper quota 50% to the period January 1st through June 30th and 50% to the period July 1st through December 31st (Table 2-13). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 2-13. Commercial vermilion snapper quotas for January-June (50%) and July-December (50%) taking into consideration estimate of PQBM.

Commercial quota	Pounds Gutted Weight **385,002**
Jan-June 50%	192,501
PQBM	24,000
Directed quota Jan-June	**168,501**
July-Dec 50%	192,501
PQBM	37,000
Directed quota July-Dec	**155,501**

Alternative 3b. Allocate the directed commercial vermilion snapper quota 40% to the period January 1st through June 30th and 60% to the period July 1st through December 31st (Table 2-14). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 2-14. Commercial vermilion snapper quotas for January-June (40%) and July-December (60%) taking into consideration estimate of PQBM.

	Pounds Gutted Weight
Commercial quota	385,002
Jan-June 40%	154,001
PQBM	27,000
Directed quota Jan-June	**127,001**
July-Dec 60%	231,001
PQBM	35,000
Directed quota July-Dec	**196,001**

Alternative 3c. Allocate the directed commercial vermilion snapper quota 50% to the period January 1st through August 31th and 50% to the period September 1st through December 31st (Table 2-15). Any remaining quota from period 1 would transfer to period 2 Any remaining quota from period 2 would not be carried forward.

Table 2-15a. Commercial vermilion snapper quotas for January-August (50%) and September-December (50%) taking into consideration estimate of PQBM.

	Pounds Gutted Weight
Commercial quota	385,002
Jan-Aug 50%	192,501
PQBM	43,000
Directed quota Jan-Aug	**149,501**
Sept-Dec 50%	192,501
PQBM	21,000
Directed quota Sept-Dec	**171,501**

Alternative 4. Manage the commercial quota with a fishing year beginning May 1 and a 1,000 pound trip limit (gutted weight). [Note This is a new alternative]

Table 2-15b. Commercial quota (pounds gutted weight) for vermilion snapper. Assumes after trip limit is met or after quota met there is no directed catch and incidental catch due to targeting co-occurring species. After quota met, assumed 20% of trips would not be met and fishermen can avoid 20% of vermilion snapper. (pounds gw)

	Pounds Gutted Weight
Commercial quota	385,002
PQBM with trip limit	10,500
PQBM after quota	40,000
Directed quota	**334,502**

Alternative 5. Adjust recreational vermilion snapper bag/size limit and establish a recreational vermilion snapper closed season; no fishing for and/or possession of vermilion snapper would be allowed during the closed season; and captain crew on for-hire vessels would not be able to retain vermilion snapper. [Note: Effects of excluding captain and crew on for-hire vessels is described in the biological effects section (Section 4.2.5.1). The effectiveness of seasonal closure was recalculated. Values formerly used assumed 100% effectiveness (wrong table was used earlier). New values assume 88% effectiveness of closure.]

Alternative 5a. Increase the recreational size limit to 14" TL and reduce the bag limit to 3 vermilion snapper (Total Reduction = 71%).

Alternative 5b. Increase the recreational size limit to 13" TL and reduce the bag limit to 1 vermilion snapper (Total Reduction = 73%).

Alternative 5c. Increase the recreational size limit to 13" TL and reduce the bag limit to 6 vermilion snapper (53% reduction) and close September & October (16% reduction) (Total Reduction = 61%).

Alternative 5d (Preferred). Reduce the bag limit from 10 to 4 vermilion snapper (45% reduction) and a season closure (no fishing for and/or possession) of October through May 15th (38% reduction) (Total reduction = 66%). Size limit remains at 12" TL.

2.1.3 Reduce Bycatch of Snapper Grouper Species

Alternative 1. No Action. Do not require use of venting tools, dehooking devices, and circle hooks to reduce bycatch.

Alternative 2. Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools and (b) use of non-offset, non-stainless steel circle hooks when using natural baits to fish for snapper grouper species in one of the following South Atlantic EEZ fisheries:

Alternative 2a. Commercial snapper grouper fishery.
Alternative 2b. Recreational snapper grouper fishery.
Alternative 2c. Both commercial and recreational snapper grouper fisheries.

Alternative 3 (Preferred). Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools.

Regulations recently implemented in the Gulf of Mexico under Gulf Reef Fish Amendment 14/27, at 50 C.F. F. §622. 41 (m) are as follows:

(m) Required gear in the Gulf reef fish fishery. For a person on board a vessel to fish for Gulf reef fish in the Gulf EEZ, the vessel must possess on board and such person must use the gear as specified in paragraphs (m)(1) through (m)(3) of this section.

(1) Non-stainless steel circle hooks. Non-stainless steel circle hooks are required when fishing with natural baits.

(2) Dehooking device. At least one dehooking device is required and must be used to remove hooks embedded in Gulf reef fish with minimum damage. The hook

removal device must be constructed to allow the hook to be secured and the barb shielded without re-engaging during the removal process. The dehooking end must be blunt, and all edges rounded. The device must be of a size appropriate to secure the range of hook sizes and styles used in the Gulf reef fish fishery.

(3) Venting tool. At least one venting tool is required and must be used to deflate the swim bladders of Gulf reef fish to release the fish with minimum damage. This tool must be a sharpened, hollow instrument, such as a hypodermic syringe with the plunger removed, or a 16-gauge needle fixed to a hollow wooden dowel. A tool such as a knife or an ice pick may not be used. The venting tool must be inserted into the fish at a 45-degree angle approximately 1 to 2 inches (2.54 to 5.08 cm) from the base of the pectoral fin. The tool must be inserted just deep enough to release the gases, so that the fish may be released with minimum damage.

2.1.4 Allow NMFS Regional Administrator (RA) to Make Adjustments to Vermilion Snapper Management Measures

Alternative 1. No Action. Do not allow the NMFS Regional Administrator (RA) to make adjustments to the management measures based on outcome of new vermilion snapper SEDAR benchmark assessment.

Alternative 2 (Preferred). Allow the NMFS Regional Administrator (RA) to make adjustments to the management measures as specified in Table 2-16a and Table 2-16b based the on outcome of new vermilion snapper benchmark assessment.

Table 2-16a. Commercial and recreational management measures to be employed by NMFS RA based on reduction harvest needed to achieve the yield at F_{OY}. Commercial quota to be divided into two seasons – January-June and July-December. Recreational measures would eliminate captain and crew from retaining the bag limit.

%REDUCTION	COMMERCIAL	RECREATONAL
Alternative 2A. 10% (5.0 – 14.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 10 FISH & NO CLOSURE**
Alternative 2B. 20% (15.0 – 24.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 10 FISH & NO CLOSURE**
Alternative 2C. 30% (25.0 – 34.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 9 FISH & NO CLOSURE**
Alternative 2D. 40% (35.0 – 44.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 9 FISH & NOV-MARCH CLOSURE**
Alternative 2E. 50% (45.0 – 54.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 5 FISH & NOV-MARCH CLOSURE**
Alternative 2F. 60% (55.0 – 64.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 5 FISH & OCT – APRIL CLOSURE**

Note: The commercial quota will be determined from an assessment projection. The preferred commercial allocation (68%) will be applied to the Total Allowable Catch from the yield at 75% Fmsy specified in the projection. The resulting quota will divided equally into the two seasons and adjusted for PQBM.

Table 2-16b. Directed quota associated with reduction in harvest required from new vermilion snapper assessment.

Reduction	10%	20%	30%	40%	50%	58%*	60%
Commercial quota	**832,744**	**740,217**	**647,690**	**555,163**	**462,636**	**385,002**	**370,108**
Jan-June 50%	416,372	370,108	323,845	277,581	231,318	192,501	185,054
PQBM	6,000	9,000	11,000	16,000	19,000	24,000	24,000
Directed quota Jan-June	**410,372**	**361,108**	**312,845**	**261,581**	**212,318**	**168,501**	**161,054**
July-Dec 50%	416,372	370,108	323,845	277,581	231,318	192,501	185,054
PQBM	19,000	21,000	24,000	29,000	34,000	37,000	37,000
Directed quota July-Dec	**397,372**	**349,108**	**299,845**	**248,581**	**197,318**	**155,501**	**148,054**

Rebuilding projections from new assessment could have different values for quotas associated with required reduction. These values are estimates until new assessment becomes available. Reduction is based on average landings from 2004-2006 (925,271 lbs gutted weight).
* Values from Alternative 3a in Section 4.2.4.

2.2 *Comparison of Alternatives*

2.2.1 Gag

The no action MSY and OY alternatives (Table 2017) describe the management reference points that would be retained if no action were taken through this amendment to redefine or update existing parameters. These existing definitions estimate sustainable and optimal fishing mortality rates using proxies, rather than point estimates. The MSY and OY action alternatives would provide more precise estimations of these parameters based on a recent SEDAR stock assessment.

Table 2-17. Summary of effects of MSY/OY alternatives under consideration for gag.

	Biological Effects	Economic, Social, and Administrative Effects
Alternative 1 (no action). MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{45\%SPR}$ is used as the F_{OY} proxy.	-	-
Alternative 2 (Preferred). MSY equals the yield produced by F_{MSY}. MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by F_{OY}. If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuild, F_{OY} = a fraction of F_{MSY}. Gag are not overfished.	+	+
Alternative 2a. Yield from F_{OY}. F_{OY} =(65%)(F_{MSY})	+ + +	+
Alternative 2b (preferred). Yield from F_{OY}. F_{OY} =(75%)(F_{MSY})	+ +	++
Alternative 2c. Yield from F_{OY}. F_{OY} =(85%)(F_{MSY})	+	+

In **Alternative 1**, F_{MSY} is estimated to equal from the $F_{30\%SPR}$ proxy; however, MSY is not specified. MSY is a function of certain characteristics of the current fish population, such as its age and size structure. **Alternative 2** offers the best estimate of the true F_{MSY} and the only estimate of MSY.

OY Alternative 2a is the most precautionary alternative because it provides the largest buffer between MSY and OY. **Preferred Alternative 2b** would reduce this safety margin, and **Alternative 2c** is the least conservative option of the action alternatives. While higher fishing mortality rates may benefit fishery participants, associated industries, and communities in the short-term by providing increased yields, they are expected to adversely affect the socioeconomic environment over the long-term because such yields are not likely to be sustainable.

As **Preferred Alternative 2** provides a better estimate of MSY, it affords greater probability for long-term protection of the stock and consequently higher probability for the long-term viability of both commercial and recreational fisheries.

Among the sub-options for **Preferred Alternative 2**, the highest OY level would likely generate higher economic benefits in the long-run, but noting that although the fishery is under a form of controlled access, it pretty much operates like an open access fishery, the highest level is probably not an ideal choice. A better choice from a long-term economic perspective is either **Alternative 2a** or **Preferred Alternative 2b**.

Alternative 2c would allow the largest harvests and provide the greatest long-term social benefits if the specified difference between OY and MSY is sufficient to capture the environmental variability of the resource. **Preferred Alternative 2b**, however, may provide a better hedge against harvest overages, thereby supporting more stable harvests and social benefits. **Alternative 2a** would be more restrictive on the fishery and, if unnecessarily conservative, it would generate the least long-term social benefit.

A summary of Total Allowable Catch (TAC) alternatives is shown in Table 2-18.

Table 2-18. Summary of effects of TAC alternatives under consideration for gag.

	Biological Effects	**Economic, Social, and Administrative Effects**
Alternative 1 (no action). Do not specify a TAC.	-	-
Alternative 2 (Preferred). Set the TAC = 694,000 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.	+	+

Setting TAC to the yield at F_{OY} rather than not specify a TAC would ensure overfishing ends and that the stock did not become overfished. With **Preferred Alternative 2**, a reduction in fishing mortality and subsequent increase in biomass would be expected to restore the natural population structure of the stock, reverse the trends of decreasing males and mean length documented in recent studies, and benefit the ecosystem in which gag occur.

The preferred alternative is based on the yield at 75%Fmsy, which was the Council's preferred alternative for OY. The Council also considered OY alternatives for 65%Fmsy and 85%Fmsy, which could correspond to TACs above and below those specified in the preferred alternative.

Preferred Alternative 2 would specify commercial and recreational allocations at percentages that have occurred in recent years (Table 2-19). As a result there would be no increase in gag bycatch. Further, as a reduction in fishing mortality is needed to end overfishing of gag and vermilion snapper, a reduction in the number of dead discards would be expected if there was a reduction in fishing effort. The magnitude of reduction in dead discards would depend on the management measures selected.

Table 2-19. Summary of effects of interim allocation alternatives for gag.

	Biological Effects	Economic, Social, and Administrative Effects
Alternative 1 (no action). Do not specify allocations.	No measurable differences	Undeterminable at this time
Alternative 2 (Preferred). Define allocations based upon landings from NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat data during 1999-2003 (51% comm./49% rec.). This alternative would establish a commercial quota of 353,940 pounds gutted weight and a recreational allocation of 340,060 pounds gutted weight.	No measurable differences	Undeterminable at this time
Alternative 3. Define allocations based upon landings from NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat data during 1986-1998 (66% comm./34% rec.). This alternative would establish a commercial quota of 458,040 pounds gutted weight and a recreational allocation of 235,960 pounds gutted weight.	No measurable differences	Undeterminable at this time
Alternative 4. Define allocations based upon landings from NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat data during 1986-2005 (61% comm./39% rec.). This alternative would establish a commercial quota of 423,340 pounds gutted weight and a recreational allocation of 270,660 pounds gutted weight.	No measurable differences	Undeterminable at this time

Alternatives 3 and 4, which would allocate a greater percentage of the catch to the commercial sector would probably not increase the magnitude of dead discards unless fishermen incidentally caught gag when harvesting co-occurring species. Commercial fishermen may be able to avoid gag to some extent by their method of fishing and where they deploy gear.

Whether the trade-offs in benefits/losses would result in net gain to society cannot be determined in the absence of a quantitative model that shows the respective sector's marginal benefit curves. Also in the absence of such a model, it would not be possible to rank the various alternatives based on net economic and social benefits to society.

A comparison of management alternatives is shown in Table 2-20.

Table 2-20. Summary of effects of management measure alternatives for gag.

	Expected Reductions	Economic, Social, and Administrative Effects
Alternative 1 (no action). Current size/bag limits and commercial spawning closure would remain.	n/a	Would depend on choice of allocation alternative. See description below.
Alternative 2 (Preferred). Establish a gag spawning season closure January through April that applies to both the commercial and recreational sectors; no fishing for and/or possession of gag would be allowed. In addition, no fishing for and/or possession of the following species would be allowed: black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.	Comm.:20% Rec.: 31%	
Alternative 3a. Establish a 1,000 pound gag gutted weight commercial trip limit with a fishing year start date of May 1. In addition, during March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.	Comm.:35%	
Alternative 3b. Establish a 1,000 pound gag commercial trip limit with a fishing year start date of January 1. In addition, during February, March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.	Comm.:35%	
Alternative 4 (Preferred). Establish a directed commercial gag quota of 352,940 lbs gutted weight. After the commercial quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession is limited to the bag limit for gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.	Comm.:35%	
Alternative 5. Divide the directed commercial quota into two regions: Allocate 63.3% to North and South Carolina (223,411 pounds gutted weight) and 36.7% to Georgia and Florida (129,529pounds gutted weight).	Comm.:35%	
Alternative 6. South of the Miami-Dade/Monroe County line, no fishing for and/or possession of the following species would be allowed during June 1-December 31: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. No fishing for and/or possession of gag would be allowed year-round south of the Miami-Dade/Monroe County line. Fishing for black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney would be allowed January 1 – May 31 for the Southern region. Note: This alternative would apply to both the recreational and commercial fisheries.	Comm: 0.46% Rec: 7.0%	
Alternative 7a (Preferred). Reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black grouper to 1 gag or black grouper within the grouper aggregate bag limit, and exclude the captain and crew on for-hire vessels from possessing a bag limit for groupers.	Rec.:5%	
Alternative 7b. Close the month of December, in addition to January through April, to recreational harvest and/or possession of gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.	Rec.:42%	

Preferred Alternative 2 would establish a January through April spawning season closure for bag and other shallow water groupers and the closure would apply to both the recreational and commercial sectors. Gag is part of a multispecies fishery. Therefore, some bycatch of gag would be expected during a seasonal closure when fishermen target co-occurring species such as vermilion snapper, scamp, greater amberjack, red grouper, and others. However, since **Preferred Alternative 2** would close all shallow water groupers during January through April, bycatch of gag would likely be decreased since fishermen would not be targeting other co-occurring grouper species. Extending the spawning season closure to other shallow water groupers could have positive biological effects including protecting spawning aggregations, increasing the percentage of males, enhancing reproductive success, and increasing the magnitude of recruitment. A spawning season closure for the recreational sector could reduce bycatch since most of the gag caught by recreational fishermen are discarded because they are less than the 24” TL minimum size limit.

Conditional on the allocation chosen, some ranking of the various alternatives in terms of economic impacts may be made. At a commercial allocation of 51%, the alternatives may be ranked in descending order as follows: **Alternative 4aS** (or **Alternative 2**), **Alternative 4a**, **Alternative 5aS**, and **Alternative 5a**. At a 66% allocation, the ranking in descending order would be: **Alternative 4b**, **Alternative 5b**, and **Alternatives 4bS and 5bS**. At a 61% allocation, the ranking in descending order would be: **Alternative 4c**, **Alternative 5c**, **Alternative 4cS, and Alternative 5cS**.

2.2.2 Vermilion Snapper

The no action MSY and OY alternatives (Table 2-21) describe the management reference points that would be retained if no action were taken through this amendment to redefine or update existing parameters. These existing definitions estimate sustainable and optimal fishing mortality rates using proxies, rather than point estimates. The MSY and OY action alternatives would provide more precise estimations of these parameters based on a recent SEDAR stock assessment.

Table 2-21. Summary of effects of MSY/OY alternatives under consideration for vermilion snapper.

	Biological Effects	**Economic, Social, and Administrative Effects**
Alternative 1 (no action). MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{45\%SPR}$ is used as the F_{OY} proxy.	-	-
Alternative 2 (Preferred). MSY equals the yield produced by F_{MSY}. MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by F_{OY}. If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuild, F_{OY} = a fraction of F_{MSY}. The overfished status of vermilion snapper is unknown.	+	+
Alternative 2a. Yield from F_{OY}. F_{OY} =(65%)(F_{MSY})	+ + +	+
Alternative 2b (Preferred). Yield from F_{OY}. F_{OY} =(75%)(F_{MSY})	+ +	++
Alternative 2c. Yield from F_{OY}. F_{OY} =(85%)(F_{MSY})	+	+

In **Alternative 1**, F_{MSY} is estimated to equal from the $F_{30\%SPR}$ proxy; however, MSY is not specified. MSY is a function of certain characteristics of the current fish population, such as its age and size structure. **Alternative 2** offers the best estimate of the true F_{MSY} and the only estimate of MSY. **OY Alternative 2a** is the most precautionary alternative because it provides the largest buffer between MSY and OY. **Preferred Alternative 2b** would reduce this safety margin, and **Alternative 2c** is the least conservative option of the action alternatives. While higher fishing mortality rates may benefit fishery participants, associated industries, and communities in the short-term by providing increased yields, they are expected to adversely affect the socioeconomic environment over the long-term because such yields are not likely to be sustainable.

Considering that **Preferred Alternative 2** provides the only estimate of MSY, it affords greater probability for long-term protection of the stock and consequently higher probability for the long-term viability of both commercial and recreational fisheries. In addition, the relatively high MSY level relative to current harvests indicates that even if restrictive measures were to be imposed their short-run costs would likely be outweighed by future benefits.

Given current landings of vermilion snapper, all OY alternatives would provide for highly restrictive harvest levels, with **Alternative 2a** being relatively more restrictive than **Preferred Alternative 2b** and **Alternative 2c** in terms of economic impacts.

The actual reduction to the commercial and recreational sectors would depend on some other measures in this amendment, such as the commercial/recreational allocation, quota, bag limits, size limits, and closures. The economic impacts of these other measures are discussed in pertinent sections of this amendment.

A summary of Total Allowable Catch (TAC) alternatives is shown in Table 2-22.

Table 2-22. Summary of effects of TAC alternatives under consideration for vermilion snapper.

	Biological Effects	**Economic, Social, and Administrative Effects**
Alternative 1 (no action). Do not specify a TAC.	-	-
Alternative 2 (Preferred). Set the TAC = 566,179 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.	+	+

Setting TAC to the yield at F_{OY} rather than not specify a TAC would ensure overfishing ends and that the stock did not become overfished. With **Preferred Alternative 2**, a reduction in fishing mortality and subsequent increase in biomass would be expected to restore the natural population structure of the stock, reverse the trends of decreasing males and mean length documented in recent studies, and benefit the ecosystem in which gag occur.

The preferred alternative is based on the yield at 75%F_{MSY}, which was the Council's preferred alternative for OY. The Council also considered OY alternatives for 65%F_{MSY} and 85%F_{MSY}, which could correspond to TACs above and below those specified in the preferred alternative.

Preferred Alternative 2 is expected to reduce commercial net operating revenues by 61.1% or about $2.8 million for vessel trips landing at least one pound of vermilion snapper (Table 2-23).

Assuming that the recreational harvest of vermilion snapper would be limited to the sector's allocation, **Preferred Alternative 2** may be expected to result in recreational benefit losses of about $1.25 million.

Table 2-23. Summary of effects of interim allocation alternatives for vermilion snapper.

	Biological Effects	Economic, Social, and Administrative Effects
Alternative 1 (no action). Do not specify allocations.	No measurable differences	Undeterminable at this time
Alternative 2 (Preferred). Define allocations based upon landings from NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat data during 1986-2005 (68% comm. /32% rec.). This alternative would establish a commercial quota of 385,002 pounds gutted weight (427,352 pounds whole weight) and a recreational allocation of 181,177 pounds gutted weight (201,107 pounds whole weight).	No measurable differences	Undeterminable at this time

A comparison of management alternatives is shown in Table 2-24. The biological effects of **Alternatives 3a (Preferred), 3b, and 3c** are very similar. **Preferred Alternative 3a** would allow the season to extend longer during the January-June period than would **Alternative 3b** and would be less likely to cause a derby fishery during a period of bad weather to fill the first quota in the spring. Further, the Council felt **Alternative 3c** would result in the vermilion snapper fishery being closed from March through August and would begin the second season in September during the peak in hurricane season.

The overall economic impacts of **Alternatives 5a and 5b** would not significantly differ from each other, but these impacts would be higher than those for **Alternative 5c** and **Preferred Alternative 5d**. Total economic impacts would be about $1.3 million for **Alternatives 5a and 5b**. Total economic impacts for **Alternative 5c** would be about $1.1 million and for **Preferred Alternative 5d**, $1.2 million. In terms of total economic impacts, the alternatives may be ranked in descending order as follows: **Alternative 5c, Preferred Alternative 5d, Alternative 5a, and Alternative 5b**. Although it may be expected for a seasonal closure to result in larger surplus reductions than size and bag limits, it would appear that a two-month closure would not totally overcome the losses from a lower size limit and higher bag limit such that an alternative like **Alternative 5c** would not result in larger surplus reductions than an alternative with relatively lower bag limit and higher size limit such as **Alternative 5a** or **Alternative 5b**. However, a much longer closure, such as in **Alternative 5d**, could easily result in very large losses.

Table 2-24. Summary of effects of management measure alternatives for vermilion snapper.

	Expected Reductions	Economic, Social, and Administrative Effects
Alternative 1 (no action). Current size/bag limits and commercial quota would remain.	n/a	-
Alternative 2 (Preferred). Establish a directed commercial vermilion snapper quota of 328,002lbs gutted weight.	Comm.:58%	-
Alternative 3a (Preferred). Allocate the directed commercial quota 50% to the period January 1st through June 30th and 50% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.	Comm.:58%	-
Alternative 3b. Allocate the directed commercial quota 40% to the period January 1st through June 30th and 60% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.	Comm.:58%	-
Alternative 3c. Allocate the directed commercial quota 50% to the period January 1st through August 31th and 50% to the period September 1st through December 31st. Any remaining quota from period 1 would transfer to period 2 Any remaining quota from period 2 would not be carried forward.	Comm.:58%	-
Alternative 4. Manage the commercial vermilion snapper quota with a fishing year beginning May 1 and a 1,000 pound trip limit (gutted weight).	Comm.:58%	
Alternative 5. Adjust recreational vermilion snapper bag/size limits and establish a recreational closed season; no fishing for and/or possession of vermilion snapper would be allowed during the closed season; and captain crew on for-hire vessels would not be able to retain vermilion snapper.		
Alternative 5a. Increase the recreational size limit to 14" TL and reduce the bag limit to 3 vermilion snapper.	Rec.:71%	- -
Alternative 5b. Increase the recreational size limit to 13" TL and reduce the bag limit to 1 vermilion snapper.	Rec.:73%	- -
Alternative 5c. Increase the recreational size limit to 13" TL and reduce the bag limit to 6 vermilion snapper and close September & October (16% reduction)	Rec.:61%	-
Alternative 5d (Preferred). Reduce the bag limit from 10 to 4 vermilion snapper and a season closure (no fishing for and/or possession) of October through May 15th.	Rec.:66%	- - - (comparing just sub-alternatives)

2.2.3 Reduce Bycatch of Snapper Grouper Species

A summary of management alternatives is shown in Table 2-25.

Table 2-25. Summary of effects of alternatives under consideration to reduce bycatch mortality of snapper grouper species.

	Biological Effects	Economic, Social, and Administrative Effects
Alternative 1. No Action. Do not require use of venting tools, dehooking devices, and circle hooks to reduce bycatch.	-	-
Alternative 2. Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools and (b) use of non-offset, non-stainless steel circle hooks when using natural baits to fish for snapper grouper species in one of the following South Atlantic EEZ fisheries: **Alternative 2a.** Commercial snapper grouper fishery. **Alternative 2b.** Recreational snapper grouper fishery. **Alternative 2c.** Both commercial and recreational snapper grouper fisheries.	 + + ++	 + + ++
Alternative 3 (Preferred). Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools.	++	++

Alternative 2c would be the most effective for reducing bycatch mortality of snapper grouper species. Amendment 15B is currently under Secretarial review and includes a preferred alternative that would require all vessels with commercial and for-hire snapper grouper vessel permits carrying hook-and-line gear onboard to have sea turtle release equipment, a long-handled dehooker for ingested hooks, and a long-handled dehooker for external hooks. These dehooking devices may be effective in removing hooks from some fish species.

Alternative 2 offers ways to reduce the recreational bycatch mortality by requiring the use of venting and dehooking tools and non-offset, non-stainless steel circle hooks. These measures will impose some short-term negative social impacts but the long-term social impacts should be positive as the stock recovers. **Preferred Alternative 3** would require venting tools and dehooking devices for both the commercial and recreational sectors but not circle hooks and would be the most efficient for reducing bycatch mortality of snapper grouper species. **Preferred Alternative 3** would only require the use of venting and dehooking tools, and as a result, avoid the loss of directed harvest of target species that cannot be caught with circle hooks. Thus, while total bycatch and bycatch mortality would not be reduced as much as under **Alternative 2**, the costs associated with lost directed harvest would be reduced.

2.2.4 Allow NMFS RA to Make Adjustments to Vermilion Snapper Management Measures

A summary of management alternatives is shown in Table 2-26.

Table 2-26. Summary of effects of alternatives under consideration to allow the Regional Administrator to make adjustments to vermilion snapper management measures based upon a new assessment.

	Biological Effects	Economic, Social, and Administrative Effects
Alternative 1. No Action. Do not allow the NMFS Regional Administrator (RA) to make adjustments to the management measures based on outcome of new vermilion snapper benchmark assessment.	-	-
Alternative 2 (Preferred). Allow the NMFS RA to make adjustments to the management measures based on outcome of new vermilion snapper benchmark assessment.* **Alternative 2A**. 10% reduction: Directed commercial quota=410,372 lbs; 397,372 lbs; Rec: 12", 10 FISH & NO CLOSURE **Alternative 2B.** 20% reduction: Directed commercial quota=361,108 lbs; 349,108 lbs; Rec: 12", 10 FISH & NO CLOSURE **Alternative 2C.** 30% reduction: Directed commercial quota=312,845 lbs; 299,845 lbs; Rec: 12", 9 FISH & NO CLOSURE **Alternative 2D.** 40% reduction: Directed commercial quota=261,581 lbs; 248,581 lbs; Rec: 12", 9 FISH & NOV-MARCH CLOSURE **Alternative 2E.** 50% reduction: Directed commercial quota=212,318 lbs; 197,318 lbs; Rec: 12", 5 FISH & NOV-MARCH CLOSURE **Alternative 2F.** 60% reduction: Directed commercial quota=161,054 lbs; 148,054 lbs Rec: 12", 5 FISH & OCT – APRIL CLOSURE	+	+

*Two seasonal commercial quotas reduced for PQBM. Quota values are estimates. Actual values would be based on yield at F_{OY} determined by new benchmark assessment.

3 Affected Environment

3.1 *Habitat*

3.1.1 Inshore/Estuarine Habitat

Many deepwater snapper grouper species utilize both pelagic and benthic habitats during several stages of their life histories; larval stages of these species live in the water column and feed on plankton. Most juveniles and adults are demersal and associate with hard structures on the continental shelf that have moderate to high relief (e.g., coral reef systems and artificial reef structures, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings). Juvenile stages of some snapper grouper species also utilize inshore seagrass beds, mangrove estuaries, lagoons, oyster reefs, and embayment systems. In many species, various combinations of these habitats may be utilized during diurnal feeding migrations or seasonal shifts in cross-shelf distributions. More detail on these habitat types is found in Sections 3.2.1 and 3.2.2 of the Council's Habitat Plan (SAFMC 1998e).

3.1.2 Offshore Habitat

Predominant snapper grouper offshore fishing areas are located in live bottom and shelf-edge habitats, where water temperatures range from 11° to 27° C (52° to 81° F) due to the proximity of the Gulf Stream, with lower shelf habitat temperatures varying from 11° to 14° C (52° to 57° F). Water depths range from 16 to 27 meters (54 to 90 feet) or greater for live-bottom habitats, 55 to 110 meters (180 to 360 feet) for the shelf-edge habitat, and from 110 to 183 meters (360 to 600 feet) for lower-shelf habitat areas.

The exact extent and distribution of productive snapper grouper habitat on the continental shelf north of Cape Canaveral is unknown. Current data suggest from 3 to 30 percent of the shelf is suitable habitat for these species. These live-bottom habitats may include low relief areas, supporting sparse to moderate growth of sessile invertebrates, moderate relief reefs from 0.5 to 2 meters (1.6 to 6.6 feet), or high relief ridges at or near the shelf break consisting of outcrops of rock that are heavily encrusted with sessile invertebrates such as sponges and sea fan species. Live-bottom habitat is scattered irregularly over most of the shelf north of Cape Canaveral, Florida, but is most abundant offshore from northeastern Florida. South of Cape Canaveral, the continental shelf narrows from 56 to 16 kilometers (35 to 10 miles) wide, thence reducing off the southeast coast of Florida and the Florida Keys. The lack of a large shelf area, presence of extensive, rugged living fossil coral reefs, and dominance of a tropical Caribbean fauna are distinctive benthic characteristics of this area.

Rock outcroppings occur throughout the continental shelf from Cape Hatteras, North Carolina to Key West, Florida (MacIntyre and Milliman 1970; Miller and Richards 1979; Parker *et al*. 1983), which are principally composed of limestone and carbonate sandstone

(Newton *et al*. 1971), and exhibit vertical relief ranging from less than 0.5 to over 10 meters (33 feet). Ledge systems formed by rock outcrops and piles of irregularly sized boulders are also common. Parker *et al*. (1983) estimated that 24% (9,443 km^2) of the area between the 27 and 101 meters (89 and 331 feet) isobaths from Cape Hatteras, NC to Cape Canaveral, FL is reef habitat. Although the benthic communities found in water depths between 100 and 300 meters (328 and 984 feet) from Cape Hatteras, NC to Key West, FL is relatively small compared to the whole shelf, this area, based upon landing information of fishers, constitutes prime reef fish habitat and probably significantly contributes to the total amount of reef habitat in this region.

Man-made artificial reef structures are also utilized to attract fish and increase fish harvests; however, research on man-made reefs is limited and opinions differ as to whether or not these structures promote an increase of ecological biomass or merely concentrate fishes by attracting them from nearby, natural unvegetated areas of little or no relief.

The distribution of coral and live hard bottom habitat as presented in the SEAMAP Bottom Mapping Project is a proxy for the distribution of the species within the snapper grouper complex. The method used to determine hard bottom habitat relied on the identification of reef obligate species including members of the snapper grouper complex. The Florida Fish and Wildlife Research Institute (FWRI), using the best available information on the distribution of hard bottom habitat in the south Atlantic region, prepared ArcView maps for the four-state project. These maps, which consolidate known distribution of coral, hard/live bottom, and artificial reefs as hard bottom, are included in Appendix E of the Habitat Plan (SAFMC 1998e). These maps are also available on the Internet at the Council's following Internet Mapping System website: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

The South Carolina Department of Natural Resources, NOAA/Biogeographic Characterization Branch, and the South Atlantic Fishery Management Council cooperatively generated additional information on managed species' use of offshore fish habitat. Plots of the spatial distribution of offshore species were generated from the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) data (Figures 35-41) in the Habitat Plan (SAFMC 1998e). The plots should be considered as point confirmation of the presence of each species within the scope of the sampling program. These plots, in combination with the hard bottom habitat distributions presented in Appendix E of the Habitat Plan (SAFMC 1998e), can be employed as proxies for offshore snapper grouper complex distributions in the south Atlantic region. Maps of the distribution of snapper grouper species by gear type based on MARMAP data can be generated through the Council's Internet Mapping System at the following web address: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

3.1.3 Essential Fish Habitat

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S. C. 1802(10)). Specific categories of EFH identified in the South Atlantic Bight, which are utilized by federally managed fish and invertebrate species, include both estuarine/inshore and marine/offshore areas. Specifically, estuarine/inshore EFH includes: Estuarine emergent and mangrove wetlands, submerged aquatic vegetation, oyster reefs and shell banks, intertidal flats, palustrine emergent and forested systems, aquatic beds, and estuarine water column. Additionally, marine/offshore EFH includes: Live/hard bottom habitats, coral and coral reefs, artificial and manmade reefs, *Sargassum* species, and marine water column.

EFH utilized by snapper grouper species in this region includes coral reefs, live/hard bottom, submerged aquatic vegetation, artificial reefs and medium to high profile outcroppings on and around the shelf break zone from shore to at least 183 meters [600 feet (but to at least 2,000 feet for wreckfish)] where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical fish complex. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including *Sargassum*, required for survival of larvae and growth up to and including settlement. In addition, the Gulf Stream is also EFH because it provides a mechanism to disperse snapper grouper larvae.

For specific life stages of estuarine dependent and near shore snapper grouper species, EFH includes areas inshore of the 30 meters (100-foot) contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom habitats.

3.1.3.1 Habitat Areas of Particular Concern

Areas which meet the criteria for essential fish habitat-habitat areas of particular concern (EFH-HAPCs) for species in the snapper grouper management unit include medium to high profile offshore hard bottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; near shore hard bottom areas; The Point, The Ten Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump (South Carolina); mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper (e.g., Primary and Secondary Nursery Areas designated in North Carolina); pelagic and benthic *Sargassum*; Hoyt Hills for wreckfish; the *Oculina* Bank Habitat Area of Particular Concern; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs). Areas that meet the criteria for designating essential fish habitat-habitat areas of particular concern include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages).

In addition to protecting habitat from fishing related degradation though FMP regulations, the Council, in cooperation with NOAA Fisheries, actively comments on non-fishing projects or policies that may impact essential fish habitat. The Council adopted a habitat policy and procedure document that established a four-state Habitat Advisory Panel and adopted a comment and policy development process. With guidance from the Advisory Panel, the Council has developed and approved habitat policies on: energy exploration, development, transportation and hydropower re-licensing; beach dredging and filling and large-scale coastal engineering; protection and enhancement of submerged aquatic vegetation; and alterations to riverine, estuarine and nearshore flows (Appendix C of Habitat Plan; SAFMC 1998e).

3.2 *Biological/Ecological Environment*

3.2.1 Species Most Impacted By This FMP Amendment

3.2.1.1 Gag, *Mycteroperca microlepis*

Gag occur in the Western Atlantic from North Carolina to the Yucatan Peninsula, and throughout the Gulf of Mexico. Juveniles are sometimes observed as far north as Massachusetts (Heemstra and Randall 1993). Gag commonly occur at depths of 39-152 m (131-498 ft) (Heemstra and Randall 1993) and prefer inshore-reef and shelf-break habitats (Hood and Schlieder 1992). Bullock and Smith (1991) indicated gag probably do not move seasonally between reefs in the Gulf of Mexico, but show a gradual shift toward deeper water with age. McGovern *et al.* (2005) reported extensive movement of gag along the Southeast United States. In a tagging study, 23% of the 435 recaptured gag moved distances greater that 185 km (100 nautical miles). Most of these individuals were tagged off South Carolina and were recaptured off Georgia, Florida, and in the Gulf of Mexico (McGovern *et al.* 2005).

Gag are probably estuarine dependent (Keener *et al.* 1988; Ross and Moser 1995; Koenig and Coleman 1998; Strelcheck *et al.* 2003). Juveniles (age 0) occur in shallow grass beds along Florida's east coast during the late spring and summer (Bullock and Smith 1991). Sea grass is also an important nursery habitat for juvenile gag in North Carolina (Ross and Moser 1995). Post-larval gag enter South Carolina estuaries when they are 13 mm (0.5 inches) TL and 40 days old during April and May each year (Keener *et al.* 1988), and utilize oyster shell rubble as nursery habitat. Juveniles remain in estuarine waters throughout the summer and move offshore as water temperatures cool during September and October. Adults are often seen in shallow water 5-15 m (16-49 ft) above the reef (Bullock and Smith 1991) and as far as 40-70 km (22-38 nautical miles) offshore.

Huntsman *et al.* (1999) indicated gag are vulnerable to overfishing since they are long-lived, late to mature, change sex, and aggregate to spawn. The estimated natural mortality rate is 0.14 (SEDAR 10 2007). Maximum reported size for gag is 145 cm (57.5 inches) TL and 36.5 kg (81 pounds) (Heemstra and Randall 1993), and maximum reported age is 26 years (Harris and Collins 2000). Gag is a sequential hermaphrodite, changing sex from female to male with increased size and age (Coleman *et al.* 1996; McGovern *et al.* 1998; Coleman *et al.* 2000). All individuals less than 87.5 cm (34.7 inches) TL are females. At 105.0 cm (41.6 inches) TL, 50% of fishes are males. Almost all gag are males at sizes greater than 120.0 cm (47.5 inches) TL (McGovern *et al.* 1998).

Along the southeastern United States (1994-1995), size at first maturity is 50.8 cm (20.2 inches) TL, and 50% of gag females are sexually mature at 62.2 cm (24.7 inches) (McGovern *et al.* 1998). According to Harris and Collins (2000), age-at-first-maturity is 2 years, and 50% of gag are mature at 3 years. For data collected during 1978-1982 off the southeastern United States, McGovern *et al.* (1998) reported the smallest mature females were 58.0 cm (22.9 inches) TL and 3 years old. Hood and Schlieder (1992) indicated most females reach sexual maturity at ages 5-7 in the Gulf of Mexico. Off the southeastern United States, gag spawn from December through May, with a peak in March and April (McGovern *et al.* 1998). Duration of planktonic larvae is about 42 days (Keener *et al.* 1988; Koenig and Coleman 1998; Lindeman *et al.* 2000). McGovern *et al.* (1998) reported the percentage of male gag landed by commercial fishermen decreased from 20% during 1979-1981 to 6% during 1995-1996. This coincided with a decrease in the mean length of fish landed. A similar decrease in the percentage of males was reported in the Gulf of Mexico (Hood and Schleider 1992; Coleman *et al.* 1996).

Adults are sometimes solitary, and can occur in groups of 5 to 50 individuals. They feed primarily on fishes, crabs, shrimp, and cephalopods (Heemstra and Randall 1993), and often forage in small groups far from the reef ledge (Bullock and Smith 1991). Juveniles feed primarily on crustaceans, and begin to consume fishes when they reach about 25 mm (1 inch) in length (Bullock and Smith 1991; Mullaney 1994).

3.2.1.2 Red grouper, *Epinephelus morio*

Red grouper is primarily a continental species, mostly found in broad shelf areas (Jory and Iversen 1989). Red grouper occur in the Western Atlantic, from North Carolina to southeastern Brazil, including the eastern Gulf of Mexico and Bermuda, but can occasionally be found as far north as Massachusetts (Heemstra and Randall 1993). Red grouper is uncommon around coral reefs; it generally occurs over flat rock perforated with solution holes (Bullock and Smith 1991), and is commonly found in the caverns and crevices of limestone reef in the Gulf of Mexico (Moe 1969). It also occurs over rocky reef bottoms (Moe 1969).

Adult red grouper are sedentary fish that are usually found at depths of 5-300 m (16-984 ft). Fishermen off North Carolina commonly catch red grouper at depths of 27-76 m (88-249 ft) for an average of 34 m (111 ft). Fishermen off southeastern Florida also catch red grouper in depths ranging from 27-76 m (88-249 ft) with an average depth of 45 m (148 ft) (Burgos 2001; McGovern *et al.* 2002). Moe (1969) reported that juveniles live in shallow water nearshore reefs until they are 40.0 cm (16 inches) and 5 years of age, when they become sexually mature and move offshore. Spawning occurs during February-June, with a peak in April (Burgos 2001). In the eastern Gulf of Mexico, ripe females are found December through June, with a peak during April and May (Moe 1969). Based on the presence of ripe adults (Moe 1996) and larval red grouper (Johnson and Keener 1984) spawning probably occurs offshore. Coleman *et al*. (1996) found groups of spawning red grouper at depths between 21-110 m (70-360 feet). Red grouper do not appear to form spawning aggregations or spawn at specific sites (Coleman *et al.* 1996). They are reported to spawn in depths of 30-90 m (98-295 ft) off the Southeast Atlantic coast (Burgos 2001; McGovern *et al.* 2002).

Red grouper are protogynous, changing sex from female to male with increased size and age. Off North Carolina, red grouper first become males at 50.9 cm (20.1 inches) TL and males dominate size classes greater than 70.0 cm (27.8 inches) TL. Most females transform to males between ages 7 and 14. Burgos (2001) reported that 50% of the females caught off North Carolina are undergoing sexual transition at age 8. Maximum age reported by Heemstra and Randall (1993) was 25 years. Burgos (2001) and McGovern *et al.* (2002) indicated red grouper live for at least 20 years in the Southeast Atlantic and a maximum age of 26 years has been reported for red grouper in the Gulf of Mexico (L. Lombardi, NMFS Panama City, personal communication). Natural mortality rate is estimated to be 0.20 (Potts and Brennan 2001). Maximum reported size is 125.0 cm (49.2 inches) TL (male) and 23.0 kg (51.1 pounds). For fish collected off North Carolina during the late 1990s, age at 50% maturity of females is 2.4 years and size at 50% maturity is 48.7 cm (19.3 inches) TL. Off southeastern Florida, age at 50% maturity was 2.1 years and size at 50% maturity was 52.9 cm (21.0 inches) TL (Burgos 2001; McGovern *et al.* 2002). These fish eat a wide variety of fishes, octopi, and crustaceans, including shrimp, lobsters, and stomatopods (Bullock and Smith 1991, Heemstra and Randall 1993).

3.2.1.3 Scamp, *Mycteroperca phenax*

Scamp occur in the Western Atlantic, from North Carolina to Key West, in the Gulf of Mexico, and in the southern portion of the Caribbean Sea. Juveniles are sometimes encountered as far north as Massachusetts (Heemstra and Randall 1993). Its reported depth range is 30-100 m (98-328 ft) (Heemstra and Randall 1993). Juveniles are found in estuarine and shallow coastal waters (Bullock and Smith 1991; Heemstra and Randall 1993).

Scamp are protogynous, with females dominating sizes less than 70.0 cm (27.8 in) (Harris *et al.* 2002). Scamp live for at least 30 years (Harris *et al.* 2002), and attain sizes as great as 107.0 cm (42.4 inches) TL and 14.2 kg (31.3 pounds) (Heemstra and Randall 1993). Natural mortality rate is estimated to be 0.15 (Potts and Brennan 2001). Harris *et al.* (2002) report the length and age at first spawning of females off North Carolina to southeast Florida was 30.0-35.0 cm (11.9-13.8 inches) TL and age 1. Length and age at 50% maturity was 35.3 cm (13.9 in) TL and 1.28 years, respectively (Harris *et al.* 2002). In a study conducted in the eastern Gulf of Mexico, all fish larger than 35.0 cm TL were sexually mature (M. Godcharles and L. Bullock, unpublished data).

Spawning occurs from February through July in the South Atlantic Bight and in the Gulf of Mexico, with a peak in March to mid-May (Harris *et al.* 2002). Hydration of eggs occurs primarily during the morning and late afternoon, which indicates scamp spawn during late afternoon and evening. Spawning individuals have been captured off South

Carolina and St. Augustine, Florida at depths of 33 to 93 m (108-305 ft). Scamp aggregate to spawn. Spawning locations and time of spawning overlaps with gag (Gilmore and Jones 1992). Fish are the primary prey of this species (Matheson *et al.* 1986).

3.2.1.4 Black grouper, *Mycteroperca bonaci*

The black grouper occurs in the Western Atlantic, from North Carolina to Florida, Bermuda, the Gulf of Mexico, West Indies, and from Central America to Southern Brazil (Crabtree and Bullock 1998). Adults are found over hard bottom such as coral reefs and rocky ledges. Black grouper occur at depths of 9 to 30 m (30 to 98 ft). Juveniles sometimes occur in estuarine seagrass and oyster rubble habitat in North Carolina and South Carolina (Keener *et al.* 1988; Ross and Moser 1995). In the Florida Keys, juveniles settle on patch reefs (Sluka *et al.* 1994). Commercial landings of black grouper exceed landings of any other grouper in the Florida Keys.

Natural mortality (M) is estimated to be 0.15 (Potts and Brennan 2001). Crabtree and Bullock (1998) found black grouper live for at least 33 years and attain sizes as great as 151.8 cm (60.1 inches) TL. Females range in length from 15.5 to 131.0 cm (6.1-51.9 inches) TL and males range in length from 94.7 to 151.8 cm (38.3-60.1 in) TL. Black grouper are protogynous. Approximately 50% of females are sexually mature by 82.6 cm (32.7 inches) TL and 5.2 years of age. At a length of 121.4 cm (48.1 inches) TL and an age of 15.5 years, approximately 50% of the females have become males. Black grouper probably spawn throughout the year, however, peak spawning of females occurs from January to March.

Off Belize, black grouper are believed to spawn in aggregations at the same sites used by Nassau grouper (Carter and Perrine 1994). Eklund *et al.* (2000) describe a black grouper spawning aggregation discovered during winter 1997-1998, less than 100 m outside a newly designated marine reserve. Adults feed primarily on fishes.

3.2.1.5 Rock hind, *Epinephelus adscensionis*

Rock hind are found in the western Atlantic from Massachusetts to southern Brazil, Bermuda, the Gulf of Mexico, and the Caribbean (Smith 1997). They also occur in the eastern Atlantic from Ascension Island and St. Helena Island (Smith 1997). Rock hind is a demersal species, inhabiting rocky reef habitat to depths of 120 m (394 ft). It is usually solitary.

Maximum reported size is 61.0 cm (24.2 inches) TL (male) and 4.1 kg (9.1 pounds) (Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 28.0 cm (11.1 inches) TL and 6.1 years, respectively. Maximum reported age is 12 years (Potts and Manooch 1995). The natural mortality rate is estimated as 0.25 (Ault *et al.* 1998).

Heemstra and Randall (1993) indicated that rock hind in the Gulf of Mexico are protogynous. This fish has been observed to spawn in aggregations near the shelf edge off the southwest coast of Puerto Rico in January at depths of 20-30 m (66 – 98 ft)

(Rielinger 1999). Off Cuba, rock hind spawn during January through March (García-Cagide *et al.* 1994). The spawning season for rock hind off South Florida is likely to be similar to Cuba. Off South Carolina, females in spawning condition (hydrated oocytes or postovulatory follicles) have been collected during May through August (Unpublished MARMAP data). Crabs comprise the majority of their diet, but rock hind have also been observed to feed on fishes and young sea turtles (Heemstra and Randall 1993).

3.2.1.6 Red hind, *Epinephelus guttatus*

Red hind is found in the Western Atlantic from North Carolina to Venezuela and is the most common species of *Epinephelus* in Bermuda and the West Indies (Smith 1997). Red hind is found in shallow reefs and rocky bottoms, at depths of 2-100 m (7 – 328 ft; Froese and Pauly 2003). It is usually solitary and territorial.

Maximum reported size is 76.0 cm (30.0 inches) TL (male) and 25.0 kg (55.5 pounds) (Heemstra and Randall 1993). Natural mortality rate is estimated to be 0.18 (Ault *et al.* 1998). Potts and Manooch (1995) examined 146 otoliths of red hind collected from North Carolina to the Dry Tortugas during 1980-1992 and report a maximum age of 11 years and maximum sizes of 49.0 cm (19.4 inches) TL. Sadovy *et al.* (1992) conducted an age and growth study of red hind from Puerto Rico (n = 624) and St. Thomas, USVI (n = 162) and report a maximum age of 18 and a maximum size of 47.5 cm (18.8 inches) TL. Luckhurst *et al.* (1992) captured a red hind off Bermuda that was 72.0 cm (28.5 in) TL and 22 years old.

Sadovy *et al.* (1994) found that red hind collected off Puerto Rico are protogynous. Females (n = 390) become sexually mature at 21.5 cm (9.7 in) TL, the size at 50% maturity is 28.5 cm (11.3 inches) TL, and they range in size from 11.0 to 48.0 cm (4.4 to 19.0 inches) TL. Males (n = 120) range in size from 27.3 to 51.0 cm (10.8 to 20.2 inches) TL and transitional individuals (n = 7) were from 27.5 to 34.5 cm (10.9 to 13.7 in) TL. In the southern latitudes, red hind occur in spawning aggregations during December through February. Annual spawning aggregations occur during the full moon in January and February off the southwest coast of Puerto Rico, and during the summer in Bermuda with no relation to lunar periodicity (Shapiro *et al.* 1993; Sadovy *et al.* 1994). Spawning off Jamaica, Puerto Rico, and USVI occurs from December to February (Thompson and Munro 1978; Colin *et al.* 1987; Sadovy *et al.* 1992; Sadovy *et al.* 1994). A similar spawning season would be expected for red hind in South Florida. Farther north, spawning has been reported to occur later in the year. Burnett-Herkes (1975) report that red hind spawn from April to July off Bermuda. Red hind in spawning condition have been collected during the summer off the Carolinas (MARMAP unpublished data). Spawning may occur earlier in the year off the Carolinas, however, MARMAP samples were limited to May through September.

Red hind feeds mainly on crabs and other crustaceans, fishes, such as labrids and haemulids, and octopus (Heemstra and Randall 1993).

3.2.1.7 Graysby, *Cephalopholis cruentata*

Graysby occurs from North Carolina to south Florida and in the Gulf of Mexico, Caribbean, and Bermuda. The graysby inhabits seagrass (*Thalassia*) beds and coral reefs, and is found as deep as 170 m (557 ft). It is sedentary, solitary, and secretive, usually hiding during the day and feeding at night. This small grouper is rarely landed off the southeast United States, and is more commonly seen in the Caribbean (Potts and Manooch 1999). Graysby are probably most often landed as unclassified grouper by commercial fishermen off the southeastern United States.

Maximum reported size is 42.6 cm (16.9 inches) TL (male) and 1.1 kg (2.4 pounds). Graysby have been collected in spawning condition from March through October but data on reproductive condition are limited. In the northeastern Caribbean, individuals in spawning condition have been observed in March and from May to July (Erdman 1976). Nagelkerken (1979) determined graysby collected in the Caribbean spawn from July through October. Graysby spawn during summer off the Carolinas (MARMAP unpublished data) but sample size was very small and limited to summer months. Size at maturity and age at first maturity are estimated as 14.0 cm (5.5 inches) TL and 3.5 years (Nagelkerken 1979). The graysby is protogynous (Nagelkerken 1979). Sexual transition occurs at sizes ranging from 14.0 to 26.0 cm (5.5-10.3 inches) TL with most transitional individuals occurring between the sizes of 20.0-23.0 cm (7.9-9.1 inches) TL and ages 4-5.

Potts and Manooch (1999) examined otoliths from 118 graysby collected during 1979 to 1997. Maximum reported age is 13 years and maximum size is 40.5 cm (16.0 inches) TL. Juveniles feed on shrimp, while adults eat primarily fishes. Natural mortality rate is estimated as 0.20 (Ault *et al.* 1998). Adult graysby eat bony fish, shrimp, stomatopods, crabs, and gastropods (Randall 1967).

3.2.1.8 Yellowfin grouper, *Mycteroperca venenosa*

Yellowfin grouper occur in the Western Atlantic, ranging from Bermuda to Brazil and the Guianas, including the Gulf of Mexico and Caribbean Sea at depths of 2-137 m (7-449 ft). Juveniles are commonly found in shallow sea grass beds, while adults occur over rocky areas and coral reefs.

Maximum reported size is 100.0 cm (39.6 inches) TL (male) and 18.5 kg (41.1 pounds) (Heemstra and Randall 1993). Thompson and Munro (1978) reported that yellowfin grouper off Jamaica are 4 years old between 46.0-57.0 cm (18.1-22.4 inches) TL, and by 80.0 cm (31.5 inches) TL, they are 10 years of age. Manooch (1987) reported a maximum age of 15 years for yellowfin grouper. Natural mortality rate (M) is estimated to be 0.18 (Ault *et al.* 1998). This fish is believed to be protogynous. Yellowfin grouper aggregate at some of the same sites utilized by tiger grouper, Nassau grouper, and black grouper (Sadovy *et al.* 1994). Spawning occurs during March in the Florida Keys (Taylor and McMichael 1983), and from March and May to August in the Gulf of Mexico (Bullock and Smith 1991). Most spawning occurs in Jamaican waters between February and April (Thompson and Munro 1978), and during July off Bermuda (Smith 1958). Yellowfin grouper feed mainly on fishes (especially coral reef species) and squids (Heemstra and Randall 1993).

3.2.1.9 Coney, *Cephalopholis fulva*

Coney is a small grouper that occurs in the Western Atlantic, ranging from South Carolina (USA) and Bermuda to southern Brazil, including Atol das Rocas. The coney is a sedentary species. It prefers coral reefs and clear water, and can be found to depths as great as 150 m (492 ft). Coneys are most commonly taken in the Caribbean, where they are found associated with patch reefs. Most commercial landings of coney are off southeast Florida and are often labeled as unclassified grouper.

Maximum reported length is 41.0 cm (16.2 inches) TL (male). This species is protogynous (Heemstra and Randall 1993). Size at 50% maturity for females sampled off the west coast of Puerto Rico was 13.0 cm (5.1 inches) FL (Figuerola and Torrez Ruiz 2000). Heemstra and Randall (1993) report that females mature at 16.0 (6.3 inches) cm TL and transform to males at about 20.0 (7.9 inches) cm TL.

Potts and Manooch (1999) examined the otoliths from 55 coney collected during 1979-1997 from North Carolina to the Dry Tortugas, Florida. The maximum reported age is 11 years and maximum size is 39.7 cm (15.7 inches) TL. Natural mortality rate is estimated as 0.18 (Ault *et al.* 1998).

Spawning occurs in small groups composed of one male and multiple females. Although ripe ovaries are found from November to March off the west coast of Puerto Rico, spawning activity appears to be limited to several days around the last quarter and new moon phases during January and February (Figuerola *et al.* 1997). The diet is composed primarily of small fishes and crustaceans (Randall 1967).

3.2.1.10 Yellowmouth grouper, *Mycteroperca interstitialis*

Yellowmouth grouper occur along the eastern U.S. coast, Bermuda, Bahamas, Gulf of Mexico, and in the Caribbean south to Brazil (Smith 1971). Adults are found over rocky hard bottom and coral reefs near the shoreline as deep as 55 m (100 ft). Individuals have been found as deep as 150 m (275 ft). Juveniles commonly occur in mangrove-lined lagoons.

The maximum reported size of yellowmouth grouper is 84.0 cm (33.2 inches) TL (male) and 10.2 kg (22.6 pounds) (Froese and Pauly 2003). In the Gulf of Mexico, maximum reported age for yellowmouth grouper was 28 years (Bullock and Murphy 1994), while in Trinidad and Tobago the maximum reported age was 41 years (Maninckhand-Heilman and Phillip 2000). Males (2-28 years) are generally older than females (2-17 years). Females become sexually mature between 40.0-45.0 cm (15.8-17.7 inches) TL and ages 2-4 years. Fifty percent are males at 60.0-64.9 cm (23.6-25.6 inches) TL. Fish undergo sexual transition from female to male at lengths from 50.3 to 64.3 cm (19.8-25.3 inches) TL, between the ages of 5 and 14 years. Yellowmouth grouper may spawn all year, but peak spawning of females in the Gulf of Mexico occurs during March to May (Bullock and Murphy 1994). Finfish constitute a large part of the diet of yellowmouth grouper (Randall 1967).

3.2.1.11 Tiger grouper, *Mycteroperca tigris*

Tiger grouper occur in the Western Atlantic, ranging from Bermuda and south Florida (USA) to Venezuela and, possibly Brazil, including the Gulf of Mexico and the Caribbean Sea. It inhabits coral reefs and rocky areas at depths of 10 to 40 m (33-131 ft).

Maximum reported size is 101.0 cm (40.0 inches) TL (male) and 10 kg (22.2 pounds) (Heemstra and Randall 1993). Approximate life span is 26 years, and natural mortality (M) is estimated at 0.12 (Ault *et al.* 1998).

The size-sex ratios described in a study conducted off Bermuda indicate this fish is probably protogynous (Heemstra and Randall 1993). It forms aggregations at specific times and locations each year, but only during the spawning season (Coleman *et al*. 2000; White *et al.* 2002). White *et al.* (2002) reported that spawning aggregations of tiger grouper occurred one week after the full moon during January through April off Puerto Rico. Tiger grouper spawn from December through April off southwest Cuba (García-Cagide *et al*. 1999). The tiger grouper preys on a variety of fishes, and frequents cleaning stations (Heemstra and Randall 1993).

3.2.1.12 Vermilion Snapper, *Rhomboplites aurorubens*

Vermilion snapper occur in the Western Atlantic, from North Carolina to Rio de Janeiro. It is most abundant off the southeastern United States and in the Gulf of Campeche (Hood and Johnson 1999). The vermilion snapper is demersal, commonly found over rock, gravel, or sand bottoms near the edge of the continental and island shelves (Froese and Pauly 2003). It occurs at depths from 18 to 122 m (59 to 400 ft), but is most abundant at depths less than 76 m (250 ft). Individuals often form large schools. This fish is not believed to exhibit extensive long range or local movement (SEDAR SAR 2 2003).

The maximum size of a male vermilion snapper, reported by Allen (1985), in Froese and Pauly (2003), was 60.0 cm (23.8 in) TL and 3.2 kg (7.1 lbs). Maximum reported age in the South Atlantic Bight was 14 years (Zhao *et al.* 1997; Potts *et al.* 1998). SEDAR 2-SAR2 (2003) recommends that natural mortality (M) be defined as 0.25/yr, with a range of 0.2-0.3/yr.

This species spawns in aggregations (Lindeman *et al.* 2000) from April through late September in the southeastern United States (Cuellar *et al.* 1996). Zhao *et al.* (1997) indicated that most spawning in the South Atlantic Bight occurs from June through August. Eggs and larvae are pelagic.

Vermilion snapper are gonochorists meaning that all vermilion snapper are mature at 2 years of age and 20.0 cm (7.9 in) (SEDAR SAR2 2003). Cuellar *et al.* (1996) collected vermilion snapper off the southeastern United States and found that all were mature. The smallest female was 16.5 cm (6.5 in) FL and the smallest male was 17.9 cm (7.1 in) FL (Cuellar *et al.* 1996). Zhao and McGovern (1997) reported that 100% of males that were collected after 1982 along the southeastern United States were mature at 14.0 cm (5.6 in) TL and age 1. All females collected after 1988 were mature at 18.0 cm (7.1 in) TL and age 1.

This species preys on fishes, shrimp, crabs, polychaetes, and other benthic invertebrates, as well as cephalopods and planktonic organisms (Allen 1985). Sedberry and Cuellar (1993) reported that small crustaceans (especially copepods), sergestid decapods, barnacle larvae, stomatopods, and decapods dominated the diets of small (< 50 mm (2 in) SL) vermilion snapper off the Southeastern United States. Larger decapods, fishes, and cephalopods are more important in the diet of larger vermilion snapper.

3.2.2 Science Underlying the Management of Snapper Grouper Species Most Impacted By This FMP Amendment

The status of gag and vermilion snapper has been recently assessed through the Southeast Data, Assessment, and Review (SEDAR) process. The SEDAR process consists of a series of workshops aimed at ensuring that each assessment is based on the best available scientific information.

First, representatives from NOAA Fisheries Service, state agencies, and the South Atlantic Council, as well as experts from non-governmental organizations and academia, participate in a data workshop. The purpose of a data workshop is to assemble and review available fishery-dependent and fishery-independent data and information on a stock, and to develop consensus about what constitutes the best available scientific information on the stock, how that information should be used in an assessment, and what type of stock assessment model should be employed.

Second, assessment biologists from these agencies and organizations participate in a stock assessment workshop, where data from the data workshop are input into one or more stock assessment models (e.g., production, age-structured, length structured, etc.) to generate estimates of stock status and fishery status. Generally, multiple runs of each model are conducted: base runs and a number of additional runs to examine sensitivity of results to various assumptions (e.g., different natural mortality rates, different data sets/catch periods, etc.).

Finally, a stock assessment review workshop is convened to provide representatives from the Center for Independent Experts (CIE) the opportunity to peer review the results of the stock assessment workshop. Representatives from NOAA Fisheries Service, the South Atlantic Council, and constituent groups may attend and observe the review but the actual review is conducted by the Center for Independent Experts. The Council's Scientific and Statistical Committee (SSC) then reviews the report of the stock assessment review workshop.

The review portion of the SEDAR process has helped improve the acceptance of stock assessments. However, continued lack of basic fishery data has resulted in uncertainty in the assessment results. Each SEDAR Review Panel has identified significant shortcomings in data and research (see Section 4.5 for a detailed list of research and data needs). In addition, not all of the reviews have been completed with 100% consensus.

The Status of Stocks Report to Congress indicates red grouper and black grouper have been experiencing overfishing since 1998. The Council recognizes there is no recent information to indicate stock status; however, given that the Reauthorized Magnuson-Stevens Act requires the Council to end overfishing of all species, the Council concluded it was appropriate to include measures to end overfishing of red grouper and black grouper in Snapper Grouper Amendment 16.

3.2.2.1 Gag assessment and stock status

SEDAR assessment

The stock of gag off the United States South Atlantic was assessed during a SEDAR assessment workshop, held at the Wyndham Grand Bay Hotel, Miami, Florida, on May 1–5, 2006. The workshop's objectives were to complete the SEDAR 10 benchmark assessment of gag and to conduct stock projections. Participants in the benchmark assessment included state, federal, and university scientists, as well as Council members and staff, and various observers. All decisions regarding stock assessment methods and acceptable data were made by consensus (SEDAR 10 2007).

Available data on the stock included abundance indices, recorded landings, and samples of annual size compositions and age compositions from fishery-dependent sources. Three fishery–dependent abundance indices were developed by the data workshop: one from the NOAA Fisheries Service headboat survey, one from the commercial logbook program, and one from the MRFSS survey. There were no usable fishery–independent abundance data for this stock of gag. Landings data were available from all recreational and commercial fisheries. The assessment included data through 2004.

A forward projecting statistical model of catch at age was used as the primary assessment model. In addition, an age-aggregated production model was used to investigate results under a different set of model assumptions. The assessment workshop developed two base runs: one assuming a time-varying catchability and one assuming constant catchability for the fishery dependent indices. Each base run of the catch-at-age model was used for estimation of benchmarks and stock status.

Stock projections were evaluated under five scenarios starting in 2008. Each scenario applied the current fishing mortality rate (F) in years 2005–2007. Starting in 2008, the five projection scenarios included: (1) current F, (2) F_{MSY}, (3) 85% of F_{MSY}, (4) 75% of F_{MSY}, and (5) 65% of F_{MSY}.

Status

The gag stock in the Atlantic is undergoing **overfishing** as of 2004 (last year of data in the stock assessment). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The

Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For gag the most recent estimate of the fishing mortality rate (F) is from 2004 and was = 0.310. The Council is using the fishing mortality rate that would produce the maximum sustainable yield (F_{MSY} = 0.237) as the maximum fishing mortality threshold. Comparing these two numbers:

- F_{2004}/MFMT = 0.310/0.237 = 1.309

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

The gag stock in the Atlantic was not **overfished** as of the start of 2005. This means that the spawning stock biomass (pounds of spawning fish in the water) has not been reduced below the level that could produce the maximum sustainable yield. The Council compares the current spawning stock biomass (SSB) to the level of spawning stock biomass that could be rebuilt to the level to produce the MSY in 10 years. This is referred to as the minimum spawning stock biomass or MSST. For gag, the estimated level of spawning stock biomass in 2005 was 7,470,000 pounds gutted weight (gw). The Minimum Stock Size Threshold (MSST) = 6,816,000 pounds gw. Comparing these two numbers:

- SSB_{2005}/MSST = 7,470,000/6,816,000 = 1.096

This comparison is referred to as the **overfished ratio**. If the ratio is less than 1, then the stock is overfished.

The Council's Scientific and Statistical Committee (SSC) reviewed the gag SEDAR assessment at their June 2007 meeting. The SSC provided guidance and suggestions on improvements that could be made in the future and the assessment was accepted as meeting all the Terms of Reference.

The Secretary of Commerce notified the Council that gag is undergoing overfishing and is approaching an overfished status (June 2007). Under the Magnuson-Stevens Act, the Council has one year to complete an amendment to end overfishing.

Gag Total Allowable Catch

The Council's Scientific and Statistical Committee (SSC) recommended the Council restrict harvest to the F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a total allowable catch (TAC) of 694,000 pounds gutted weight for all sectors in 2009 onwards (Table 3-1).

Table 3-1. Gag total allowable catch (TAC).

Alternatives	**TAC (pounds gutted weight)**
Alternative 1 (no action)	Do not specify a TAC
Alternative 2 (preferred)	Set the TAC* = 694,000 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.
*Source: SEDAR 10 (2006)	

3.2.2.2 Vermilion Snapper assessment and stock status

SEDAR assessment

A SEDAR stock assessment workshop was convened at the NOAA Center for Coastal Fisheries and Habitat Research Beaufort, North Carolina, on Monday, April 4, 2007. The workshop's objectives were to conduct an update assessment of the vermilion snapper off the southeastern U.S. and to conduct stock projections based on possible management scenarios. Participants in the update assessment included state and federal scientists, Council AP and SSC members, and various observers. All decisions regarding stock assessment methods and acceptable data were made by consensus (SEDAR Assessment Update #3 2007).

Available data on the species included all those utilized for the benchmark assessment conducted in 2002; no additional data sources were identified during the scoping workshop. These data were abundance indices, recorded landings, and samples of annual size compositions from indices and landings. Four abundance indices were used in the benchmark assessment: one from the NMFS headboat survey and three from the SC MARMAP fishery-independent monitoring program. Landings data were available from all recreational and commercial fisheries. While the MARMAP chevron trap index decreased in recent years, the remaining abundance indices showed neither marked increase nor decline during the assessment period (1976–2006).

The statistical model of catch at length as developed for the benchmark assessment was used as the only assessment model. The assessment workshop provided the base run of the model, identical to that used in the benchmark assessment. This base run was used for the estimation of benchmarks and stock status. The benchmark assessment concluded that the high degree of uncertainty in recruitment and spawning stock biomass estimates meant that reliable biomass based benchmarks could not be developed from the assessment, and this was found to be the case for the update assessment as well.

The ratio of fishing mortality in 2006 to F_{MAX} was 2.05, compared to 1.71 in the benchmark assessment, suggesting that overfishing continues. Projections were used to evaluate the potential of the stock to be rebuilt, but could only be conducted for constant F scenarios. Four projections were considered: $F=F_{MAX}$; $F=85\%F_{MAX}$; $F=75\%F_{MAX}$; and $F=65F_{MAX}$. The results of each were very similar.

Stock Status

The vermilion snapper stock in the Atlantic is undergoing **overfishing** as of 2006 (last year of data in the stock assessment update). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For vermilion snapper the most recent estimate of the fishing mortality rate is from 2006 and was = 0.729. The Council is using the fishing mortality rate that produces the greatest yield per fish (F_{MAX} = 0.355) as the maximum fishing mortality threshold. F_{MAX} is being used as a proxy for F_{MSY} (F_{MSY} = Fishing mortality rate that would produce maximum sustainable yield) because the SSC did not have confidence in the calculated biomass reference points. The SSC does have confidence in the fishing mortality rate estimates from the SEDAR assessment. Comparing these two numbers:

- F_{2006}/MFMT = 0.729/0.355 = 2.05

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

Whether the vermilion snapper stock in the Atlantic is currently **overfished** is unknown because the SSC does not have confidence in the biomass reference points from the SEDAR assessment. Recognizing the need for a new benchmark assessment, NMFS and the State of South Carolina began sampling available vermilion snapper otoliths for use in an age-based assessment. Further, the SEDAR steering committee replaced white grunt in the SEDAR schedule with vermilion snapper. Results from an age-based assessment for vermilion snapper will be reviewed by the Council's Scientific and Statistical Committee (SSC) during their November 30 – December 2, 2008 meeting.

The Council was notified in June 2007 that vermilion snapper was undergoing overfishing. Therefore, the Council is obligated to develop an amendment to end overfishing by June 2008. Since efforts to reassess vermilion snapper are proceeding, NMFS should have the opportunity to review the new assessment results prior to implementing any vermilion snapper regulations proposed by the Council to address the June 2007 overfishing notification.

Vermilion Snapper Total Allowable Catch

The Council's Scientific and Statistical Committee (SSC) recommended the Council restrict harvest to the F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a total allowable catch (TAC) of 628,459 pounds whole weight (566,179 pounds gutted weight) for all sectors until modified by future action (Table 3-2).

Table 3-2. Vermilion snapper total allowable catch (TAC).

Alternatives	TAC
Alternative 1 (no action)	Do not specify a TAC
Alternative 2 (preferred)	Set the TAC = 628,459 pounds whole weight* (566,179 pounds gutted weight) for 2009 onwards.
*Source: SSC.	

3.2.3 Other Affected Council-Managed Species

Gag and vermilion snapper are targeted by fishermen and are commonly taken on trips together. Red grouper, scamp, blueline tilefish, red snapper, gray triggerfish, greater amberjack, white grunt, and others are also targeted by commercial fishermen and are taken on trips with gag and vermilion snapper. Gag and vermilion snapper are commonly taken on trips by recreational fishermen with white grunt, black sea bass, gray triggerfish, and red porgy. Proposed actions that would end overfishing of gag and vermilion snapper would likely affect other target and non-target snapper grouper species through bycatch and effort shifting. A detailed description of the life history of these species is provided in the Snapper Grouper SAFE report (NMFS 2005).

3.2.4 Protected Species

There are 31 different species of marine mammals that may occur in the EEZ of the South Atlantic region. All 31 species are protected under the MMPA and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback, and North Atlantic right whales). There are no known interactions between the South Atlantic snapper grouper fishery and marine mammals. Other species protected under the ESA occurring in the South Atlantic include five species of sea turtle (green, hawksbill, Kemp's ridley, leatherback, and loggerhead); the smalltooth sawfish; and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]). A discussion of these species is included below. Designated critical habitat for the northern right whale also occurs within the South Atlantic region.

The impacts of the South Atlantic snapper grouper fishery on ESA-listed species were evaluated in a biological opinion on the continued authorization of snapper grouper fishing under the South Atlantic Snapper Grouper Fishery Management Plan and Amendment 13C (NMFS 2006). The opinion stated the fishery was not likely to adversely affect Northern right whale critical habitat, seabirds, or marine mammals (see NMFS 2006 for discussion on these species). However, the opinion did state that the snapper grouper fishery would adversely affect sea turtles and smalltooth sawfish. A discussion of these species is included below.

NOAA Fisheries Service has also recently conducted an informal Section 7 consultation evaluating the impacts of the South Atlantic snapper grouper fishery on ESA-listed *Acropora* species. The consultation concluded that the continued operation of the snapper grouper fishery was not likely to adversely affect newly listed *Acropora* species. A discussion of these species is included below.

3.2.4.1 ESA-Listed Sea Turtles

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory and travel widely throughout the South Atlantic. The following sections are a brief overview of the general life history characteristics of the sea turtles found in the South Atlantic region. Several volumes exist that cover the biology and ecology of these species more thoroughly (i.e., Lutz and Musick (eds.) 1997, Lutz *et al.* (eds.) 2002).

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987, Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick 1976, Hughes 1974). At approximately 20 to 25 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also know to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Paredes 1969; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft.) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

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

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

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

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

3.2.4.2 ESA-Listed Marine Fish

Historically the **smalltooth sawfish** in the U.S. ranged from New York to the Mexico border. Their current range is poorly understood but believed to have contracted from these historical areas. In the South Atlantic region, they are most commonly found in Florida, primarily off the Florida Keys (Simpfendorfer and Wiley 2004). Only two smalltooth sawfish have been recorded north of Florida since 1963 [the first was captured off North Carolina in 1999 (Schwartz 2003) and the other off Georgia 2002 (Burgess unpublished data)]. Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 m (Bigelow and Schroeder 1953, Adams and Wilson 1995), while mature animals occur in waters in excess of 100 meters (Simpfendorfer pers. comm. 2006). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser 1938, Bigelow and Schroeder 1953).

3.2.4.3 ESA-Listed Marine Invertebrates

Elkhorn (*Acropora palmata)* and staghorn (*A. cervicornis*) coral were listed as threatened under the ESA on May 9, 2006. The Atlantic *Acropora* Status Review (*Acropora* Biological Review Team 2005) presents a summary of published literature and other currently available scientific information regarding the biology and status of both these species.

Elkhorn and **staghorn** corals are two of the major reef-building corals in the wider Caribbean. In the South Atlantic region, they are found most commonly in the Florida Keys; staghorn coral occurs the furthest north with colonies documented off Palm Beach, Florida (26º3'N). The depth range for these species ranges from <1 m to 60 m. The optimal depth range for elkhorn is considered to be 1 to 5 m depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 m (Goreau and Goreau 1973).

All Atlantic *Acropora* species (including elkhorn and staghorn coral) are considered to be environmentally sensitive, requiring relatively clear, well-circulated water (Jaap *et al.* 1989). Optimal water temperatures for elkhorn and staghorn coral range from 25° to 29°C (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990). Both species are almost entirely dependent upon sunlight for nourishment, contrasting the massive, boulder-shaped species in the region (Porter 1976, Lewis 1977) that are more dependent on zooplankton. Thus, Atlantic *Acropora* species are much more susceptible to increases in water turbidity than some other coral species.

Fertilization and development of elkhorn and staghorn corals is exclusively external. Embryonic development culminates with the development of planktonic larvae called planulae (Bak *et al.* 1977, Sammarco 1980, Rylaarsdam 1983). Unlike most other coral larvae, elkhorn and staghorn planulae appear to prefer to settle on upper, exposed surfaces, rather than in dark or cryptic ones (Szmant and Miller 2006), at least in a laboratory setting. Studies of elkhorn and staghorn corals indicated that larger colonies of both species[1] had higher fertility rates than smaller colonies (Soong and Lang 1992).

[1] As measured by surface area of the live colony

3.2.4.4 South Atlantic Snapper Grouper Fishery Interactions with ESA-Listed Species

Sea turtles are vulnerable to capture by bottom longline and vertical hook-and-line gear. The magnitude of the interactions between sea turtles and the South Atlantic snapper grouper fishery was evaluated in NMFS (2006) using data from the Supplementary Discard Data Program (SDDP). Three loggerheads and three unidentified sea turtles were caught on vertical lines; one leatherback and one loggerhead were caught on bottom longlines, all were released alive (Table 3-3). The effort reported program represented between approximately 5% and 14% of all South Atlantic snapper grouper fishing effort. These data were extrapolated in NMFS (2006) to better estimate the number of interactions between the entire snapper grouper fishery and ESA-listed sea turtles. The extrapolated estimate was used to project future interactions (Table 3-4).

The SDDP does not provide data on recreational fishing interactions with ESA-listed sea turtle species. However, anecdotal information indicates that recreational fishermen occasionally take sea turtles with hook-and-line gear. The biological opinion also used the extrapolated data from the SDDP to estimate the magnitude of recreational fishing on sea turtles (Table 3-4).

Smalltooth sawfish are also considered vulnerable to capture by bottom longline and vertical hook-and-line gear based on their capture in other southeast fisheries using such gear (Poulakis and Seitz 2004; Simpfendorfer and Wiley 2004). SDDP data does not include any reports of smalltooth sawfish being caught in the South Atlantic commercial snapper grouper fishery. There are no other documented interactions between smalltooth sawfish and the South Atlantic commercial snapper grouper fishery. However, the potential for interaction, led NOAA Fisheries Service to estimate future interactions between smalltooth sawfish and the snapper grouper fishery in the 2006 biological opinion (Table 3-4).

Table 3-3. Sea turtle incidental take data from the supplementary discard data program (SDDP) for the Southeast U.S. Atlantic.

Reporting Period	Month	Logbook Statistical Grid	Species Caught	Number Caught	Discard Condition
Vertical Hook-and-Line Sea Turtle Catch Data					
8/1/01-7/31/02	April	2482	Unidentified	1	Alive
8/1/01-7/31/02	November	3377	Loggerhead	1	Alive
8/1/02-7/31/03	February	2780	Loggerhead	1	Alive
8/1/02-7/31/03	November	3474	Loggerhead	1	Alive
8/1/02-7/31/03	November	3476	Unknown	1	Alive
8/1/02-7/31/03	December	3476	Unknown	1	Alive
Bottom Longline Sea Turtle Catch Data					
8/1/01-7/31/02	August	3674	Leatherback	1	Alive
8/1/03-7/31/04	January	3575	Loggerhead	1	Unknown

Source: SEFSC Supplementary Discard Data Program

Table 3-4. Three year South Atlantic anticipated takes of ESA-Listed species for snapper grouper gears.

Species	Amount of Take	Total
Green	Total Take	39
	Lethal Take	14
Hawksbill	Total Take	4
	Lethal Take	3
Kemp's ridley	Total Take	19
	Lethal Take	8
Leatherback	Total Take	25
	Lethal Take	15
Loggerhead	Total Take	202
	Lethal Take	67
Smalltooth sawfish	Total Take	8
	Lethal Take	0

Source: NMFS 2006

3.3 *Administrative Environment*

3.3.1 The Fishery Management Process and Applicable Laws

3.3.1.1 Federal Fishery Management

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

Responsibility for Federal fishery management decision-making is divided between the U.S. Secretary of Commerce and eight regional Fishery Management Councils that represent the expertise and interests of constituent states. Regional Councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary of Commerce (Secretary) is responsible for collecting and providing the data necessary for the Councils to prepare fishery management plans and for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the M-Magnuson-Stevens Act and with other applicable laws summarized in Section 8.0. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

The South Atlantic Fishery Management Council is responsible for conservation and management of fishery resources in Federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 miles offshore from the seaward boundary of the States of North Carolina, South Carolina, Georgia, and east Florida to Key West. The Council has thirteen voting members: one from NOAA Fisheries Service; one each from the state fishery agencies of North Carolina, South Carolina, Georgia, and Florida; and eight public members appointed by the Secretary. On the South Atlantic Council, there are two public members from each of the four South Atlantic States. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission (ASMFC). The South Atlantic Council has adopted procedures whereby the non-voting members serving on the Council Committees have full voting rights at the Committee level but not at the full Council level. Council members serve three-year terms and are recommended by State Governors and appointed by the Secretary of Commerce from lists of nominees submitted by State governors. Appointed members may serve a maximum of three consecutive terms.

Public interests also are involved in the fishery management process through participation on Advisory Panels and through Council meetings, which, with few exceptions for discussing personnel matters, are open to the public. The Council uses a Scientific and Statistical Committee to review the data and science being used in assessments and fishery management plans/amendments. In addition, the regulatory process is in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking.

3.3.1.2 State Fishery Management

The state governments of North Carolina, South Carolina, Georgia, and Florida have the authority to manage fisheries that occur in waters extending three nautical miles from their respective shorelines. North Carolina's marine fisheries are managed by the Marine Fisheries Division of the North Carolina Department of Environment and Natural Resources. The Marine Resources Division of the South Carolina Department of Natural Resources regulates South Carolina's marine fisheries. Georgia's marine fisheries are managed by the Coastal Resources Division of the Department of Natural Resources. The Marine Fisheries Division of the Florida Fish and Wildlife Conservation Commission is responsible for managing Florida's marine fisheries. Each state fishery management agency has a designated seat on the South Atlantic Council. The purpose of state representation at the Council level is to ensure state participation in Federal fishery management decision-making and to promote the development of compatible regulations in state and Federal waters.

The South Atlantic States are also involved through the Atlantic States Marine Fisheries Commission (ASMFC) in management of marine fisheries. This commission was created to coordinate state regulations and develop management plans for interstate fisheries. It has significant authority, through the Atlantic Striped Bass Conservation Act and the Atlantic Coastal Fisheries Cooperative Management Act, to compel adoption of consistent state regulations to conserve coastal species. The ASFMC also is represented at the Council level, but does not have voting authority at the Council level.

NOAA Fisheries Service' State-Federal Fisheries Division is responsible for building cooperative partnerships to strengthen marine fisheries management and conservation at the state, inter-regional, and national levels. This division implements and oversees the distribution of grants for two national (Inter-jurisdictional Fisheries Act and Anadromous Fish Conservation Act) and two regional (Atlantic Coastal Fisheries Cooperative Management Act and Atlantic Striped Bass Conservation Act) programs. Additionally, it works with the ASMFC to develop and implement cooperative State-Federal fisheries regulations.

3.3.2 Enforcement

Both the National Oceanic and Atmospheric Administration (NOAA) Fisheries Office for Enforcement (NOAA/OLE) and the United States Coast Guard (USCG) have the authority and the responsibility to enforce South Atlantic Council regulations. NOAA/OLE agents, who specialize in living marine resource violations, provide fisheries expertise and investigative support for the overall fisheries mission. The USCG is a multi-mission agency, which provides at sea patrol services for the fisheries mission.

Neither NOAA/OLE nor the USCG can provide a continuous law enforcement presence in all areas due to the limited resources of NOAA/OLE and the priority tasking of the USCG. To supplement at sea and dockside inspections of fishing vessels, NOAA entered into Cooperative Enforcement Agreements with all but one of the States in the Southeast Region (North Carolina), which granted authority to State officers to enforce the laws for which NOAA/OLE has jurisdiction. In recent years, the level of involvement by the States has increased through Joint Enforcement Agreements, whereby States conduct patrols that focus on Federal priorities and, in some circumstances, prosecute resultant violators through the State when a state violation has occurred.

NOAA General Counsel issued a revised Southeast Region Magnuson-Stevens Act Penalty Schedule in June 2003, which addresses all Magnuson-Stevens Act violations in the Southeast Region. In general, this Penalty Schedule increases the amount of civil administrative penalties that a violator may be subject to up to the current statutory maximum of $120,000 per violation.

3.4 *Human Environment*

3.4.1 Description of the Fishery

A more detailed description of the snapper grouper fishery is contained in previous amendments [Amendment 13C (SAFMC 2006), Amendment 15A (SAFMC 2008a), and Amendment 15B (SAFMC 2008b)] and is incorporated herein by reference. The following sections summarize key information relevant to this amendment.

3.4.1.1 Commercial Fishery

3.4.1.1.1 Gear and Fishing Behavior

The commercial snapper grouper fishery utilizes vertical lines, longlines, black sea bass pots/traps, spears, and powerheads (i.e., spears with spring-loaded firearms). Vertical lines are used from the North Carolina/Virginia border to the Atlantic side of Key West, Florida. The majority of hook and line fishermen use either electric or hydraulic reels (bandit gear) and generally have 2-4 bandit reels per boat. The majority of the bandit fleet fishes year round for snapper grouper with the only seasonal differences in catch associated with the regulatory spawning season closures in March and April for gag. Most fluctuations in fishing effort in this fishery are a result of the weather. Trips can be limited during hurricane season and also during the winter months from December through March. Some fishermen stop bandit fishing to target king mackerel when they are running.

The Council allows the use of bottom longlines north of St. Lucie Inlet, Florida, in depths greater than 50 fathoms. Bottom longline gear is used to target snowy grouper and golden tilefish. Longline boats are typically bigger than bandit boats, their trips are longer, and they cost more to operate because they operate farther offshore. A longline spool generally holds about 15 miles of cable. Longlines are fished from daylight to dark because sea lice eat the flesh of hooked fish at night. The fishery is operated year long with little or no seasonal fluctuation barring hurricane disruption.

Spears or powerheads are most commonly used off Florida and are illegal for killing snapper grouper species in South Carolina and in Special Management Zones.

Black sea bass pots are used exclusively to target black sea bass, though bycatch of other snapper grouper species is allowed. The pots have mesh size, material, and construction restrictions to facilitate bycatch reduction. All sea bass pots must have a valid identification tag attached and more than 87% of tags in April 2003 were for vessels with homeports in North Carolina. Fishing practices vary by buoy practices, setting/pulling strategies, number of pots set, and length of set, with seasonal variations. The South Carolina pot fishery is mainly a winter fishery with short soak times (in some cases about an hour) and relatively few pots per boat. Most trips are day trips with pots being retrieved before heading to port. The North Carolina pot fishery also is primarily a winter fishery with some fishermen continuing to pot through the summer. North Carolina fishermen tend to use more pots than those in South Carolina. Although most North Carolina trips with sea bass pots last one day, more pots are left to soak for several days than in South Carolina. Many participants in the black sea bass fishery are active in other fisheries, including the recreational charter fishery during the summer months. Many snapper grouper permit holders maintain pot endorsements but are not active in the pot fishery.

3.4.1.1.2 *Landings, Ex-vessel Value, Price, and Effort*

Landings of all species in the snapper grouper management unit averaged 6.77 million pounds from 2001 through 2006, with an average annual dockside value of $12.99 million in current year dollars and $13.55 million in constant 2005 dollars (Table 3-5).[2] The shallow water groupers and mid-shelf snappers are the largest species groups by volume and value within the snapper grouper fishery. Vermilion snapper in the mid-shelf snapper group is the largest volume species in the fishery, and accounts for 13% of total landings and 17% of dockside revenues on trips with at least one pound of snapper grouper species. Gag is the largest volume shallow water grouper, and accounts for 6% of total landings and 10% of dockside revenues on trips that landed at least one pound of snapper grouper species. Fishermen also landed an average of 1.84 million pounds of non-snapper grouper species worth $1.95 million in current year dollars on trips that landed at least one pound of species in the snapper grouper management unit. These trips included trips that targeted species in the snapper grouper management unit and trips that landed snapper grouper species while targeting non-snapper grouper species.

Landings and dockside revenues declined between 2001 and 2006 for species in the snapper grouper management unit (Table 3-5). Part of the declines appear to be attributable to variation in landings of vermilion snapper, which experienced a significant decline in 2003 due to unusually cold water temperatures in the summer and fall of 2003. Landings of vermilion snapper recovered in 2004 and 2005, but not to the levels experienced in 2001 and 2002, and declined again in 2006.

[2] Fishermen are required to report their landings by species by trip to NOAA Fisheries Service Southeast Fisheries Science Center logbook program. However, they do not report prices or revenues on their logbook sheets. Therefore, trip revenues were approximated as reported landings from individual logbook reports multiplied by average monthly prices for each species as calculated from the NOAA Fisheries Service Accumulated Landings System.

Table 3-5. Annual landings and dockside (ex-vessel) revenues for trips with at least one pound of species in the snapper grouper fishery management unit in the south Atlantic.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of snapper grouper species						
snapper grouper landings (million pounds, whole wgt)	7.60	7.36	6.50	6.70	6.39	6.07	6.77
Dockside revenue from snapper grouper species (million dollars)	$13.95	$13.55	$12.12	$12.70	$12.98	$12.63	$12.99
Dockside revenue in constant 2005 dollars (millions)*	$15.38	$14.71	$12.87	$13.13	$12.98	$12.23	$13.55
Price/lb (whole wgt) for snapper grouper species	$1.83	$1.84	$1.86	$1.90	$2.03	$2.08	$1.92
Price/lb in constant 2005 dollars*	$2.02	$2.00	$1.98	$1.96	$2.03	$2.01	$2.00
Producer price index for #2 diesel fuel, adjusted to constant 2005 price levels (index=100 for 2005)	44.1	41.2	53.1	67.8	100.0	114.7	70.2
Landings of other species on these trips (million lbs)	1.71	1.76	2.10	1.65	1.74	2.06	1.84
Dockside revenue from other species on these trips (million $)	$1.97	$1.96	$1.92	$1.78	$1.92	$2.17	$1.95
Dockside revenue from other species in constant 2005 dollars (millions)	$2.17	$2.13	$2.04	$1.84	$1.92	$2.10	$2.03
Vermilion snapper landings (million pounds)	1.65	1.31	0.77	1.07	1.16	0.86	1.14
Gag landings (million pounds)	0.52	0.53	0.60	0.53	0.54	0.50	0.54

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007. *The Consumer Price Index for all Urban Consumers was used to adjust dockside revenues and average annual prices for inflation.

In addition, participation in the snapper grouper fishery has declined over time. The number of boats with snapper grouper permits declined from 1,264 in 2001 to 974 in 2006 (Table 3-6). Two types of permits were created with the limited access program for the snapper grouper fishery that was implemented in 1998. The number of transferable permits that allow an unlimited harvest per trip declined from 959 in 2001 to 783 in 2006, while the number of vessels with non-transferable permits with a 225-pound trip limit declined from 305 in 2001 to 191 in 2006. The number of transferable permits declined, in part, because new entrants into the fishery must buy two permits and retire one as the condition for entry into the fishery. Furthermore, it is likely that the number of vessels in the snapper grouper fishery declined for economic reasons. Average annual prices, as indexed by the ratio of annual commercial revenues to landings, for species in the snapper grouper management unit remained relatively constant when adjusted for inflation, whereas fuel prices more than doubled since 2001 (Table 3-5). The net result has been a decline since 2001 in the number of vessels, trips, and days fished for species in the snapper grouper management unit (Table 3-6). The decline in the number of vessels is evident in all harvest categories except for the highest producing category of 50,000 pounds or more per year. The number of fish dealers with permits to operate in the snapper grouper fishery reached a maximum in 2003 (271) and has declined since then (Table 3-6).

From 2001 through 2006, an average of 922 boats averaged 15,500 trips per year on which at least one pound of snapper grouper species was landed (Table 3-6). On average, 528 boats landed at least 1000 pounds of snapper grouper species annually; 260 boats landed at least 5,000 pounds; 173 boats landed at least 10,000 pounds; and 27 boats landed at least 50,000 pounds of snapper grouper species.

Table 3-6. Fishing effort and distribution of catch for trips with at least one pound of species in the snapper grouper fishery management unit in the south Atlantic.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of snapper grouper species						
Number of trips	17,278	17,199	16,563	15,045	13,757	13,159	15,500
Days away from port	29,932	29,580	27,620	24,828	22,810	23,005	26,296
Number of vessels landing snapper grouper species	1,002	976	931	905	858	857	922
Number of vessels with more than 100 lbs of snapper grouper spp.	867	829	791	749	720	697	776
Number of vessels with more than 1,000 lbs of snapper grouper spp.	593	589	546	524	476	442	528
Number of vessels with more than 5,000 lbs of snapper grouper spp.	287	280	277	261	238	217	260
Number of vessels with more than 10,000 lbs of snapper grouper spp.	195	198	173	165	153	154	173
Number of vessels with more than 50,000 lbs of snapper grouper spp.	26	27	20	32	29	26	27
Number of permitted vessels	1,264	1,174	1,123	1,066	1,007	974	1,101
Number of vessels with transferable permits	959	907	879	841	801	783	862
Number of vessels with non-transferable permits	305	267	244	225	206	191	240
Number of dealer permits	252	246	271	269	268	251	260

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007 and NOAA Fisheries Service, Southeast Regional Office permits database.

3.4.1.1.3 *The Snapper Grouper Fishery by State*

The following discussion provides annual averages from 2001 to 2006. To maintain the confidentiality of individual reporting units, summaries are provided for regions defined as North Carolina, South Carolina, Georgia and northeast Florida combined, and central and south Florida combined. The northeast Florida region consists of trips landed in Nassau, Duval, and St. Johns Counties, and the central and south Florida region consists of trips landed from Flagler through Miami-Dade Counties and trips from Atlantic waters off the Florida Keys and landed in Monroe County.

The average annual quantities of snapper grouper species harvested from 2001-2006 included 1.86 million pounds worth $3.46 million per year in North Carolina, 1.64 million pounds worth $3.44 million in South Carolina, 0.81 million pounds worth $1.65 million in Georgia and northeast Florida, and 2.46 million pounds worth $4.44 million in central and south Florida (Table 3-7). snapper grouper landings by state were not proportional to total days fished in each state. Boats in central and south Florida made 72% of the trips that landed species in the snapper grouper management unit and accounted for 36% of the total snapper grouper harvest. Conversely, boats in other states accounted for relatively larger portions of the total snapper grouper harvest. Boats in North Carolina made 18% of the trips and landed 27% of the snapper grouper harvest. Boats in South Carolina made 6% of the trips and landed 24% of the harvest. In addition, boats in Georgia and northeast Florida made 4% of the trips and landed 12% of the snapper grouper harvest. Boats in South Carolina and Georgia and northeast Florida took fewer but longer trips than their counterparts in North Carolina or central and south Florida.

Gag and other shallow water groupers and vermilion snapper and other mid-shelf snappers tend to be landed in North Carolina, South Carolina, and Georgia and northeast Florida, while jacks and shallow water snappers tend to be landed in central and south Florida (Tables 3-8 and 3-9). The species groups that accounted for more than 10% of total landings and revenues in North Carolina include shallow water groupers with nearly 22% of total pounds landed and nearly 30% of total revenues on trips with at least one pound of snapper grouper species; black sea bass with 20% of total landings and 19% of total revenues; and mid-shelf snappers with 18% of total landings and 25% of total revenues. In South Carolina, the shallow water groupers accounted for 27% of total pounds and 38% of total revenues, and the mid-shelf snappers accounted for 26% of total pounds and 30% of total revenues. In Georgia and northeast Florida, mid-shelf snappers accounted for 45% of total pounds and 52% of total revenues; shallow water groupers accounted for 19% of total pounds and nearly 25% of total revenues; and jacks accounted for 16% of total pounds and 7% of total revenues. In central and south Florida, the shallow water snappers accounted for 29% of total pounds and nearly 41% of total revenues, and jacks accounted for 17% of total pounds and 10% of total revenues on trips with at least one pound of snapper grouper species. Fishermen in central and south Florida, especially in the Keys, tend to catch larger quantities of non-snapper grouper species such as mackerels.

Table 3-7. Average annual landings and dockside revenues for trips with at least one pound of species in the snapper grouper fishery, averages for 2001-2006 by state.

Item	North Carolina	South Carolina	Georgia and Northeast Florida	Central and South Florida	Total
	Trips with at least one pound of snapper grouper species				
snapper grouper landings (million pounds, whole wgt)	1.86	1.64	0.81	2.46	6.77
Percent of total snapper grouper pounds	27.4%	24.2%	12.0%	36.4%	100%
Dockside revenue from snapper grouper species (million dollars)	$3.46	$3.44	$1.65	$4.44	$12.99
Percent of total snapper grouper revenues	26.7%	26.5%	12.7%	34.2%	100%
Landings of other species on these trips (million lbs)	0.29	0.14	0.07	1.34	1.84
Dockside revenue from other species on these trips (million $)	$0.32	$0.18	$0.15	$1.30	$1.95
Number of boats*	170	66	50	650	922
Number of trips	2,801	956	560	11,183	15,500
Percent of trips	18.1%	6.2%	3.6%	72.1%	100%
Number of days	4,979	4,835	2,290	14,192	26,296
Trips per boat	16.5	14.5	11.2	17.2	16.8
Days per trip	1.8	5.1	4.1	1.3	1.7

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007. *Some boats land in more than one state.

Table 3-8. Average annual landings (in thousands of pounds, whole weights) on trips that landed at least one pound of snapper grouper species: averages for 2001-2006 by state and species group.

Item	North Carolina		South Carolina		Georgia and Northeast Florida		Central and South Florida		Total	
	lbs, 1000s	column percent	lbs, 1000s	column percent	lbs, 1000s	column percent	lbs, 1000s	column percent	lbs, 1000s	column percent
Shallow water groupers	464	21.6%	480	26.9%	163	18.5%	225	5.9%	1,332	15.5%
Deep water groupers	95	4.5%	98	5.5%	7	0.8%	113	3.0%	313	3.6%
Tilefishes	105	4.9%	150	8.4%	3	0.3%	252	6.6%	509	5.9%
Shallow water snappers	12	0.6%	18	1.0%	23	2.7%	1,104	29.1%	1,157	13.4%
Mid-shelf snappers	385	18.0%	467	26.2%	400	45.4%	68	1.8%	1,320	15.3%
Triggerfish /Spadefish	117	5.4%	69	3.8%	51	5.8%	6	0.2%	242	2.8%
Jacks	118	5.5%	159	8.9%	142	16.1%	647	17.0%	1,066	12.4%
Grunts & porgies	126	5.9%	80	4.5%	16	1.8%	42	1.1%	265	3.1%
Sea basses	436	20.3%	120	6.7%	6	0.7%	5	0.1%	567	6.6%
snapper grouper	1,858	86.6%	1,641	91.9%	811	92.1%	2,462	64.8%	6,771	78.7%
Coastal pelagics	205	9.5%	55	3.1%	40	4.6%	907	23.9%	1,207	14.0%
Sharks	11	0.5%	19	1.1%	7	0.8%	319	8.4%	357	4.1%
Tunas	25	1.1%	2	0.1%	1	0.1%	1	0.0%	29	0.3%
Other species	46	2.1%	68	3.8%	21	2.4%	109	2.9%	244	2.8%
All species	2,145	100.0%	1,785	100.0%	881	100.0%	3,798	100.0%	8,608	100.0%
Vermilion snapper	365	17.0%	424	23.8%	330	37.5%	18	0.5%	1,138	13.2%
Gag	146	6.8%	206	11.5%	99	11.3%	86	2.3%	537	6.2%

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Table 3-9. Average annual dockside revenues in thousands of constant 2005 dollars on trips that landed at least one pound of snapper grouper species: averages for 2001-2006 by state and species group.

Item	North Carolina		South Carolina		Georgia and Northeast Florida		Central and South Florida		Total	
	dollars, 1000s	column percent	dollars, 1000s	column percent	dollars, 1000s	column percent	dollars, 1000s	column percent	dollars, 1000s	column percent
Shallow water groupers	1,165	29.5%	1,433	38.0%	463	24.6%	600	10.0%	3,661	23.5%
Deep water groupers	212	5.4%	247	6.6%	17	0.9%	276	4.6%	752	4.8%
Tilefishes	128	3.2%	255	6.8%	6	0.3%	511	8.5%	899	5.8%
Shallow water snappers	24	0.6%	43	1.1%	51	2.7%	2,435	40.7%	2,553	16.4%
Mid-shelf snappers	1,001	25.4%	1,110	29.5%	984	52.2%	173	2.9%	3,268	21.0%
Triggerfish /Spadefish	123	3.1%	73	1.9%	54	2.9%	7	0.1%	256	1.6%
Jacks	100	2.5%	143	3.8%	123	6.5%	593	9.9%	959	6.2%
Grunts and porgies	117	3.0%	78	2.1%	17	0.9%	37	0.6%	249	1.6%
Sea basses	737	18.7%	199	5.3%	9	0.5%	8	0.1%	953	6.1%
snapper grouper	3,607	91.5%	3,581	95.1%	1,724	91.5%	4,638	77.4%	13,550	86.9%
Coastal pelagics	262	6.7%	93	2.5%	69	3.7%	950	15.9%	1,375	8.8%
Sharks	3	0.1%	13	0.3%	2	0.1%	121	2.0%	139	0.9%
Tunas	33	0.8%	4	0.1%	1	0.1%	2	0.0%	40	0.3%
Other species	39	1.0%	76	2.0%	88	4.7%	278	4.6%	481	3.1%
All species	3,943	100.0%	3,767	100.0%	1,885	100.0%	5,989	100.0%	15,584	100.0%
Vermilion snapper	943	23.9%	984	26.1%	776	41.2%	40	0.7%	2,743	17.6%
Gag	400	10.1%	639	17.0%	290	15.4%	255	4.2%	1,583	10.2%

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

3.4.1.1.4 *The Snapper Grouper Fishery by Gear*

The following discussion provides annual averages from 2001 to 2006. To maintain the confidentiality of individual reporting units, summaries are provided for vertical lines, longlines, black sea bass pots, and all other gears combined. The all-other-gear category includes trolling lines, diving gear, nets, and other gears.

Most of the snapper grouper harvest, including vermilion snapper and gag, is taken by some type of vertical hook-and-line gear. The exceptions include black sea bass, which is harvested primarily with black sea bass pots and golden tilefish and yellowedge grouper, which are harvested primarily with bottom longlines. Some species, such as snowy grouper, are harvested by both vertical lines and longlines. Longlines also are used in the shark fishery and may catch species in the snapper grouper management unit as secondary species.

The average quantities of snapper grouper species harvested from 2001-2006 included 5.36 million pounds worth $10.48 million per year with vertical lines, 0.54 million pounds worth $1.02 million with longlines, 0.53 million pounds worth $0.83 million with black sea bass pots, and 0.34 million pounds worth $0.65 million with other gears (Table 3-10). Trips with vertical lines accounted for 78% of all trips that landed species in the snapper grouper management unit and 79% of the total snapper grouper harvest. Trips with longlines tend to be longer than trips with other gears. Longline trips accounted for 2% of the trips and 8% of the snapper grouper harvest. Trips with black sea bass pots represented 5% of the trips and accounted for 8% of the harvest, while trips with other gears represented 15% of the trips and 5% of the harvest.

Table 3-10. Average annual landings and dockside revenues for trips with at least one pound of species in the snapper grouper fishery: averages for 2001-2006 by primary gear.

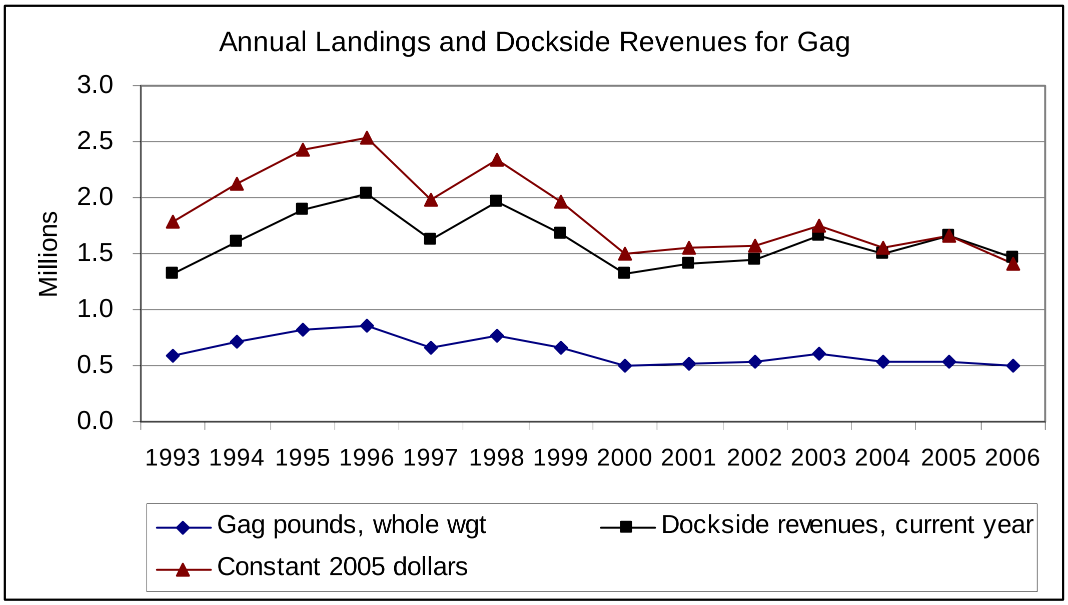
Item	Vertical Lines	Longlines	Traps / Pots	Other Gears	Total
	Trips with at least one pound of snapper grouper species				
Vermilion snapper landings (million pounds, whole wgt)	1.13	0.00	0.00	0.01	1.14
Percent of total vermilion snapper pounds	99.3%	0.0%	0.1%	0.5%	100.0%
Gag landings (million pounds, whole wgt)	0.44	0.00	0.00	0.09	0.54
Percent of total gag pounds	81.7%	0.7%	0.2%	17.4%	100.0%
snapper grouper landings (million pounds, whole wgt)	5.36	0.54	0.53	0.34	6.77
Percent of total snapper grouper pounds	79.2%	7.9%	7.8%	5.1%	100%
Dockside revenue from snapper grouper species (million dollars)	$10.48	$1.02	$0.83	$0.65	$12.99
Percent of total snapper grouper revenues	80.7%	7.9%	6.4%	5.0%	100%
Dockside revenue in constant 2005 dollars (millions)*	$10.93	$1.07	$0.87	$0.68	$13.55
Landings of other species on these trips (million lbs)	0.60	0.35	0.02	0.87	1.84
Dockside revenue from other species on these trips (million $)	$0.78	$0.19	$0.03	$0.96	$1.95
Dockside revenue from other species in constant 2005 dollars (millions)	$0.80	$0.20	$0.03	$1.01	$2.03
Number of boats*	749	33	53	304	922
Number of trips	12,065	286	793	2,357	15,500
Percent of trips	77.8%	1.8%	5.1%	15.2%	100%
Number of days	21,187	1,239	1,027	2,844	26,296
Trips per boat	16.1	8.7	15.0	7.8	16.8
Days per trip	1.8	4.3	1.3	1.2	1.7

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007. Some boats fish with more than one primary gear.

3.4.1.1.5 *The commercial fishery for gag*

Logbook data provide information about commercial landings for gag from 1993 through 2006. Between 1993 and 2006, commercial landings of gag ranged from a high of 0.85 million pounds (whole weight) worth approximately $2.03 million in 1996 to a low of 0.50 million pounds worth $1.32 million in 2000 (Figure 3-1). Data for 2006 indicate that landings of gag were approximately 0.50 million pounds worth $1.46 million. Dockside revenues and pounds landed fluctuate in the same direction, which suggests that ex-vessel demand is price elastic. The policy implication is that regulations that reduce industry landings in the short-term are expected to reduce dockside revenues in the short-term. Conversely, dockside revenues are expected to increase over time if regulation successfully increases biomass and landings.

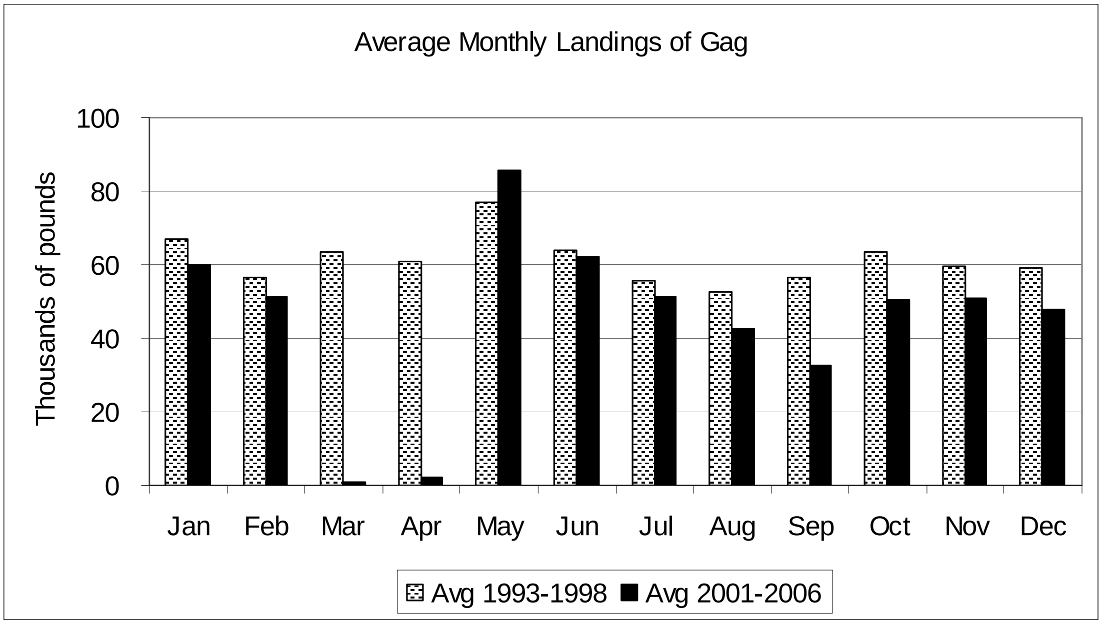
Figure 3-1. Annual landings and dockside revenues for gag, 1993-2006.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

The time series for gag is defined by regulatory periods, with landings between 1993 and 1999 usually exceeding landings between 2000 and 2006. Between 1992 and 1998, the fishery for gag was regulated with a 20-inch minimum size limit. Beginning in 1999, the size limit was increased to 24 inches and the fishery was closed in March and April to protect the spawning stock. Prior to 1998, average monthly landings were highest in May and lowest in August (Figure 3-2). After the closure and larger size limit were implemented, average monthly landings increased in May, but otherwise declined in the remaining open months when compared to the 1993-1998 period, especially in September.

Figure 3-2. Average monthly landings of gag for the 1993-1998 and 2001-2006 periods.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

On average from 2001-2006, there were 2,417 trips that landed at least one pound of gag, and totaled an annual average of 0.54 million pounds of gag worth $1.52 million in current year dollars and $1.58 million in constant 2005 dollars (Table 3-11). In addition, these trips annually produced an average of 2.13 million pounds of other species worth $3.98 million in current year dollars.

Table 3-11. Annual landings, dockside revenues, and fishing effort on trips for gag, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of gag						
Gag landings (million pounds, whole wgt)	0.52	0.53	0.60	0.53	0.54	0.50	0.54
Dockside revenue from gag (million dollars)	$1.41	$1.44	$1.66	$1.50	$1.65	$1.46	$1.52
Dockside revenue in constant 2005 dollars (millions)*	$1.55	$1.57	$1.76	$1.55	$1.65	$1.41	$1.58
Landings of other species on trips with gag (million lbs)	2.67	2.20	1.98	1.98	2.05	1.87	2.13
Dockside revenue from other species on trips with gag (mill $)	$4.87	$4.00	$3.52	$3.71	$4.03	$3.78	$3.98
Dockside revenue from other species in constant 2005 dollars	$5.36	$4.34	$3.73	$3.83	$4.02	$3.65	$4.16
Number of boats that landed gag	337	305	302	292	302	257	299
Number of boats landing 1000 lbs or more per year of gag	117	99	114	100	99	95	104
Number of boats landing 5000 lbs or more per year of gag	27	35	39	33	35	34	34
Number of boats landing 10,000 lbs or more per year of gag	10	10	13	13	13	14	12
Number of trips with at least one pound of gag	2,787	2,767	2,484	2,183	2,203	2,079	2,417

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Gag was the primary source of trip revenue on an average of 1,062 trips per year and a lesser source of revenue on 1,355 trips per year (Table 3-12). Therefore, gag was the primary source of trip revenue on 44% of the total number of trips on which they were landed. However, these trips accounted for approximately 67% of the total commercial harvest of gag. Trips on which gag was the primary source of revenue accounted for an annual average of 0.36 million pounds of gag worth $1.03 million in current dollars and 0.43 million pounds of other species, including other groupers, snappers, jacks, grunts, porgies and non-snapper grouper species, worth $0.78 million. Trips on which gag was a lesser source of revenue accounted for an annual average of 0.17 million pounds of gag worth $0.49 million in current dollars and 1.70

million pounds of other species worth $3.20 million. Gags were caught as a lesser source of revenue on trips for vermilion snapper, scamp, red grouper, jacks, and other species.

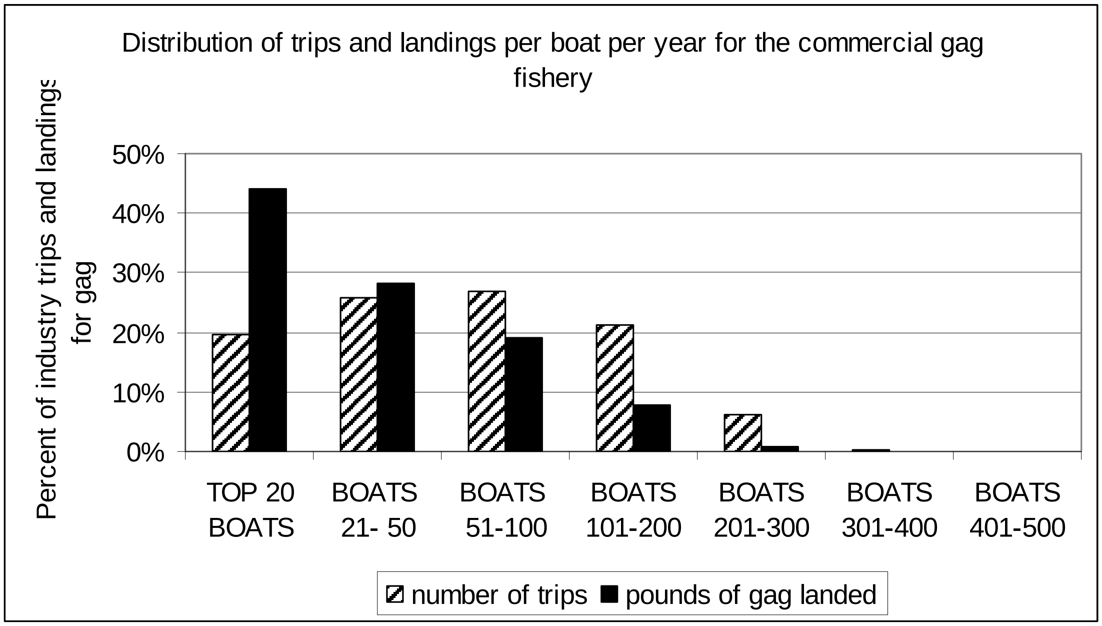
Table 3-12. Annual landings, dockside revenues, and fishing effort on trips with gag as the primary source of trip revenue, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with gag as primary source of revenue						
Number of trips with at least one pound of gag	2,787	2,767	2,484	2,183	2,203	2,079	2,417
Number of trips with gag as primary source of trip revenue	1,084	1,194	1,192	993	1,026	885	1,062
Number of trips with gag as a lesser source of trip revenue	1,703	1,573	1,292	1,190	1,177	1,194	1,355
Landings of gag on trips with gag as primary source of revenue (million pounds)	0.32	0.36	0.42	0.38	0.37	0.34	0.36
Dockside revenue for gag on trips with gag as primary source of revenue (million $)	$0.86	$0.97	$1.16	$1.08	$1.13	$1.00	$1.03
Landings of other species on trips with gag as primary source of revenue	0.39	0.38	0.51	0.47	0.43	0.39	0.43
Dockside revenues for other species on trips with gag as the primary source of revenue	$0.67	$0.66	$0.91	$0.86	$0.83	$0.75	$0.78

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

The number of boats that reported landing at least one pound of gag declined from 337 in 2001 to 257 in 2006, and averaged 299 boats per year (Table 3-11). The fleet was not uniformly productive in the fishery for gag, which is consistent with the observation that gag was the primary source of trip revenue on some trips and a lesser source of revenues on other trips. On average for 2001-2006, the top 20 boats for gag production made 20% of the trips that landed gag and recorded 44% of the total commercial harvest of gag (Figure 3-3). The top 50 producing boats made 46% of the trips and recorded 72% of the total harvest, while the top 100 producing boats made 72% of the trips and landed 91% of the total harvest. On average, 104 boats landed at least 1,000 pounds of gag per year, 34 boats landed at least 5,000 pounds per year, and 12 boats landed at least 10,000 pounds of gag per year (Table 3-11). Approximately 82% of gag is landed with vertical lines, and most of the remainder is landed with dive gear (Table 3-10).

Figure 3-3. Distribution of trips and landings per boat per year, based on trips that reported at least one pound of gag (averages for 2001-2006).

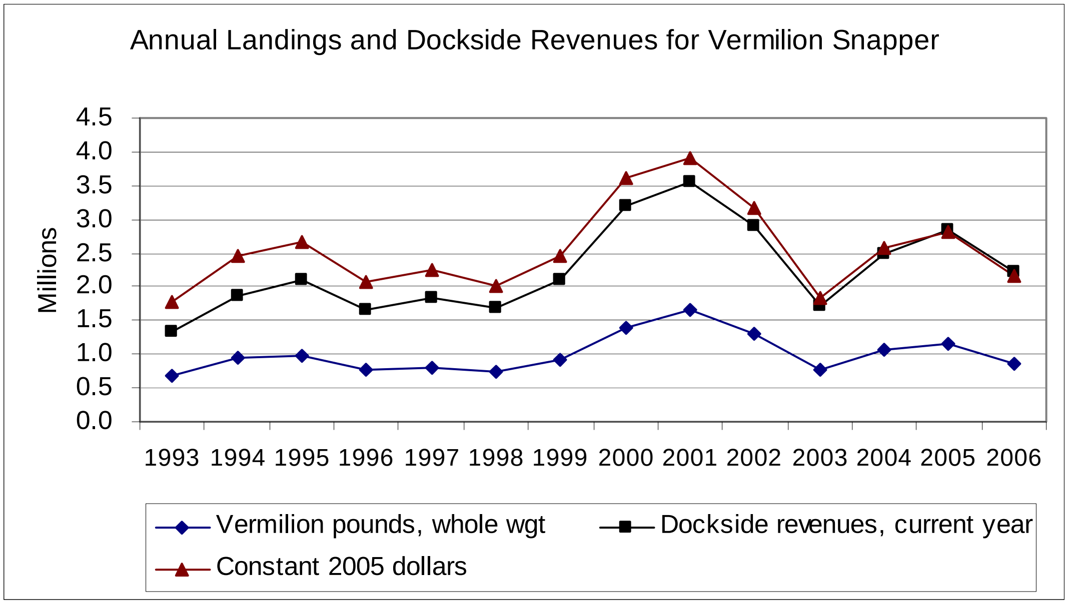


Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

3.4.1.1.6 *The commercial fishery for vermilion snapper*

Based on logbook data from 1993 through 2006, commercial landings of vermilion snapper ranged from a low of 0.68 million pounds (whole weight) worth $1.33 million in 1993 to a high of 1.65 million pounds worth approximately $3.54 million in 2001 (Figure 3-4). Landings of vermilion snapper began to increase in 1999 coincident with the implementation of more restrictive regulations for gag, peaked in 2001, and then declined through 2003 when unusually cold water temperatures reduced the availability of fish in the summer and fall of 2003. Landings of vermilion snapper recovered in 2004 and 2005, but not to the levels experienced in 2001 and 2002. Data for 2006 indicate that landings of vermilion snapper were approximately 0.86 million pounds worth $2.23 million. Dockside revenues generally displayed the same trend over time as commercial landings, which suggests that ex-vessel demand for vermilion snapper is price elastic. Hence, regulations that reduce industry landings in the short-term are expected to reduce dockside revenues in the short-term. Conversely, dockside revenues are expected to increase over time if regulation successfully increases biomass and landings.

Figure 3-4. Annual landings and dockside revenues for vermilion snapper, 1993-2006.

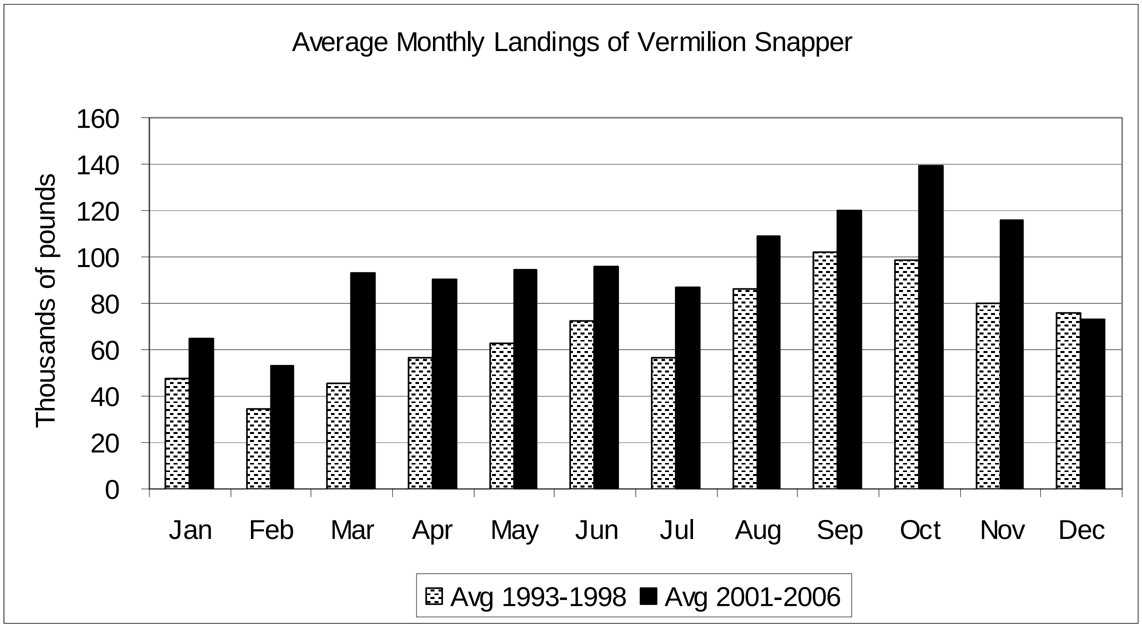


Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

Vermilion snapper are landed throughout the year, with peak months from August through November (Figure 3-5). Average monthly landings were higher for all months except December during the 2001-2006 period compared to the 1993-1998 period. The greatest relative monthly increases in average landings between the two periods occurred during March and April, apparently as fishermen shifted their fishing effort from gag to vermilion in response to the closed season that was implemented in 1999.

On average from 2001-2006, there were 2,423 trips that landed at least one pound of vermilion snapper, and totaled an average of nearly 1.14 million pounds of vermilion snapper worth $2.62 million in current-year dollars and $2.74 million in constant 2005 dollars (Table 3-13). In addition, these trips annually produced an average of 2.14 million pounds of other species combined worth $4.07 million in current year dollars.

Figure 3-5. Average monthly landings of vermilion snapper for the 1993-1998 and 2001-2006 periods.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Vermilion snapper was the primary source of trip revenue on an average of 1,186 trips per year and a lesser source of revenue on 1,237 trips per year (Table 3-14). Therefore, vermilion snapper was the primary source of trip revenue on 49% of the total number of trips on which they were landed. However, these trips accounted for 86% of total vermilion snapper landings. Trips on which vermilion snapper was the primary source of revenue accounted for an annual average of 0.98 million pounds of vermilion snapper worth $2.27 million in current dollars and 0.92 million pounds of other species, including groupers, jacks, grunts, porgies, and non-snapper grouper species, worth $1.53 million. Trips on which vermilion snapper was a lesser source of revenue accounted for an annual average of 0.16 million pounds of vermilion snapper worth $0.35 million in current dollars and 1.22 million pounds of other species worth $2.54 million. Vermilion snapper were caught as a lesser source of revenue on trips for gag, scamp, and red grouper in the shallow water grouper fishery and snowy grouper in the deep water grouper fishery.

Table 3-13. Annual landings, dockside revenues and fishing effort on trips for vermilion snapper, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of vermilion snapper						
Vermilion snapper landings (million pounds, whole wgt)	1.65	1.31	0.77	1.07	1.16	0.86	1.14
Dockside revenue from vermilion snapper (million dollars)	$3.54	$2.92	$1.73	$2.49	$2.83	$2.23	$2.62
Dockside revenue in constant 2005 dollars (millions)*	$3.90	$3.16	$1.83	$2.57	$2.83	$2.16	$2.74
Landings of other species on trips with vermilion snapper (million lbs)	2.36	2.20	2.03	2.06	2.07	2.15	2.14
Dockside revenue from other species on trips with vermilion snapper (million $)	$4.34	$3.99	$3.82	$3.90	$4.16	$4.19	$4.07
Dockside revenue from other species in constant 2005 dollars (millions)	$4.78	$4.33	$4.06	$4.03	$4.16	$4.05	$4.24
Number of boats that landed vermilion snapper	295	274	248	255	252	232	259
Number of boats landing 1,000 lbs or more per year of vermilion snapper	118	106	91	84	91	80	95
Number of boats landing 5,000 lbs or more per year of vermilion snapper	17	72	53	56	53	45	49
Number of boats landing 10,000 lbs or more per year of vermilion snapper	62	53	27	44	38	33	43
Number of trips with at least one pound of vermilion snapper	3,029	2,911	2,173	2,148	2,173	2,102	2,423

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

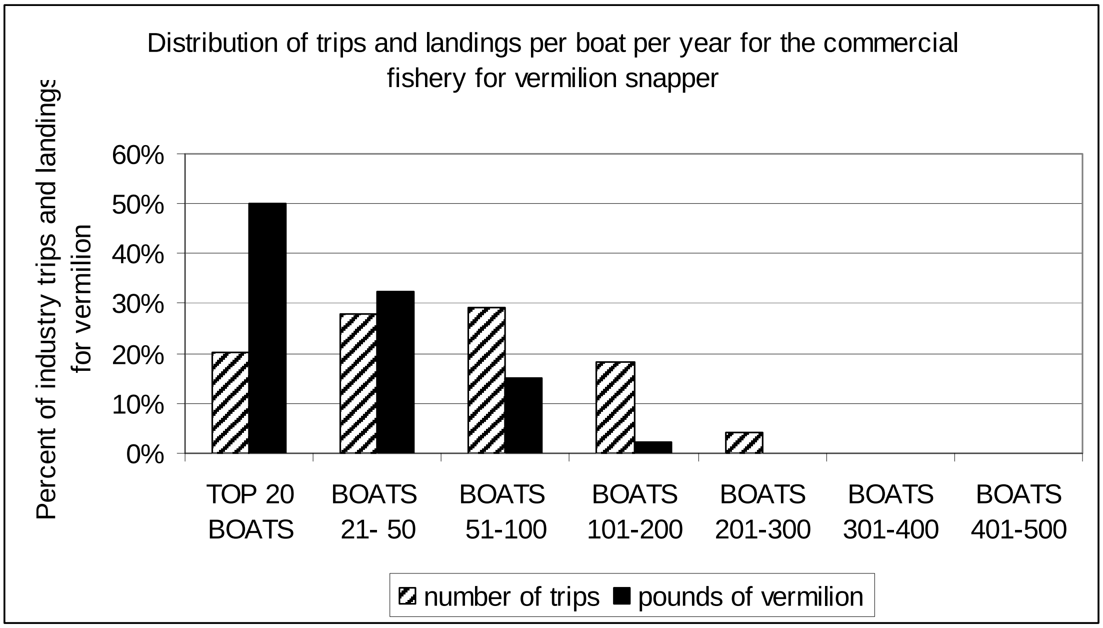
Table 3-14. Annual landings, dockside revenues and fishing effort on trips with vermilion snapper as the primary source of trip revenue, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with vermilion snapper as primary source of revenue						
Number of trips with at least one pound of vermilion snapper	3,029	2,911	2,173	2,148	2,173	2,102	2,423
Number of trips with vermilion snapper as primary source of trip revenue	1,693	1,495	924	1,053	1,084	867	1,186
Number of trips with vermilion snapper as a lesser source of trip revenue	1,336	1,416	1,249	1,095	1,089	1,235	1,237
Landings of vermilion snapper on trips with vermilion as primary source of revenue (million lbs)	1.47	1.16	0.62	0.93	1.00	0.71	0.98
Dockside revenue for vermilion on trips with vermilion as primary source of revenue (million $)	$3.17	$2.58	$1.39	$2.16	$2.47	$1.86	$2.27
Landings of other species on trips with vermilion as primary source of revenue	1.16	1.04	0.69	0.86	0.99	0.80	0.92
Dockside revenues for other species on trips with vermilion as the primary source of revenue	$1.89	$1.66	$1.13	$1.42	$1.72	$1.36	$1.53

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

The number of boats that reported landing at least one pound of vermilion snapper declined from 295 in 2001 to 232 in 2006, and averaged 259 boats per year (Table 3-13). The fleet was not uniformly productive in the fishery for vermilion snapper, which is consistent with the observation that vermilion snapper was the primary source of trip revenue on some trips and a lesser source of revenues on other trips. On average for 2001-2006, the top 20 boats for the production of vermilion snapper made 20% of the trips that landed vermilion and recorded 50% of the total commercial harvest of vermilion snapper (Figure 3-6). The top 50 producing boats made 48% of the trips and recorded 82% of the total harvest, while the top 100 producing boats made 77% of the trips and landed 98% of the total harvest. On average, 95 boats landed at least 1,000 pounds of vermilion snapper per year, 49 boats landed at least 5,000 pounds per year, and 43 boats landed at least 10,000 pounds of vermilion snapper per year (Table 3-13). Virtually all vermilion snapper are landed with vertical lines (Table 3-10).

Figure 3-6. Distribution of trips and landings per boat per year, based on trips that reported at least one pound of vermilion snapper (averages for 2001-2006).



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

3.4.1.1.7 *Imports*

Imports have been a major source of seafood supply in the U.S., and the domestic snapper grouper market is not an exception. For the period 2001-2006, imports of fresh and frozen snappers and groupers have stayed at relatively high levels, averaging44.7 million pounds (Table 3-15). Compare this with the average overall landings of snapper grouper in the South Atlantic for the same period of 6.77 million pounds (Table 3-5), and one can immediately see the dominance of imports in the snapper grouper market. At an annual average of $79.2 million for the years 2001-2006, imports clearly dwarf the $12.99 million ex-vessel value of South Atlantic snapper grouper landings. Dominance of imports in the snapper grouper market may be expected to exert limits on the movement of domestic ex-vessel prices resulting from changes in domestic landings of snappers and groupers.

Table 3-15. U.S. imports of snappers and groupers, 2001-2006.

YEAR	Pounds of imports by product form Millions of pounds*			Value of imports by product form Millions of dollars		
	FRESH	FROZEN	TOTAL	FRESH	FROZEN	TOTAL
2001	31.1	8.4	39.4	$51.7	$10.6	$62.3
2002	33.4	9.2	42.6	$57.1	$12.3	$69.5
2003	34.3	10.2	44.5	$58.9	$14.4	$73.3
2004	33.3	9.8	43.1	$61.7	$13.9	$75.6
2005	35.9	13.8	49.7	$72.0	$21.0	$93.0
2006	35.2	13.4	48.6	$78.8	$22.9	$101.7
Average	33.9	10.8	44.7	$63.4	$15.9	$79.2

Source: NOAA Fisheries, Foreign Trade Database.
*Weights are not converted to equivalent whole weights.

3.4.1.2 Recreational Fishery

The South Atlantic recreational fishery is comprised of the private sector and for-hire sector. The private sector includes anglers fishing from shore (all land-based structures) and private/rental boats. The for-hire sector is composed of the charterboat and headboat (also called partyboat) sectors. Charterboats generally carry fewer passengers and charge a fee on an entire vessel basis, whereas headboats carry more passengers and payment is per person. The type of service, from a vessel- or passenger-size perspective, affects the flexibility to search different fishing locations during the course of a trip and target different species since larger concentrations of fish are required to satisfy larger groups of anglers.

3.4.1.2.1 *Harvest*

Recreational snapper grouper harvest has been variable during the period 2001-2006, averaging at a little over 10 million pounds (Table 3-16). The private/shore mode of fishing accounted for around 67% of all harvests, followed by the charter mode (17%), and then by headboats (16%). Harvests in each state also fluctuated during the same time period (Table 3-17). On average, Florida accounted for 67% of total harvests, followed by North Carolina (16%), South Carolina (12%), and Georgia (7%).

Gag and vermilion snapper are the main species addressed in this amendment, but there are also other species that may be affected especially by the closure alternatives. These other species include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. For the period 2001-2006, gag averaged at 499,930 pounds, vermilion snapper at 537,300 pounds, and other species at 517,789 pounds (Table 3-18). The private/shore mode dominated the harvest of gag (70%) while the headboat sector dominated the harvest of vermilion snapper (59%). The private/shore mode dominated the harvest of other species (56%). Summing across species, total harvest is dominated by the private/mode sector, followed by the headboat sector, and lastly by the charterboat sector (Table 3-18).

Table 3-16. Harvest of snapper grouper species by mode in the South Atlantic.

Year	Charterboat[1]	Headboat[2]	Shore and Private/Rental Boat[1]	Total
2001	1,347,441	1,655,941	7,984,461	10,987,843
2002	1,362,090	1,432,450	5,182,763	7,977,303
2003	2,301,303	1,375,688	7,265,886	10,942,877
2004	1,517,384	1,889,010	6,688,596	10,094,990
2005	2,313,468	1,649,210	6,123,049	10,085,727
2006	1,998,902	1,648,405	7,282,328	10,929,635
Average	1,676,139	1,608,451	6,754,514	10,039,103

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.
[1] Pounds of A and B1 fish estimated from the MRFSS Survey.
[2] The total annual estimate of headboat catch derived from data collected through the NMFS headboat survey.

Table 3-17. Harvest of snapper grouper species by state in the South Atlantic.

Year	Florida	Georgia	South Carolina	North Carolina
2001	7,480,907	740,040	1,517,191	1,249,704
2002	5,741,379	366,369	711,612	1,157,941
2003	7,848,011	770,993	1,042,157	1,281,714
2004	5,970,816	763,609	1,625,212	1,735,353
2005	6,696,212	622,302	852,105	1,915,107
2006	6,474,221	746,982	1,466,944	2,241,489
Average	6,701,924	668,383	1,202,537	1,596,885

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

Florida accounted for the largest amount of harvests, followed by North Carolina, then by South Carolina, and lastly by Georgia (Table 3-19). Florida accounted for the largest share in the harvest of gag (67%) and other species (46%). South Carolina, on the other hand accounted for the largest share of vermilion snapper harvest (36%).

Table 3-18. Average harvest (lbs) of gag, vermilion snapper, and other species in this amendment by sector, 2001-2006.

Sector	Gag	Vermilion snapper	Other species*	Total
Charterboat	92,743	46,048	86,743	225,534
Headboat	56,046	316,907	140,820	513,773
Private/shore	351,141	174,345	290,226	815,712
Total	499,930	537,300	517,789	1,555,019

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.
*Other species includes black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

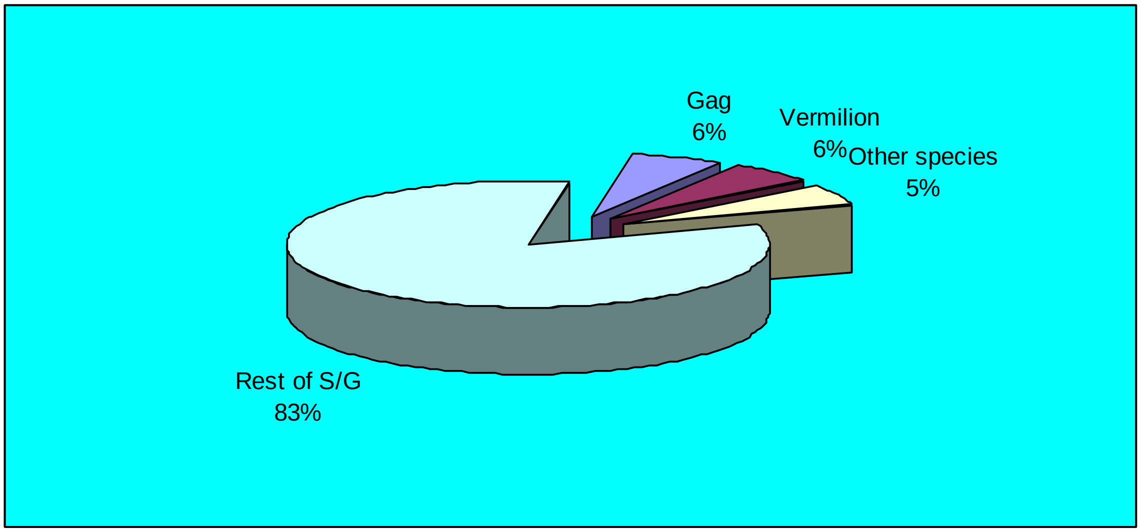
Table 3-19. Average harvest (lbs) of gag, vermilion snapper, and other species in this amendment by state, 2001-2006.

Sector	Gag	Vermilion snapper	Other species*	Total
Florida	334,480	128,467	236,172	699,119
Georgia	19,295	94,616	13,450	127,362
South Carolina	26,850	191,379	89,454	307,683
North Carolina	119,305	122,838	178,713	420,855
Total	499,930	537,300	517,789	1,555,019

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.
*Other species includes black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

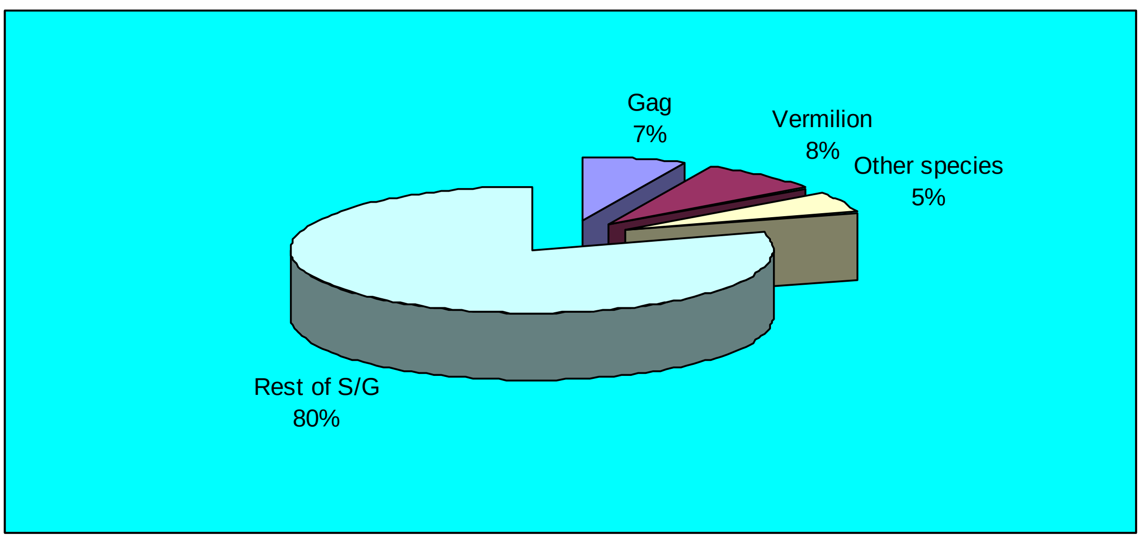
The species addressed by this amendment accounted for 17% of total recreational harvests of snappers and groupers for the period 2001-2006 (Figure 3-7). Gag and vermilion snapper accounted for 6% each of total harvests while other species accounted for 5%of total harvests. The subject species in this amendment vary in importance by sector. In the charterboat sector, the species in this amendment comprised 20% of this sector's total harvest (Figure 3-8). Of this sector's total harvest, vermilion comprised 8%, gag 7%, and other species 5%. For headboats, the species in this amendment accounted for 35% of total harvest (Figure 3-9). This can be broken down into 22% vermilion, 9% other species, and 4% gag. Among the various sectors, the private/shore mode has the lowest percentage of harvest affected by this amendment. The species in this amendment accounted for 12% of this sector's total harvest, with the following breakdown: 7% gag, 4% other species, and 1% gag (Figure 3-10).

Figure 3-7. Average composition of harvests (all modes) of species in this amendment, 2001-2006.



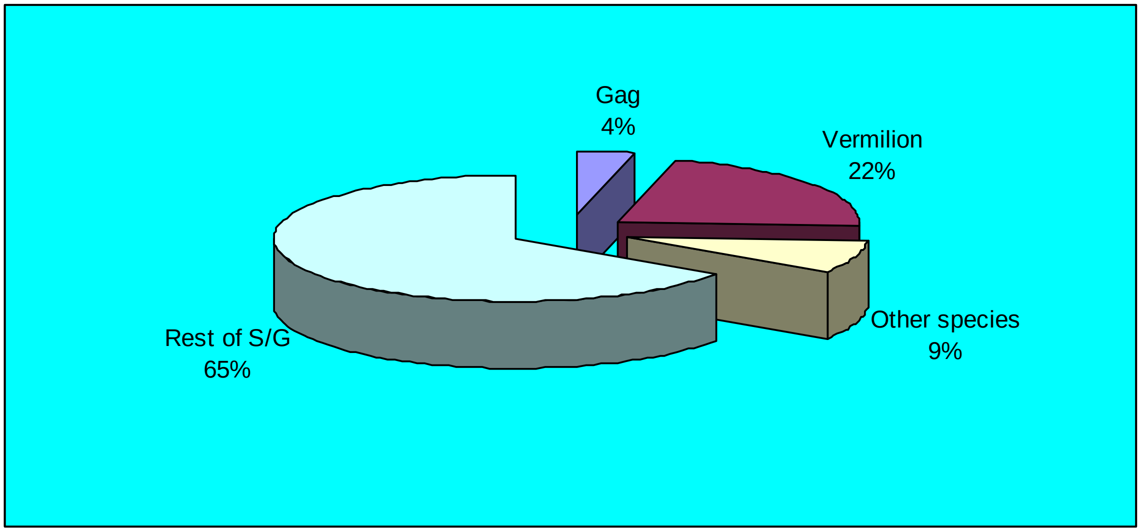
Sources: Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

Figure 3-8. Average composition of charterboat harvests of species in this amendment, 2001-2006.



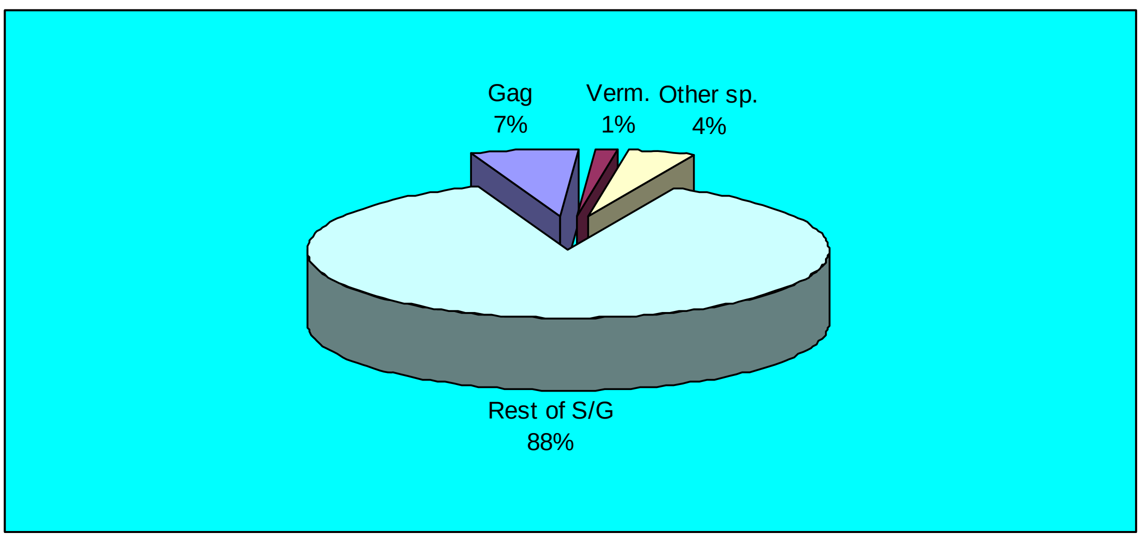
Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Figure 3-9. Average composition of headboat harvests of species in this amendment, 2001-2006.



Source: Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab.

Figure 3-10. Average composition of private/shore mode harvests of species in this amendment, 2001-2006.



Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

3.4.1.2.2 *Effort*

Recreational effort derived from the MRFSS can be characterized in terms of the number of trips as follows:

1. Target effort - The number of individual angler trips, regardless of duration, where the intercepted angler indicated that the species or a species in the species group was targeted as either the first or second primary target for the trip. The species did not have to be caught.
2. Catch effort - The number of individual angler trips, regardless of duration and target intent, where the individual species or a species in the species group was caught. The fish did not have to be kept.
3. Total recreational trips - The total estimated number of recreational trips in the South Atlantic, regardless of target intent or catch success.

Estimates of average effort for the entire snapper grouper fishery are provided in Table 3-20 for trips by mode and Table 3-21 for trips by state. The total column refers to the total number of trips taken by anglers in the South Atlantic snapper grouper fishery and not to the sum catch and target trips. On average, catch trips were highest on those taken through the private mode and lowest on those through the charter mode. The same is true with target trips: they were highest for private mode and lowest for charter mode. For the charter mode, both catch and target trips increased over time although there was some downward blip in the last year. Shore mode catch and target trips remained about flat around their means. Catch trips for the private fluctuate around their mean, but high levels were experienced in the last two years. On the other hand, private mode target trips declined over time, with a slight uptick in the last year.

Table 3-20. Recreational effort for the snapper grouper fishery in the South Atlantic, in thousand trips, by mode, 2001-2006.

	Charter Mode Trips			Shore Mode Trips			Private Mode Trips		
	Catch	Target	Total*	Catch	Target	Total*	Catch	Target	Total*
2001	102	21	497	1,200	355	11,534	1,803	607	9,565
2002	105	22	440	919	233	9,057	1,744	495	8,266
2003	118	23	412	1,103	263	10,872	2,105	648	9,963
2004	129	28	418	987	209	11,186	1,985	477	9,488
2005	373	69	971	1,095	195	11,240	2,096	473	9,886
2006	285	68	834	1,276	272	12,511	2,603	530	10,749
Avg.	185	39	595	1,097	255	11,067	2,056	538	9,653

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

*Note: The total column refers to the total number of trips taken by anglers in the South Atlantic snapper grouper fishery and not to the sum catch and target trips.

Table 3-21. Recreational effort for the snapper grouper fishery in the South Atlantic, in thousand trips, by state, 2001-2006.

	Florida			Georgia			South Carolina			North Carolina		
	Catch	Target	Total*	Catch	Target	Total*	Catch	Target	Total*	Catch	Target	Total*
2001	2,620	772	12,464	78	53	807	123	96	1,676	283	61	6,650
2002	2,395	628	10,303	57	20	619	87	51	1,254	230	51	5,586
2003	2,860	723	11,444	92	46	971	143	86	2,098	231	80	6,733
2004	2,530	532	10,800	90	26	960	191	84	2,224	289	71	7,107
2005	2,835	579	12,200	96	28	859	178	60	2,188	454	70	6,849
2006	3,325	633	13,349	71	28	799	248	133	2,670	520	76	7,276
Avg.	2,761	645	11,760	81	34	836	162	85	2,018	335	68	6,700

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.
*Note: The total column refers to the total number of trips taken by anglers in the South Atlantic snapper grouper fishery and not to the sum catch and target trips.

For the period 2001-2006, an annual average of 295,593 trips taken by anglers caught some of the species in this amendment (Table 3-22). This is about 9% of all catch trips taken by anglers in the South Atlantic snapper grouper fishery. An average of 96,800 trips caught gag, 81,815 caught vermilion snapper, and 116,978 caught other species. The private mode accounted for the largest number of catch trips for all species groups in this amendment. The charter and shore modes registered substantially lower catch trips than the private mode. There were more trips catching other species than either gag or vermilion, and more gag catch trips than vermilion.

The number of trips that targeted species in this amendment (55,485)was substantially lower than catch trips. This is about 7% of all target trips in the South Atlantic snapper grouper fishery. Again, the private mode dominated all other modes in terms of number of target trips. In fact, target trips by the charter and shore modes registered at very low levels (Table 3-22). There were substantially more target trips for gag (47,330) than for vermilion snapper (1,381), or other species (6,774).

Table 3-22. Average recreational effort for species in this amendment, by mode, 2001-2006.

	Gag	Vermilion	Other Species	Total
	Catch Trips			
Charter	11,405	36,148	25,461	73,014
Shore	7,423	310	3,098	10,831
Private	77,972	45,357	88,419	211,748
Total	96,800	81,815	116,978	295,593
	Target Trips			
Charter	3,155	250	177	3,582
Shore	2,151	0	379	2,530
Private	42,024	1,131	6,218	49,373
Total	47,330	1,381	6,774	55,485

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

The regional distribution of catch and target trips for the species in this amendment is presented in Table 3-23. Florida, with 233,188 total catch trips, dominated all other states, but catch trips in North Carolina (36,382) and South Carolina (17,753) were also relatively high. Florida also had the largest catch trips for each of the three species groups in this amendment, followed by North Carolina, South Carolina, and Georgia.

In terms of target trips, only Florida registered large numbers while all other states showed relatively minimal target trips. In fact, Florida, with a total of 54,550 target trips, accounted for about 98 percent of all target trips for species in this amendment. It may be pointed out, though, that most of the Florida target trips (85%) were for gag, and there were more target trips for other species than for vermilion snapper.

Table 3-23. Average recreational effort for species in this amendment, by state, 2001-2006.

	Gag	Vermilion	Other Species	Total
	Catch Trips			
Florida	81,200	52,713	99,275	233,188
Georgia	1,607	5,784	879	8,270
South Carolina	3,358	10,831	3,564	17,753
North Carolina	10,636	12,486	13,260	36,382
Total	96,801	81,814	116,978	295,593
	Target Trips			
Florida	46,635	1,145	6,770	54,550
Georgia	252	0	0	252
South Carolina	14	22	0	36
North Carolina	429	214	3	646
Total	47,330	1,381	6,773	55,484

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

The fact that target trips were substantially lower than catch trips has implications on the determination of the economic effects of regulations considered in this amendment. It may be contended that target trips contain more meaningful economic valuation of the fishing experience than catch trips from the standpoint of predicting the economic outcome of regulations. One reason for this is that a target trip carries with it an indication of an angler's assignment of some positive values to the species targeted. On the other hand, some catch trips may simply be accidental and as such may not provide any indication of an angler's assignment of value on certain species. It is possible, of course, that past catch trips may shape future target trips, but this would necessitate further research to determine the nature and extent of the effects of past catch trips on future target trips. At any rate, the substantial difference between catch and target trips may imply that if regulations in this amendment were effective in reducing harvest by reducing catch trips more than target trips, then the resulting economic effects would likely be less than harvest reductions.

Similar analysis is not possible for the headboat sector since data are not collected at the angler level. Estimates of effort in the headboat sector are provided in terms of angler days, or the number of standardized 12-hour fishing days that account for the different half-, three-quarter-, and full-day fishing trips by headboats. Despite the inability to associate headboat effort with specific species, the stationary bottom nature of headboat fishing, as opposed to trolling, suggests that all headboat trips and, hence, angler days, are snapper grouper trips by intent, though not necessarily success.

Headboat angler days are presented in Table 3-24. Due to very low headboat angler days for Georgia, entries for Georgia were combined with those of Florida to avoid showing confidential data. For the period 2001-2006, total headboat angler days fluctuated around the mean of 238,012 days. On average, Florida accounted for the largest number of angler days (163,375), or about 69% of all headboat angler days. Nevertheless, the numbers for South Carolina (44,810 days) and North Carolina (27,824 days) are far from being negligible.

Table 3-24. Estimate of headboat angler days for the U.S. South Atlantic.

	Florida*	South Carolina	North Carolina	Total
2001	163,389	49,265	31,779	246,434
2002	151,546	42,467	27,601	223,616
2003	145,011	36,556	22,998	206,568
2004	173,701	50,461	27,255	253,421
2005	171,078	34,036	31,573	238,692
2006	175,522	56,074	25,736	259,338
Average	163,375	44,810	27,824	238,012

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab.
*Note: Florida data includes Georgia to avoid showing confidential data.

3.4.1.2.3 *Permits*

For-hire vessels in the South Atlantic are required to have a snapper grouper for-hire permit to fish for or possess snapper grouper species in the EEZ. The number of permitted vessels for the period 2001-2006 is provided in Table 3-25. This sector operates as an open access fishery and not all permitted vessels are necessarily active in the fishery. Some vessel owners have been known to purchase open access permits as insurance for uncertainties in the fisheries in which they currently operate.

The number of for-hire permits issued in the South Atlantic snapper grouper fishery increased over the period 2001-2006, with 1,095 permits in 2001 to 1,681 permits in 2006. Most of the increases would likely be for strictly for-hire business, since permits issued for vessels operating as for-hire and commercial entities remained about flat during the same period. The majority of snapper grouper for-hire permitted vessels were home-ported in Florida; a good number of vessels were also home-ported in North Carolina and South Carolina. Interestingly, there were several vessels with home ports in states other than those within the South Atlantic Council's area of jurisdiction. Most of the vessels with both for-hire and commercial permits were home-ported in the South Atlantic Council's area of jurisdiction.

Table 3-25. Snapper grouper for-hire permit holders by home port state.

	Number of vessels issued for-hire vessel permits						Number of vessels with both a for-hire permit and a commercial snapper grouper permit					
Home Port State	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Florida	675	776	957	1,084	1,119	1,108	144	145	148	151	148	151
North Carolina	180	195	206	232	254	284	39	35	45	42	43	46
South Carolina	137	129	122	108	121	119	39	34	34	33	33	34
Georgia	25	27	36	27	33	33	4	5	4	2	2	2
Virginia	10	11	5	13	10	10	6	6		4	3	2
Other States	33	38	69	48	51	62	3	2	8	3	5	3
Gulf States	35	44	82	82	79	65						
Total	**1,095**	**1,220**	**1,477**	**1,594**	**1,667**	**1,681**	**235**	**227**	**239**	**235**	**234**	**238**

Source: Southeast Permits Database, NOAA Fisheries, SERO.

The for-hire permit does not distinguish between whether the vessel operates as a charterboat or headboat. Based on a 1997 survey, Holland *et al.* (1999) estimated that a total of 1,080 charter vessels and 96 headboats supplied for-hire services in all South Atlantic fisheries during 1997.

3.4.1.2.4 *Economic Value and Expenditures*

Participation, effort, and harvest are indicators of the value of saltwater recreational fishing. However, a more specific indicator of value is the satisfaction that anglers experience over and above their costs of fishing. The monetary value of this satisfaction is referred to as consumer surplus. The value or benefit derived from the recreational experience is dependent on several quality determinants, which include fish size, catch success rate, and the number of fish kept. These variables help determine the value of a fishing trip and influence total demand for recreational fishing trips.

Estimates of the economic value of a day of saltwater recreational fishing in the South Atlantic indicate that the mean value of access per marine recreational fishing trip is $109.31 for the South Atlantic (Haab *et al.* 2001). While this estimate is not specific to snapper grouper fishing trips, it may shed light on the magnitude of an angler's willingness to pay for this type of recreational experience.

Willingness to pay for an incremental increase in catch and keep rates per trip was also estimated to be $3.01 for bottom fish species by Haab *et al.* (2001). Whitehead and Haab (2001) estimated the marginal willingness to pay to avoid a one fish red snapper bag limit decrease to be $1.06 to $2.20. Finally, Haab *et al.* (2001) provided a compensating variation (the amount of money a person would have to receive to be no worse off after a reduction of the bag limit) estimate of $2.49 per fish when calculated across all private boat anglers that targeted snapper grouper species in the South Atlantic.

These valuation estimates should not be confused with angler expenditures or economic activity. While expenditures for a specific good or service may represent a proxy or lower bound of value (a person would not logically pay more for something than it was worth to them), they do not represent the net value (benefits minus cost), nor the change in value associated with a change in the fishing experience. However, angler expenditures benefit a number of sectors that provide goods and services for salt-water sport fishing. Gentner *et al.* (2001) provided estimates of saltwater recreational fishing trip expenditures (Table 3-26). These estimates do not include expenditures in Monroe County, Florida, or expenditures in the headboat sector.

Table 3-26. Summary of expenditures on saltwater trips.

	North Carolina		**South Carolina**		**Georgia**		**Florida**	
Item	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**
Shore mode trip expenses	$63.61	$75.53	$54.12	$104.27	$31.78	$115.13	$36.90	$141.30
Private/rental boat trip expenses	$71.28	$92.15	$35.91	$67.07	$161.34	$77.51	$66.59	$94.15
Charter mode trip expenses	$201.66	$110.71	$139.72	$220.97	$152.45	$155.90	$96.11	$196.16
Charter fee-average-per day	$133.76	$70.59	$114.26	$109.97	$73.68	$80.99	$71.37	$100.79

Source: 1999 MRFSS add-on survey (Gentner *et al.* 2001).

3.4.1.2.5 *Financial Operations of the Charter and Headboat Sectors*

Holland *et al.* (1999) estimated that the charterboat fee in the South Atlantic ranged from $292 to $2,000. The actual cost depended on state, trip length, and the variety of services offered by the charter operation. Depending on the state, the average fee for a half-day trip ranged from $296 to $360; for a full day trip the range was $575 to $710; and for an overnight trip the range was $1,000 to $2,000. Most (>90 percent) Florida charter operators offered half-day and full-day trips and about 15% of the fleet offered overnight trips. In comparison, only about 3% of operations in the other South Atlantic states offered overnight trips.

For headboats, the average fee in Florida was $29 for a half-day trip and $45 for a full day trip. For North and South Carolina, the average base fee was $34 per person for a half-day trip and $61 per person for a full day trip. Most of these headboat trips operated in Federal waters in the South Atlantic (Holland *et al.* 1999).

Capital investment in charter vessels averaged $109,301 in Florida, $79,868 for North Carolina, $38,150 for South Carolina and $51,554 for Georgia (Holland *et al.* 1999). Charterboat owners incur expenses for inputs such as fuel, ice, and tackle in order to offer the services required by their passengers. Most expenses incurred in 1997 by charter vessel owners were on crew wages and salaries and fuel. The average annual charterboat business expenditures incurred was $68,816 for Florida vessels, $46,888 for North Carolina vessels, $23,235 for South Carolina vessels, and $41,688 for vessels in Georgia in 1997. The average capital investment for headboats in the South Atlantic was approximately $220,000 in 1997. Total annual business expenditures averaged $135,737 for headboats in Florida and $105,045 for headboats in other states in the South Atlantic.

The 1999 study on the for-hire sector in the Southeastern U.S. presented two sets of average gross revenue estimates for the charter and headboat sectors in the South Atlantic (Holland *et al*. 1999). The first set of estimates were those reported by survey respondents and were as follows: $51,000 for charterboats on the Atlantic coast of Florida; $60,135 for charterboats in North Carolina; $26,304 for charterboats in South Carolina; $56,551 for charterboats in Georgia; $140,714 for headboats in Florida; and $123,000 for headboats in the other South Atlantic states (Holland *et al*. 1999). The authors generated a second set of estimates using the reported average trip fee, average number of trips per year, and average number of passengers per trip (for the headboat sector) for each vessel category for Florida vessels. Using this method, the resultant average gross revenue figures were $69,268 for charterboats and $299,551 for headboats. Since the calculated estimates were considerably higher than the reported estimates (22% higher for charterboats and 113% higher for headboats), the authors surmised that this was due to sensitivity associated with reporting gross receipts, and subsequent under reporting. Alternatively, the respondents could have overestimated individual components of the calculated estimates. Although the authors only applied this methodology to Florida vessels, assuming the same degree of under reporting in the other states results in the following estimates in average gross revenues: $73,365 for charterboats in North Carolina; $32,091 for charterboats in South Carolina; $68,992 for charterboats in Georgia; and $261,990 for headboats in the other South Atlantic states.

It should be noted that the study's authors were concerned that while the reported gross revenue figures may be underestimates of true vessel income, the calculated values could overestimate gross income per vessel from for-hire activity (Holland *et al.* 1999). Some of these vessels are also used in commercial fishing activities and that income is not reflected in these estimates.

3.4.2 Social and Cultural Environment

A more detailed description of the social and cultural environment of the snapper grouper fishery is contained in Amendment 13C (SAFMC 2006) and is incorporated herein by reference. The following sections summarize key information relevant to this action. Key communities were identified primarily based on permit and employment activity. These data were obtained from the U.S. Bureau of the Census and from state and federal permitting agencies.

Permit trends are hard to determine, since several factors may affect how many vessels are homeported in certain communities, including vessel mobility, shifting stock locations, and resettlement of fishermen due to coastal development. Nevertheless, although vessel location shifts occur, static geographical representations help determine where impacts may be felt.

Data from the U.S. Census Bureau must be used with some caution. Census data may not reflect shifting community demographics. Businesses routinely start up and fail or move and the census data collection cycle may fail to capture key changes. Further, census estimates do not include seasonal visitors and tourists, or those that live less than half the year in a surveyed area. Many of the latter group may work as seasonal employees and not be counted. Census data also misses some types of labor, such as day laborers, undocumented crew members, or family members that help with bookkeeping responsibilities.

Permit requirements for the commercial snapper grouper fishery were established in 1998 by Amendment 8 (SAFMC 1997). This amendment created a limited entry system for the fishery and established two types of permits based on the historic landings associated with a particular permit. Those who could demonstrate a certain amount of landings over a certain time period received permits that did not limit the number of pounds of snapper grouper that could be landed from federal waters (hereafter referred to as "unlimited commercial permits"). These permits were transferable. Vessels with verified landings, but did not meet the threshold were issued permits that allowed them to land 225 pounds of snapper grouper species from federal waters each trip (hereafter referred to as "limited commercial permits"). These permits were not transferable. New entry into the fishery required the purchase of two unlimited permits from existing permit holders for exchange for a new permit. This "two for one" system was intended to gradually decrease the number of permits in the fishery. These restrictions only applied to the commercial snapper grouper permit.

Impacts on fishing communities from coastal development, rising property taxes, decreasing access to waterfront due to increasing privatization of public resources, rising cost of dockage and fuel, lack of maintenance of waterways and ocean passages, competition with imported fish, and other less tangible (often political) factors have combined to put all these communities and their associated fishing sectors under great stress.

While studies on the general identification of fishing communities have been undertaken in the past few years, little social or cultural investigation into the nature of the snapper grouper fishery itself has occurred. A socioeconomic study by Waters *et al.* (1997) covered the general characteristics of the fishery in the South Atlantic, but those data are now over 10 years old and do not capture important changes in the fishery. Cheuvront and Neal (2004) conducted survey work of the North Carolina commercial snapper grouper fishery south of Cape Hatteras, but did not include ethnographic examination of communities dependent upon fishing.

To help fill information gaps, members of the South Atlantic Council's Snapper Grouper Advisory Panel, Council members, Advisory Panel members, and representatives from the angling public identified communities they believed would be most impacted by the management measures proposed in Amendment 13C on the species addressed by this amendment. Details of their designation of particular communities, and the factors considered in this designation, can be found in Amendment 13C (SAFMC 2006).

Because so many communities in the South Atlantic benefit from snapper grouper fishing, the following discussion focuses on "indicator communities," defined as communities thought to be most heavily impacted by snapper grouper regulations.

3.4.2.1 North Carolina

Figure 3-11. North Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

3.4.2.1.1 *Statewide*

Overview

Of the four states in the South Atlantic region, North Carolina (Figure 3-11) is often recognized as possessing the most “intact” commercial fishing industry; that is, it is more robust in terms of viable fishing communities and fishing industry activity than the other three states. The state offers a wide variety of fishing opportunities, including sound fishing, trolling for tuna, bottom fishing, and shrimping. Perhaps because of the wide variety of fishing opportunities, fishermen have been better able to weather regulations and coastal development pressures, adjusting their annual fishing patterns as times have changed.

Commercial Fishing

There has been a steady decline in the number of federal commercial snapper grouper permits in North Carolina since 1999, with 194 unlimited commercial permits in 1999, but only 139 in 2004. Limited permits similarly declined from 36 to16.

State license sale and use statistics for all types of licenses also indicate an overall decrease since 1994. While the overall number of state licenses to sell any species of fish or shellfish increased from 6,781 in 1994 to 9,712 in 2001/2002, the number of license holders actually reporting sales decreased from 6,710 in 1994/1995 to 5,509 in 2001/2002 (SAFMC 2006).

North Carolina fishermen demographics are detailed in Cheuvront and Neal (2004). Ninety eight percent of surveyed fishermen were white and 58% had completed some college or had graduated from college. Of those who chose to answer the question, 27% of respondents reported a household income of less than $30,000 per year, and 21%made at least $75,000 per year. On average, respondents had been fishing for 18 years and had lived in their communities for 27 years.

Cheuvront and Neal (2004) also provided an overview of how North Carolina commercial snapper grouper fishermen carry out their fishery. Approximately 65% of surveyed fishermen indicated year-round fishing. Gag is the fish most frequently targeted by these fishermen, with 61% of fishermen targeting gag at some point in the year, despite the prohibition of commercial sales and limit to the recreational bag limit in March and April. Vermilion snapper (36.3%) and black sea bass (46%) are the next most frequently targeted species. A significant number of fishermen land king mackerel during each month, with over 20% of fishermen targeting king mackerel between October and May. During the gag closed season, king mackerel are targeted by about 35% of the fishermen. Other snapper grouper complex species landed by at least 5% of the fishermen in any given month were red grouper (39.5%), scamp (27.4%), snowy grouper (9.7%), grunts (14.5%), triggerfish (13.7%), and golden tilefish (5.6%). Non-snapper grouper complex species landed by at least 5% of the fishermen in any given month included Atlantic croaker, yellowfin tuna, bluefin tuna, dolphin, and shrimp.

Recreational Fishing

Recreational fishing is well developed in North Carolina and, due to natural geography, is not limited to areas along the coast. Data show that North Carolina is almost on par with east Florida for total recreational fishing participation effort (data not shown; see SAFMC (2006)). A brief discussion of public boat ramps and local recreational fishing clubs, as well as sources of information used by these anglers, can be found in SAFMC (2006).

The North Carolina state legislature approved the creation of a state recreational saltwater fishing license in 2004. The license created controversy for both the recreational and commercial sectors, each believing that it will hurt or help their access to marine resources. Possession of the license, subject to exemptions, will be required beginning on January 1, 2007 (http://www.ncdmf.net/recreational/NCCRFLfaq.htm).

3.4.2.1.2 *Hatteras Village*

A detailed history of this community, from its discovery by Italian explorers in the 16th century to establishment of a National Seashore in 1953, can be found in SAFMC (2006).

Overview

Census data indicate there was not a significant increase in population size in Hatteras Village from 1990 to 2000 (SAFMC 2006). The demographics of the island have shifted, as is evidenced in the decreasing percentage of the population that is actively in the workforce, perhaps reflecting a larger number of retirees in the community, and the increasing proportion of residents with higher education, also reflecting a retired, professional segment of the population. Hatteras Village has also experienced a significant increase in the percent of the population in the farming, fishing, and forestry occupations, from 5.6% to 10.8%. This may be reflective of the increasing number of persons employed in businesses related to recreational fishing, such as charter boat captains and crew, boat repair and sales, marinas, etc. See SAFMC (2006) for the raw data describing community demographics. Figure 3-12 includes two maps detailing the area.

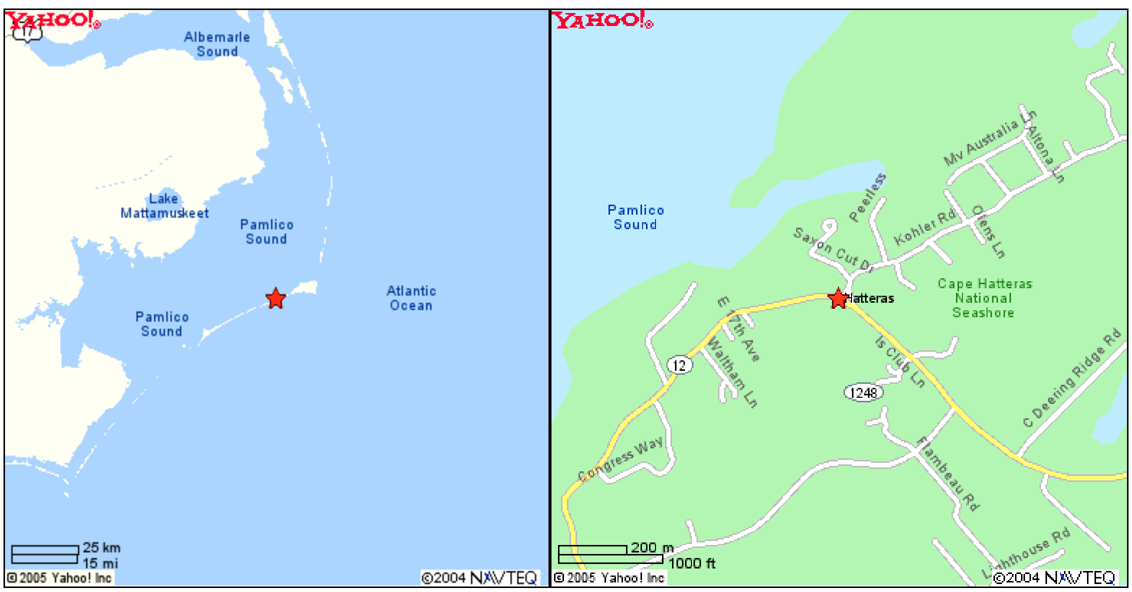


Figure 3-12. Hatteras Island and Village, Outer Banks, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

Commercial Fishing

Anecdotal information from Hatteras residents indicates the number of fish houses has decreased as tourism has increased (SAFMC 2006). Residents, however, still promote the fisherman's way of life through festivals and special community designations (SAFMC 2006).

Mirroring the statewide trend, the number of unlimited commercial permits held by residents of Hatteras decreased from 1999 (9 permits) to 2004 (5 permits). The number of limited commercial permits has remained at 3 (SAFMC 2006). Twenty people stated they were employed in fishing related industry in the 1998 census, with 18 of these employed by marinas. A listing of the six marinas and eight bait and tackle stores in Hatteras Village can be found in SAFMC (2006).

Recreational Fishing

Hatteras is host to several prestigious fishing tournaments and is homeport for the island's famous charter fishing fleet. The number of charter/headboat permits held by Hatteras residents has dramatically increased, from one permit in 1999 to 28 in 2004.

3.4.2.1.3 *Wanchese*

A history of this community, and neighboring Manteo, describing its persistence as a small, close-knit community focused on making its living from the sea, can be found in SAFMC (2006).

Figure 3-13. Map of Roanoke Island, North Carolina, showing Wanchese and Manteo.
Source: Kathi Kitner.

Overview

Figure 3-13 provides a map of Roanoke Island, including Wanchese and Manteo. While Wanchese has maintained its identity as a commercial fishing community, it faces continuing pressure from developers in nearby Manteo and other Outer Banks communities. However, the town has recently approved a zoning document that would prevent unplanned growth and would help preserve working waterfronts and residential areas (Kozak 2005). A partial community profile detailing local traffic patterns, businesses, and prominent families can be found in SAFMC (2006).

The largest industrial area in Wanchese is centered on the Wanchese Seafood Industrial Park, built to enhance business opportunities in the seafood and marine trades. Tenants of the park are able to ship products overnight to major domestic and international markets through the airport in Norfolk, Virginia. The park is utilized by fishermen and seafood dealers, as well as boatbuilding and boat maintenance businesses. The park is full of activity and it is common to find large numbers of people, especially Hispanics, working in the marine trade industries.

Census statistics from 2000 show the population of Wanchese is aging and very homogenous, with little ethnic diversity. There has been a slight increase in the Hispanic population since 1990, mirroring most other communities in North Carolina. Education levels have also increased, and the poverty rate has decreased. A higher percentage of people are employed in fishing-related professions in Wanchese than in almost any other community – 10% – although even that number has decreased nearly 50% since 1990.

Commercial Fishing

Commercial landings and value for Wanchese/Stumpy Point declined from 31.9 million pounds valued at $26.1 million in 2001 to 28.7 million pounds valued at $23.2 million in 2002. In 2001, Wanchese/Stumpy Point was listed as the 28th most prominent United States port based on the value of the product landed, declining to 30th in 2002. While landings increased in 2003, to 33 million pounds, value further declined to $21 million (31st place), with further declines in both poundage (31 million pounds) and value ($20.5 million) in 2004.

Amendment 8, which limited entry into the commercial snapper grouper fishery, does not appear to have caused a decrease in the number of commercial permits held by residents of Wanchese (SAFMC 2006). In 1999, seven unlimited commercial permits were held, with eight in 2004. Three limited commercial licenses were held in both 1999 and in 2004.

One hundred twenty residents of Wanchese stated they were employed in fishing related industries in the 1998 census (SAFMC 2006). Sixteen of these were listed as employed in fishing, 56 in fish and seafood, and 40 in boatbuilding.

There were 228 commercial vessels registered and 201 state standard commercial fishing licenses issued in the community in 2002 (SAFMC 2006). Wanchese residents also held 12 dealer licenses. The town is an important unloading port for many vessels transiting to and from the Mid-Atlantic and South Atlantic.

Recreational Fishing

As of 2005, nine boatbuilding businesses were located in Wanchese, building pleasure yachts, recreational fishing vessels or, less often, commercial fishing vessels. There were two bait and tackle businesses and two marinas in town. All these businesses rely on the fishing industry. Manteo also maintains an active private and for-hire recreational fishing community. From 1999 to 2004, there was an increase in the number of charter/headboat licenses held, from two permits to nine permits. As most of the recreational sector for the region operates out of Manteo and Nags Head, these communities would be more affected by recreational fishing restrictions than would Wanchese.

Figure 3-14. Area of Carteret County, North Carolina, showing Morehead City, Atlantic Beach (at the red star), and Beaufort.
Source: Yahoo Maps, http://www.yahoo.com.

3.4.2.1.4 *Morehead City*

In Carteret County, Morehead City, Beaufort, and Atlantic Beach form a triad of different but complementary communities in close geographic proximity (Figure 3-14). A detailed history of Morehead City, from its founding in the 1840s-1850s to its development as a center for sport and tournament fishing in recent years, can be found in SAFMC (2006).

Overview

Morehead City's economy is currently based on tourism, fishing (commercial and recreational), light industry, government, and other service and professional industries. The town has regained its commercial viability as a modern port terminal, and benefits from its location on the "sound-side" of the Atlantic Beach resort trade. Diving has become an important tourist activity; Rodale's Scuba Diving magazine recently named North Carolina as the best wreck diving destination in North America and Morehead City as the best overall dive destination. Recreational fishing effort is growing quickly, as new marinas, boat storage areas, boat builders, and marine supply stores open in the city.

Detailed statistics on community demographics of Morehead City in 1990 and 2000 can be found in SAFMC (2006). The population of Morehead City increased from 1990 to 2000, with sizable increases in the number of people declaring non-white ethnicities. Median income increased from approximately \$20,000 to nearly \$29,000 from 1990 to 2000. Median home value nearly doubled, and median rent increased 35 percent. The percentage of those completing high school increased by 10%, and there was a 7% increase in those receiving a bachelor's degree or higher. The poverty level decreased. However, the unemployment rate increased. The occupations of farming, fishing, and forestry employ more than 1% of the population of Morehead City.

Commercial Fishing

In 1998, 100 people were employed in fishing related businesses according to census figures, with 40 employed in marinas and 36 employed in fish and seafood businesses (SAFMC 2006). Over 200 state commercial vessel licenses, 150 state standard commercial fishing licenses, and 14 dealer licenses were issued by the state to residents of Morehead City in 2002. The number of unlimited commercial permits held by Morehead City residents was 15 in 1999 and 14 in 2004, while the three limited commercial permits held in 1999 were no longer held by 2004 (SAFMC 2006). As of 2002, the state had issued 211 commercial vessel registrations, 150 standard commercial licenses, and 14 dealer licenses to Morehead City residents. Residents of Morehead City were primarily employed by marinas (40%) and fish and seafood (36%), with 16% employed in boatbuilding businesses.

A narrative detailing the fishing methods, habits, and observations of a bandit-rig fisherman in Morehead City can be found in SAFMC (2006).

Recreational Fishing

The number of charter/headboat permits held by Morehead City residents nearly doubled, from seven in 1999 to 13 in 2004.

3.4.2.1.5 *Beaufort*

Beaufort is located on the coast near Cape Lookout, and borders the southern portion of the Outer Banks. Its deep harbor is home to vessels of all sizes, and its marinas are a favorite stop-over for transient boaters. A detailed history of Beaufort, from its establishment to its importance as a trade center during the 18th and 19th centuries, to its later involvement in the menhaden fishing industry, can be found in SAFMC (2006).

Overview

Tourism, service industries, retail businesses, and construction are important mainstays of the Beaufort area, with many shops and restaurants catering to people from outside the area. Census data show a slight decrease in population size from 1990 to 2000, from 3,808 inhabitants to 3,771, perhaps due to the aging population. Educational attainment rose over the last decade, and the percentage of individuals below the poverty line fell slightly. The percentage of those in the labor force decreased, another possible indication of an aging population. However, the percentage unemployed also decreased. The number of people working in farming, fishing, and forestry remained about the same from 1990 to 2000. According to census business pattern data from 1998, most of the fishing-related employment in Beaufort (total 300 persons) occurs in the boat building industry, which employs 184 residents (SAFMC 2006). Forty-eight people reported working in marinas, while others are employed in fish processing, fish harvesting, and seafood marketing.

Commercial Fishing

There has been a slight decrease in the number of unlimited commercial permits held by residents of Beaufort, from 5 permits in1999 to 4 permits in 2004. In the last two years, the one limited commercial permit held by a Beaufort resident was no longer reported. As of 2002, the state had issued 430 commercial vessel registrations, 294 standard commercial licenses, and 32 dealer licenses to Beaufort residents.

Recreational Fishing

There has been virtually no change in the number of charter/headboat permits, 1 permit in 2003 and 2004, held by residents.

3.4.2.1.6 *Atlantic Beach*

Atlantic Beach has been a popular resort town since the 1870s. The first bathing pavilion was built on Bogue Banks in 1887. Tourists flocked to the resorts, and ferry service to Atlantic Beach increased. Other resorts and tourism related development occurred over the next century, and the area remains a popular vacation destination (www.atlanticbeach-nc.com/).

Overview

Atlantic Beach demographic data from 1990 and 2000 show a slight population decline since 1990, as well as decreases in the percent of the population involved in farming, fishing, and forestry (SAFMC 2006). The median age of the population has increased, perhaps a reflection of the growing number of retirees moving to this area of the coast.

Commercial Fishing

As observed in other areas of North Carolina, since limited access was put into place, the number of commercial permits has decreased from eight unlimited commercial permits in 1999 to four in 2004, and four limited commercial permits to zero (SAFMC 2006). In 1998, 60 residents of Atlantic Beach were employed in fishing related industry, with 93% of those employed by the marine sector. In 2002, 56 vessels were registered with the state as commercial fishing vessels, 42 standard commercial fishing licenses were held by Atlantic Beach residents, and there were ten valid dealer licenses issued to community members (SAFMC 2006).

Recreational Fishery

Since 1999, the number of federal charter/headboat permits held by Atlantic City residents has increased from six to 19, though only one permit was recorded in 2002. Of the 60 individuals reporting working in a fishing related industry in 1998, 46 worked in marinas. Two state permits were issued to recreational fishing tournaments to sell licenses in 2002 (SAFMC 2006).

Figure 3-15. General area of Sneads Ferry, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

3.4.2.1.7 *Sneads Ferry*

Sneads Ferry is a historical fishing village located on the New River near the northern tip of Topsail Island (Figure 3-15). The river joins the Intracoastal Waterway at Sneads Ferry, with easy access to the Atlantic Ocean. A very active commercial fishing community, Sneads Ferry takes in more fish than any other Onslow County port. It also includes Camp Lejeune, a U.S. Marine base. The Sneads Ferry Shrimp Festival has been held annually since 1971. Now grown to a two-day event, the annual shrimp festival is the town's major fund-raiser. From its proceeds, the town established a 14-acre community park and built a 7200-sq. ft. Shrimp Festival Community Building (www.sneadsferry.com/areahistory/his_sf.htm).

Overview

Census data indicate the population of Sneads Ferry increased by about 10% from 1990 to 2000, from 2,031 inhabitants to 2,248. Most new residents were white, and the number of black or African American residents decreased from 159 to 115. Median income increased from about $20,000 to nearly $35,000. Median home value increased from $65,000 to $110,000, but median rent remained about the same. The percentage of those completing high school increased by 10% and the percentage of residents with at least a Bachelor's degree doubled, from 6% to 12.8%. The poverty level decreased from 20.9% to 13.5%, and the percentage of the population unemployed decreased from 8.3% to 2.2%. The percentage of residents employed in farming, fishing, and forestry decreased by half from 18.2% to 9%, while employment in sales and office occupations increased by over 17%. It is unclear who may be buying home sites on newly developed land in the town, but the town's current demographics may point to an increase in retirees in Sneads Ferry, as they are better educated, have higher incomes, and are older. The dramatic decline by approximately 50% of persons employed in extractive natural resource occupations may be due to increasing job opportunities outside of the community, the changing impacts of regulations, or status of the resources

Commercial Fishing

Sneads Ferry is a small town with little of the large-scale development seen elsewhere on the North Carolina coast. Many houses in the community have fishing vessels docked in front of the house or on the lawn. The white rubber boots worn by commercial fishermen in this community and many other parts of North Carolina are commonly referred to as "Sneads Ferry Sneakers", suggesting the importance of commercial fishing to the area. Most of the fishermen in town are shrimpers and net fishermen who go out daily. There is also a strong contingent of black sea bass pot fishermen resident in the town. The species with the highest consistent landings in the town are black sea bass, button clams, blue crab, flounders, mullet, shrimp, spot, and whiting.

The number of federal charter/headboat permits held by residents increased from six in 1999 to 13 in 2004, while the number of unlimited commercial permits decreased from 22 to 17, and the number of limited commercial permits remained at one (SAFMC 2006). Over 347 commercial fishing vessels were registered with the state in 2002, and 228 residents held state-issued standard commercial fishing licenses. There were also 18 dealer licenses in the community and 169 shellfish licenses. In 1998, 16 persons were employed in fishing related industry, with 75% working in fish and seafood.

Recreational Fishing

Recreational fishing in Sneads Ferry is not as prominent an activity as in Morehead City. However, there are a large number of vessels with charter permits for snapper grouper homeported there. Little is currently known about recreational fishing out of Sneads Ferry, aside for its advertisement as an important tourist attraction in many websites that discuss the community. At least five marinas cater to recreational fishermen. There are two other marinas at Camp LeJeune Marine Base, just across the Neuse River. Some smaller river and sound fishing charters operating out of the area and one headboat runs from Sneads Ferry. Other than black sea bass, it does not appear that many snapper grouper species are frequently caught recreationally from Sneads Ferry.

3.4.2.2 South Carolina

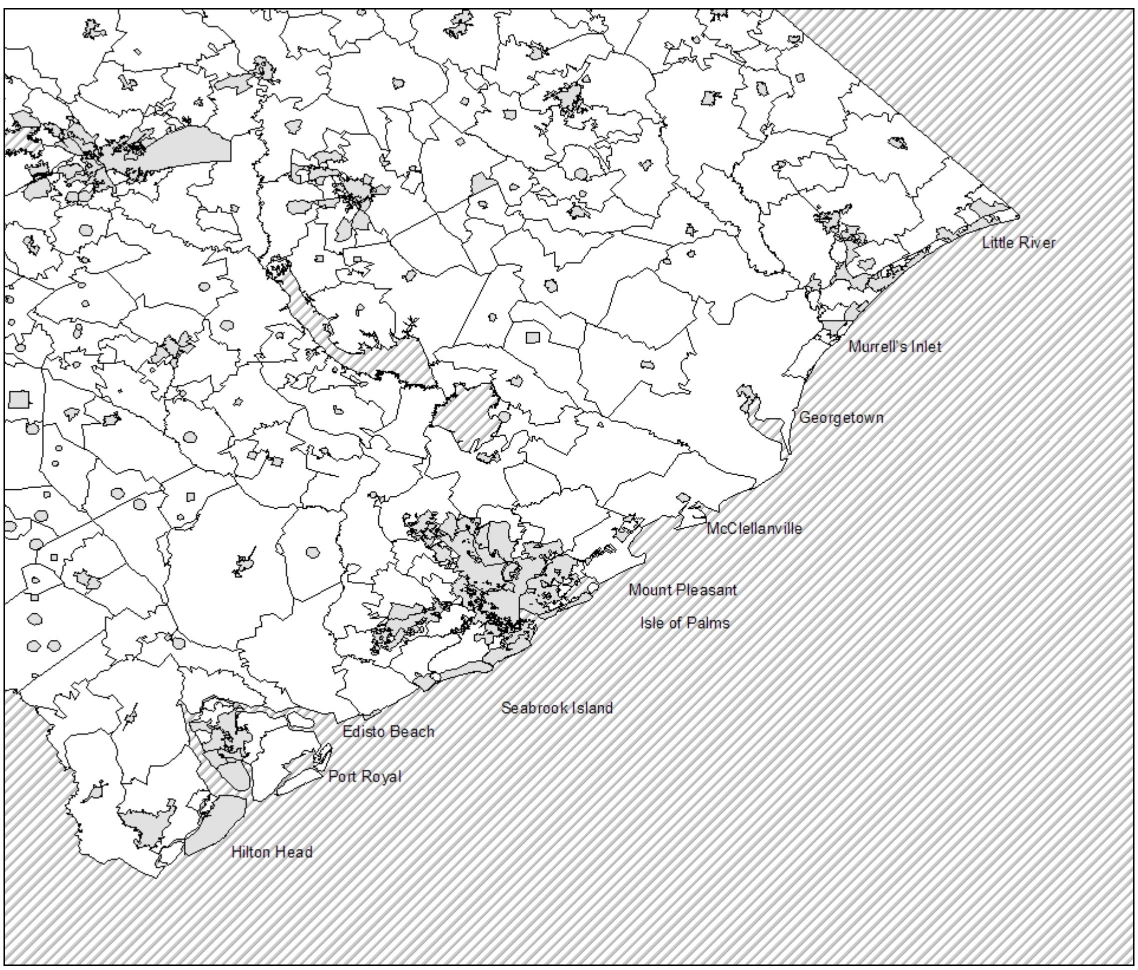


Figure 3-16. South Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

3.4.2.2.1 *Statewide*

Overview

South Carolina communities with substantial fishing activity are less developed than those in North Carolina and, over the past 20 to 30 years, the state has seen much more tourist-oriented development along its coasts than Georgia or North Carolina. In Horry County, the urban area of Myrtle Beach has expanded greatly in the past few decades, and much of the coastal area has been developed as vacation homes, condominiums, and golf courses. The communities most impacted by this development are Little River, Murrells Inlet, Pawleys Island, and Georgetown, although the latter three are located in Georgetown County (Figure 3-16). The same is true of rapid developing Charleston County, and the cities and communities of McClellanville, Mt. Pleasant, Sullivans Island, Wadmalaw, and Edisto Islands feel the impact of urban sprawl from the city of Charleston. Further south along the coast, the Hilton Head Island resort development has been the impetus for changing coastal landscapes in the small towns of Port Royal, Beaufort, St. Helena Island, and Bluffton.

For the purpose of this document, only Little River will be singled out as a community with a high concentration of both commercial and recreational fishing, along with other types of coastal oriented leisure pursuits. Other analyses will consider South Carolina as a whole.

Commercial Fishing

While pockets of commercial fishing activities remain in the state, most are being displaced by the development forces and associated changes in demographics. The number of unlimited commercial permits, however, increased from 74 in 1999 to 87 in 2004, while the number of limited commercial permits decreased by 75 percent from 12 to 4 (SAFMC 2006).

Recreational Fishing

Many areas that used to be dedicated to commercial fishing endeavors are now geared towards the private recreational angler and for-hire sector. The number of federal charter/headboat permits held by South Carolina residents increased from 41 in 1999 to 111 in 2004. The majority of saltwater anglers fish for coastal pelagic species such as king mackerel, Spanish mackerel, tunas, dolphins, and billfish. A lesser number focus primarily on bottom fish such as snapper and groupers and often these species are the specialty of the headboats that run out of Little River, Murrells Inlet, and Charleston. There are 35 coastal marinas in the state and 34 sportfishing tournaments (SAFMC 2006).

3.4.2.2.2 *Little River*

A history of Little River detailing its settlement in the late 1600s, its popularity as a vacation destination in the 1920s, and the concurrent rise in charter fishing, can be found in SAFMC (2006).

Figure 3-17. Little River, South Carolina, and surrounding area.
Source: Yahoo Maps, http://www.yahoo.com.

Overview

Figure 3-17 shows Little River and the surrounding area. A detailed description of changes in land-use patterns in and near Little River can be found in SAFMC (2006). Nearby Murrells Inlet is gradually transforming into a residential community for Myrtle Beach, and SAFMC (2006) argues this is also true for Little River.

Census data indicate the Little River population more than doubled from 1990 (3,470 persons) to 2000 (7,027 persons) and became more ethnically diverse with more people of American Indian or Alaskan Native, and Hispanic or Latino ethnicities. Median income increased by over 40%, from nearly $29,000 to over $40,000. Median home value also increased by over 40%, and median rent increased by nearly 35%. The percentage of those completing high school and those with a Bachelor's degree remained about the same. The poverty level decreased by nearly two-thirds to 4.7%, and the percentage of the population unemployed decreased from 6.6% to 3.4%. The percentage of residents employed in farming, fishing, and forestry decreased from 3.6% to 0.9%.

Commercial Fishing

In 1998, 38 residents of Little River were employed in fishing related industry according to the U.S. Census, with 81% of those employed by the marina sector. The number of snapper grouper unlimited harvest commercial permits held by community residents remained about the same between 1999 and 2004, from 15 permits to 16 permits, and one resident still held a limited harvest commercial license. Twenty-four Little River residents held state permits, with the most being saltwater licenses (8 permits) or trawler licenses (5 permits) (SAFMC 2006).

Recreational Fishing

As observed in other coastal communities described herein, the number of charter/headboat permits held by community residents increased from nine in 1999 to 16 in 2004. Three headboats operated out of Little River, and this part of the for-hire industry has a long and storied past in the community. Recreational fishing, primarily as headboat effort, came about as a way for commercial fishermen to continue fishing in the summer months. A detailed account of how recreational fishing developed in Little River can be found in Burrell (2000). Most of the private recreational fishing effort in this area occurs out of marinas in North Myrtle Beach, Myrtle Beach, and Murrells Inlet.

3.4.2.3 Georgia

3.4.2.3.1 *Statewide*

Overview

Only one community in Georgia (Townsend) lands a substantial amount of the snapper grouper species addressed in this amendment. Other parts of the state involved in the commercial harvest of seafood are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and mullet.

Brunswick, the other community that has a commercial fishing presence, was once a more thriving commercial fishing community but now tourism and other related activities are competing for waterfront in the town. The most commonly harvested species in Brunswick are blue crab and different species of penaeid shrimp. According to the ACCSP website, there have been no snapper grouper species landed in Brunswick since 2001. Other parts of the state involved in the commercial harvest of seafood are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and some mullet.

Commercial Fishing

Unlike the pattern observed in many other areas, the number of unlimited commercial permits and limited commercial permits held by Georgia residents did not decrease from 1999 to 2004, with eight permits and one permit, respectively. In 2002, 947 vessels were registered with the state as commercial fishing vessels, 612 full-time state commercial fishing licenses were held by Georgia residents, and 147 residents held part-time state commercial fishing licenses. Within the commercial fishing fleet, four hundred and eighty two vessels had shrimp gear on board in that year (SAFMC 2006).

Recreational Fishing

As observed in other areas, the number of charter/headboat permits held by Georgia residents increased markedly from five permits in 1999 to 27 permits in 2004 (SAFMC 2006). Recreational vessels are located at Tybee Island close to Savannah, on the barrier islands off Brunswick, and between Savannah and Brunswick.

3.4.2.3.2 *Townsend*

A history of the area, describing its economy before the Civil War, the rise and fall of lumbering, and the building of the railroad, can be found in SAFMC (2006).
Townsend is a small, rural community. In 2005, the fish house in this community was relocating inland. It is not known if this relocation was successful and whether that fish house will be handling domestically harvested fish in the future.

Overview

The population of Townsend increased by over 1,000 residents from 2,413 in 1990 to 3,538 in 2000. Although there was a large relative increase in the number of Hispanic or Latino residents, from 2 to 27, most of the new inhabitants were white (1,465 in 1990 and 2,437 in 2000). Median income increased from approximately $23,000 to $35,000. Median home value nearly tripled, from $33,000 in 1990 to $98,100 in 2000, and monthly rent nearly doubled, from $213 to $431. In 1990, 26.9% of residents had less than a 9th grade education, but by 2000, that number declined to 11.0%. The percentage of those completing high school increased by nearly 15%, while the percent receiving a bachelor's degree or higher remained about the same (8.4% to 8.9%). The percentage of the population with an income below the poverty line deceased by 4%, but remained high at 14.6%. The percentage of the population unemployed increased from 3.4% to 6.5%. There has been a sizeable decline in the percentage of the population employed in manufacturing, from 29.0% to 16.2%, and the proportion of the population employed in farming, fishing, and industry remained unchanged at approximately 3%.

Commercial Fishing

A comprehensive description of the historic and current fish houses of coastal Georgia and how they operate, focusing on Phillips Seafood of Townsend, can be found in SAFMC (2006). For nearly a decade, only one fish house has consistently handled snapper grouper species. A fish house in Brunswick may have landed these species in the past, but has not reported landings since 2001.

Recreational Fishing

Offshore recreational anglers do not often target or harvest snapper grouper species in Georgia (http://www.st.nmfs.noaa.gov/st1/recreational/overview/overview.html).

Of the snapper grouper species harvested, black sea bass, sheepshead, and vermilion snapper are the most commonly harvested fish at 5%, 7%, and 2%, respectively. As of 2004, residents of the Savannah area held 11 charter/headboat permits for snapper grouper, and many of these vessels are docked on Tybee Island. Residents of the area around the city of Brunswick, including Jekyll Island and Sea Island, held four snapper grouper charter/headboat permits. Interestingly, unlike the cities profiled in the Carolinas, the number of federally permitted for-hire vessels has declined dramatically. From 2003 to 2004, the number of snapper grouper permitted for-hire vessels declined from 43 to 27 (NMFS 2004). The cause of this decline is unknown.

3.4.2.4 Florida

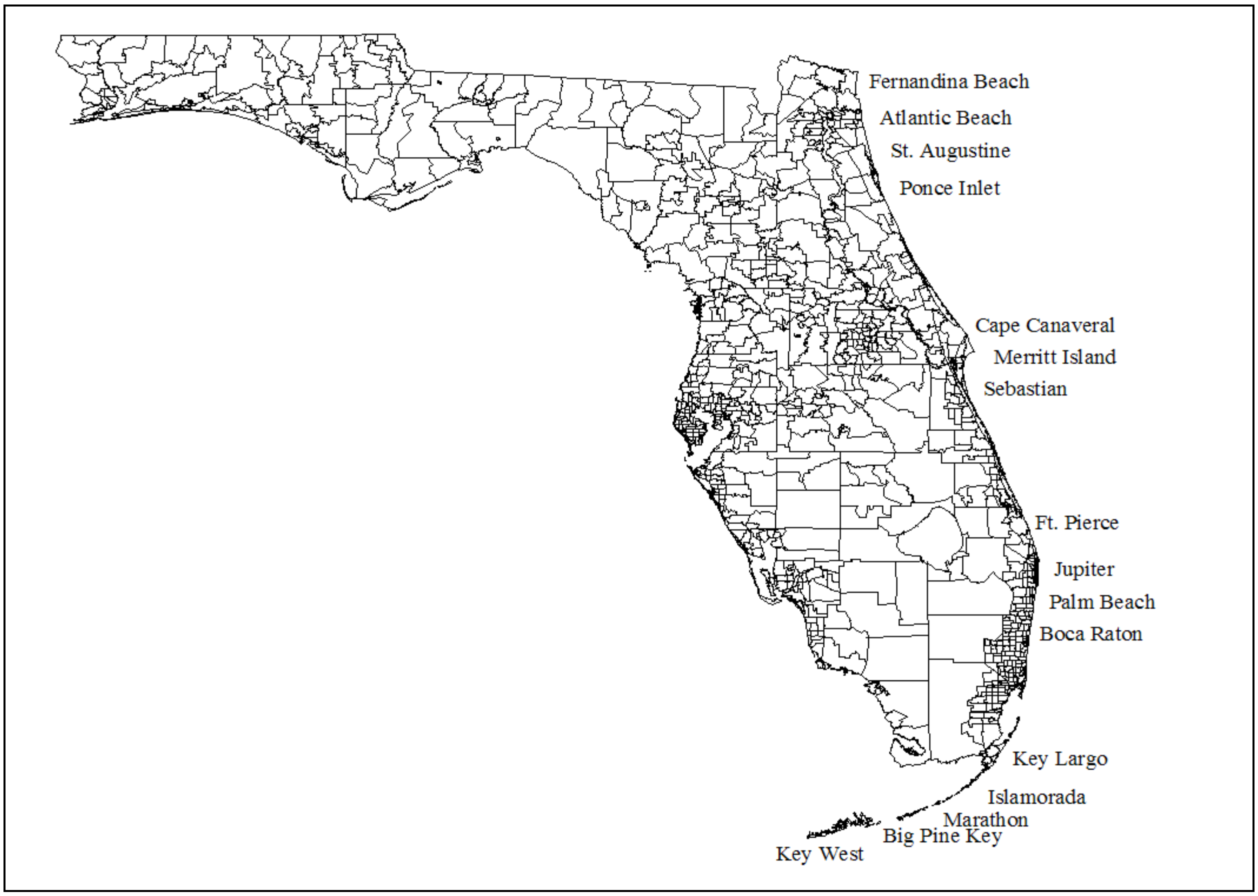


Figure 3-18. Florida communities with substantial fishing activity. Identified by South Atlantic Advisory Panels.
Source: Jepson *et al.* (2005).

3.4.2.4.1 *Statewide*

Overview

Florida stands apart from other states in the South Atlantic region in fishing behaviors, history, and demographics. Florida has one of the fastest growing populations in the United States, estimated to increase each day by 750 to 1,000 new immigrants. Twenty-five percent of all vacation homes in the United States are located in Florida's coastal counties (Coastal Ocean Resource Economics 2005).

Along with being heavily populated on land, coastal waters off Florida are also heavily used by recreational users of all kinds. This growth of a leisured class occupying coastal areas has led, in part, to conflicts over natural resource access and use-rights. One example of this type of struggle was the conflict over the use of gillnets in state waters. The conflict culminated in a state-wide ban on the use of gillnets, which dealt a resounding blow to many Florida fishermen, ending in the loss of many commercial fishing properties and the displacement of many fishermen. There have also been conflicts between the "environmental community" and commercial fishermen over the closing of the *Oculina* Bank off of Florida's central coast and the creation of both the Florida Keys National Marine Sanctuary and the Tortugas Sanctuary, both in the Keys.

The natural geography of Florida also sets it apart from other South Atlantic states, particularly in the area from central Florida through the Keys. The weather is amenable to fishing almost year round, though hurricanes in 2004 were particularly devastating and took a toll on all fisheries in the state, both east and west coast. There was also a cold water event that started near West Palm Beach in 2003, which moved up the east coast causing a substantial decline in snapper grouper fishing that year. The continental shelf is much narrower in Florida than elsewhere in the region, allowing fishermen to access deep waters quickly and return the same day. Finally, the species of snapper grouper available to fishermen in southern Florida are different than further north, with yellowtail snapper, gag, and black grouper, and other alternative species such as stone crab, spiny lobster, dolphin, kingfish, and billfish allow a greater variety of both commercial and recreational fishing opportunities. These fisheries are important to many Florida communities identified by the Snapper Grouper Advisory Panel as shown in Figure 3-18.

Commercial Sector

Considering the high population growth rates and emphasis on a tourism economy in Florida, the commercial fishing sector in Florida is still robust in some areas. Although total landings and dollar values of all species landed on the Florida East coast have decreased from 1998 to 2003 (from nearly 30 million pounds worth approximately $44 million to approximately 23 million pounds worth $33 million dollars; SAFMC 2006), there is still a considerable commercial fishing presence in east Florida.

Recreational Sector

While the commercial fishing industry, though still strong, may be in decline, the recreational sector appears to be stable. Excluding the headboat sector, although the number of participants declined in 2004 to approximately 1.9 million from 2.2 million in 2003 and from a high of 2.6 million in 2001, the number of trips taken in 2003 and 2004 remained at approximately 21 million. As may be recalled from Table 3-17, the headboat sector has exhibited a steady decline. In 2004, many homeports hosted at least one vessel holding both federal charter/headboat permits and federal unlimited commercial permits. Key West and Miami stand out, with 35 and 15 such vessels, respectively.

3.4.2.4.2 *Cape Canaveral*

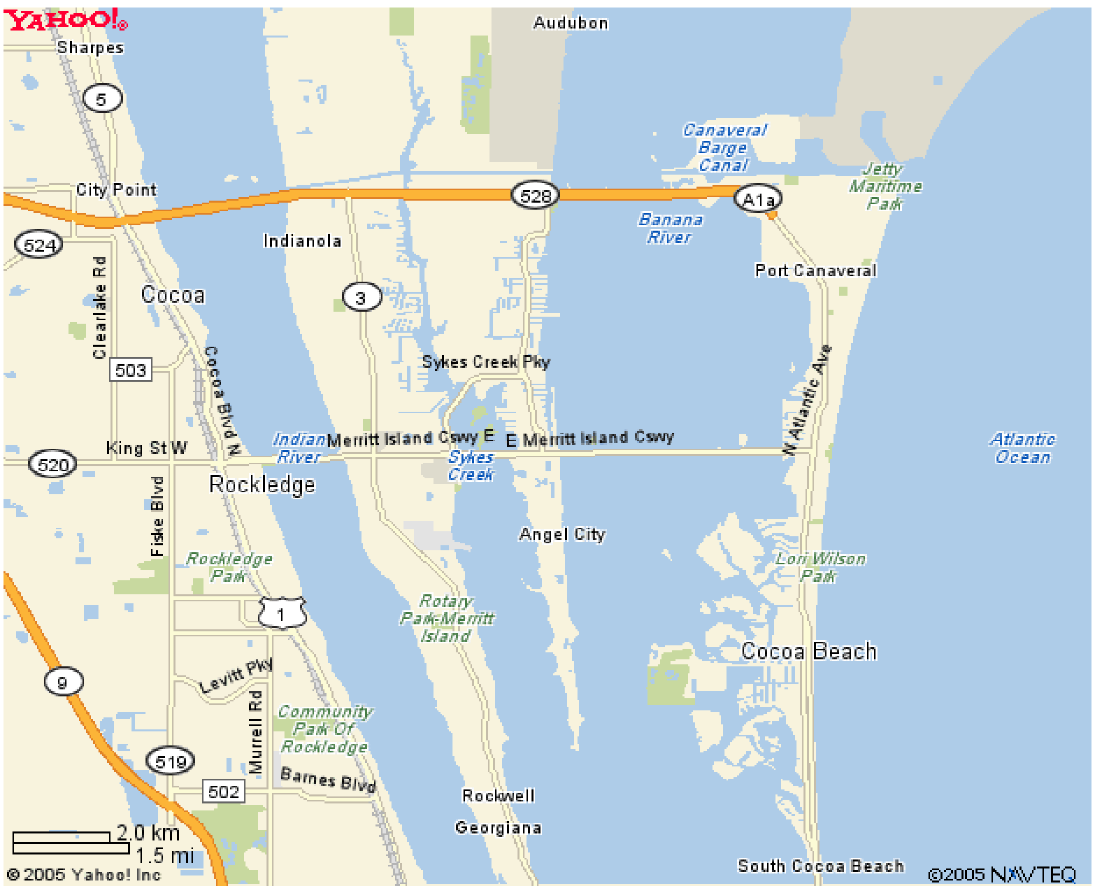


Figure 3-19. Area map of Cape Canaveral, Florida.

A detailed history of Cape Canaveral, Florida, from its first habitation 10,000 years ago, its settlement by the United States in the early 1800s, the establishment of the Banana River Naval Air Station in World War II, to NASA's arrival in 1952, can be found in SAFMC (2006). A map of the area is shown in Figure 3-19.

Overview

Cape Canaveral has a fairly homogenous, aging population, with those 65 years and older growing from 16.1% of the population to 23.1% since 1990. Overall, educational attainment has increased. The number of persons who speak a language other than English at home has increased 2.5%, and fewer people have incomes below the poverty line. Unemployment has decreased, but fewer people are in the labor force today than in 1990, perhaps due to an aging population. The percentage of persons in a service occupation has grown from 14.1% to 20.4%, while there has been a sizeable decline in the percentage of residents employed in forestry, mining, and fishing, from 2.7% in 1990 to 0.4% in 2000.

Fisheries in central Florida generally operate in two different environments, inshore river or inlet fishing with associated lagoons, which primarily attracts recreational fishing, and offshore areas, where commercial fishing primarily occurs. Popular inshore areas include the Indian, St. Johns, and Banana Rivers and associated lagoons. Commercial exploitation of the rivers and lagoons declined after implementation of the Florida Net Ban of 1994.

Many commercial fish houses have gone out of business or have shifted to selling imported products to supplement their local supplies. At the same time, the number of businesses possessing federal dealer permits has increased from about 180 in 1999 to a little over 200 in 2001. There is some industry speculation that the increasing number of dealer permits reflects increased decentralization in the domestic fishing markets and the need to increase profits by self-marketing.

Commercial Fishing

Cape Canaveral draws fishermen from Cocoa/Cocoa Beach, Merritt Island, Melbourne, and Titusville. These fishermen target many snapper grouper species, as well as coastal migratory pelagics such as mackerel, highly migratory species such as sharks and swordfish, and shellfish such as oysters, quahogs, and shrimp. Snowy grouper and tilefish (particularly golden or sand tilefish) landings exceed 10,000 pounds per year. Total commercial landings decreased, however, from 8.9 million pounds to 6.0 million pounds from 1998 to 2004 (SAFMC 2006).

The number of unlimited commercial permits in this area increased from nine in 1999 to 16 in 2004. The number of limited commercial permits fluctuated over this period, but ultimately declined from four permits in 1999 to one in 2004 (SAFMC 2006).

The number of Florida Saltwater Products Licenses issued to residents of Brevard County (where Cape Canaveral is located) decreased from 872 in 1998/99 to 492 in 2004/05 (SAFMC 2006). This license is needed to sell marine species in the state. There have also been declines in license sales for various crustacean fisheries.

Recreational Fishing

In 2004, Brevard county supported 36 bait and tackle stores, with five in Cape Canaveral, and 70 marinas with over 3,000 wet slips, indicating the importance of recreational fishing to the area. Fourteen fishing tournaments consistently occur in the area. Additional details about these businesses and tournaments can be found in SAFMC (2006).

As in other coastal areas of Florida, there is a fairly heavy presence in Brevard County of charter boat businesses, private marinas, and other associated businesses catering to the recreational fishing sector. The number of federally permitted charter/headboat vessels in Cape Canaveral increased from zero to seven from 1999 to 2004. According to Holland *et al.* (1999), there were approximately 32 charter boats and 2 headboats in the Canaveral/Melbourne area. Current estimates from permit files show at least 38 for-hire vessels with snapper grouper permits homeported in Cape Canaveral or Port Canaveral, which includes approximate four headboats. That is likely a low estimate for the total number of for-hire vessels in the area since it does not include vessels in the nearby Merritt Island and in the Cocoa/Cocoa Beach areas.

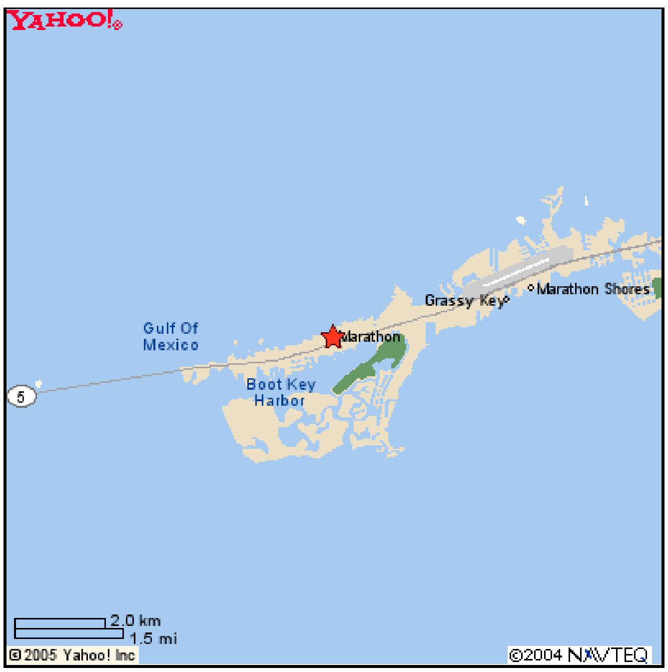


Figure 3-20. Marathon, Florida.
Source: Yahoo Maps, http://www.yahoo.com.

3.4.2.4.3 *Marathon*

A history of Marathon, detailing its settlement in the 1800s, the rise of industry, the effects of the Great Hurricane of 1935, the rise of tourism, and the importance of commercial fishing, can be found in SAFMC (2006). Figure 3-20 shows a map of Marathon, which lies in Monroe County.

Overview

Census data from 1990 and 2000 show there was an increase in overall population in Marathon from 8,857 in 1990 to 10,255 in 2000. During this period, the Hispanic population more than doubled, increasing from 1,040 to 2,095. This increase accounts for more than two thirds of the total population increase for the area. During this period of time, the median household income increased from approximately $25,000 to over $36,000.

Marathon has maintained a relatively high percentage of the total population, 4.1% in 2000, involved in farming, fishing, and forestry, though the percentage has declined from 8.7% in 1990. Since there is little commercial farming and forestry occurring in the area, the majority of percentage can be assumed to relate to fishing activities. The percentage of people that live below the poverty line decreased slightly from 15.1% in 1990 to 14.2% in 2000.

Commercial Fishing

In 1998, 184 Marathon residents were employed in fishing related industry according to the Census data, with 39 of those in the "fishing" category, 92 employed in "fish and seafood," and 47 employed by marinas (SAFMC 2006). The number of unlimited commercial permits held by community residents decreased from 65 permits to 44 permits between 1999 and 2004. Similarly, the number of limited commercial permits decreased from 43 permits to 31 permits.

Recreational Fishing

While most of the waters around Marathon are open to fishing, some areas have been set aside for eco-tourism and fish-viewing by divers and snorkelers. Sombrero Reef, said to be one of the most beautiful sections of North America's only living coral barrier reef, lies several miles offshore and is protected by the Florida Keys National Marine Sanctuary (http://www.fla-keys.com/marathon).

The importance of recreational boating and fishing to the economy of Marathon is shown by the businesses reliant upon it. As of 2004, there were at least 25 charter boat businesses, two party boat businesses, eight bait and tackle shops, and 27 marinas in the area. The number of vessels holding the federal charter/headboat permit increased from 16 in 1999 to 30 in 2004. In addition, there were seven fishing tournaments in Marathon. Most tournaments are centered on tarpon fishing. However, there are inshore and offshore fishing tournaments as well. These tournaments begin in February and run through June. Hotels and restaurants fill with participants and charters, guides and bait shops reap the economic benefits of these people coming to the area. These tournaments are positive economic pulses in the local economy, one that thrives on the existence of tourism and recreational fishing.

4 Environmental Consequences

4.1 *Gag*

4.1.1 Background

Gag are experiencing overfishing, since current fishing mortality exceeds the fishing mortality, which would achieve the maximum sustainable yield (SEDAR 10 2007). Overfishing is defined as a fishing mortality rate (F) exceeding the maximum fishing mortality threshold (MFMT), which the Council has specified as F_{MSY}. Current F_{2004}/F_{MSY} is 1.309.

Gag are not overfished since the current spawning stock biomass (SSB) is greater than the spawning stock biomass specified as the minimum spawning stock biomass (MSST). SSB_{2005}/MSST = 7,470,000/6,816,000 = 1.096. However, gag biomass is less than the biomass at MSY and is approaching an overfished condition.

Review of Previous Stock Assessments
The first stock assessment for gag was conducted in 1990 (PDT 1990) using data from 1972 through 1988/89. Spawning Stock Ratio (SSR) (considered to be the same as Spawning Potential Ratio (SPR)) was calculated separately for recreational and commercial fisheries (Table 4-1):

Table 4-1. Spawning Stock Ratio (SSR) values for gag from PDT (1990).

SPECIES	RECREATIONAL	COMMERCIAL
Gag	Carolinas = 19%	Carolinas = 24%
	Florida = 30 - 32%	Florida = 54 - 56%

A series of stock assessments conducted by NMFS (1991), Huntsman *et al.* (1992); and Potts and Brennan (2001) provided estimates of SSR/SPR based on catch curves (Table 4-2).

Table 4-2. Spawning Stock Ratio (SSR) values for snowy grouper from NMFS (1991); Huntsman *et al.* (1992); and Spawning Potential Ratio from Potts and Brennan (2001).

Species	Assessment Year	Catch Data From	Overall SSR
Gag	1991	1988	32%
	1992	1990	35%
	1996	1993	20%
	2001	2000	30%

Landings information
During 2001-2006, 82% of the commercial catch was with vertical lines and 17% was from other gears including diving (Table 3-10). The distribution of landings was similar during 2001-2006. Commercial landings of gag are pretty evenly divided among the

states of North Carolina, South Carolina, and Florida (Table 4-3). Headboat landings were also fairly evenly distributed among states (Table 4-4); however, the magnitude of headboat landings was much less than those from the commercial sector or reported by MRFSS (Figure 4-1). Landings reported by MRFSS were similar in magnitude to commercial landings but greater than 70% of the catches were from Florida (Table 4-5).

Table 4-3. The percentage (in weight) of gag landed by commercial fishermen by state during 1999-2005 and 2001-2006.

State	1999-2005	2001-2006
FL	29.60%	28.30%
Monroe	0.80%	0.80%
Georgia	6.30%	6.00%
NC	31.50%	32.40%
SC	31.80%	32.50%

Source: NMFS Accumulative Landings System.

Table 4-4. The percentage (in weight) of gag landed by headboats by state during 1999-2005 and 2001-2006.

State	1999-2005	2001-2006
GA AND NORTH FL	26.70%	22.14%
NORTH CAROLINA	27.70%	29.43%
SOUTH CAROLINA	16.30%	17.34%
SOUTH FLORIDA	29.20%	31.09%

Source: NMFS Headboat Survey.

Table 4-5. The percentage (in weight) of gag landed by recreational fishermen by state during 1999-2005 and 2001-2006.

State	1999-2005	2001-2006
FL	83.30%	70.23%
GA	0.70%	1.99%
SC	5.10%	4.16%
NC	10.80%	23.62%

Source: MRFSS.

Commercial landing peaked in 1995 but decreased after 1998 after new management measures were put into place increasing the minimum size limit (24" TL) and implementing a March-April spawning season closure beginning in 1999 (Figure 4-1). Recreational landings have generally been on an increasing trend. Regulations, which may have affected the catch of gag, are shown in Table 4-6.

Table 4-6. Gag regulations.

Regulation	Effective Date	Plan or Amendment
4" trawl mesh size	8/31/1983	FMP
Prohibit trawls	1/12/1989	Amendment 1
Required permit to fish for, land or sell snapper grouper species.	1/31/1991	Amendment 3
Prohibited gear: fish traps except black sea bass traps north of Cape Canaveral, FL; entanglement nets; longline gear inside 50 fathoms; bottom longlines to harvest wreckfish; powerheads and bangsticks in designated SMZs off S. Carolina. Established 20" TL minimum size and a 5 grouper bag limit.	1/1/1992	Amendment 4
Oculina Experimental Closed Area	6/27/1994	Amendment 6
Limited entry program: transferable permits and 225-pound non-transferable permits	Dec-98	Amendment 8
24" TL size limit; no harvest or possession > bag limit, and no purchase or sale, during March and April. No more than 2 gag or black (individually or in combination) within 5-grouper aggregate bag limit. Vessels with longline gear aboard may only possess snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish.	2/24/1999	Amendment 9
Oculina Experimental Closed Area extended indefinitely	4/26/2004	Amendment 13A

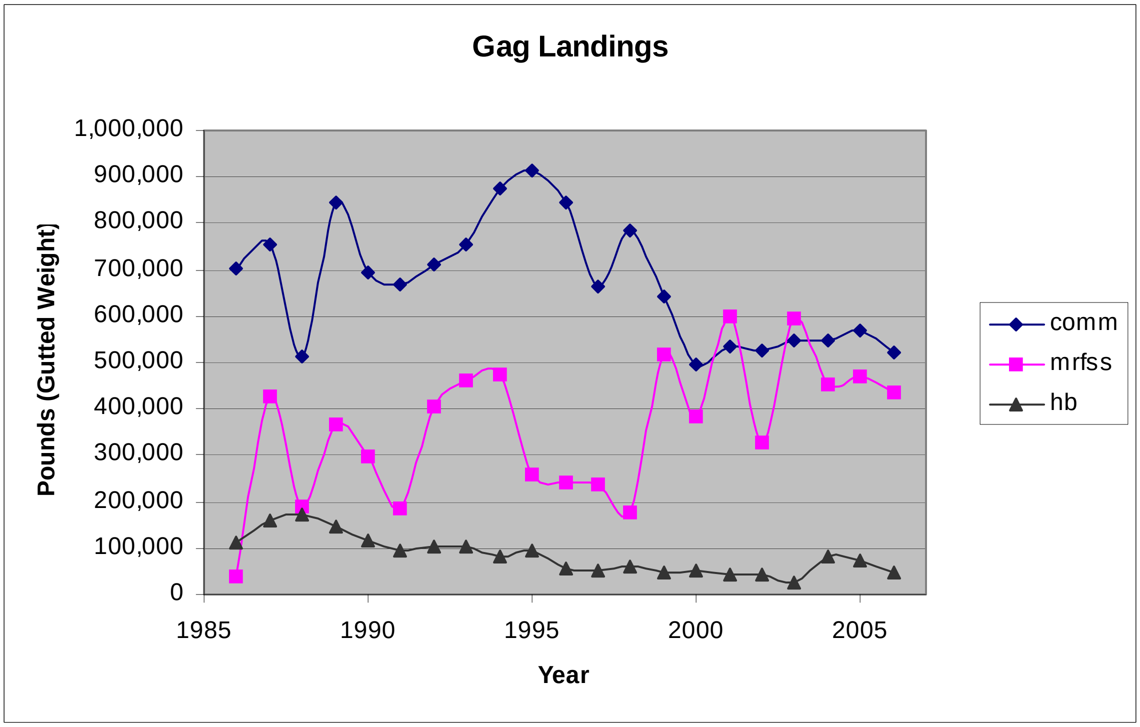


Figure 4-1. Annual landings (lbs gutted weight) of gag 1986-2006.
Source: Commercial landings are from the NMFS Accumulative Landings System (ALS), Headboat data are from NMFS-Beaufort, and MRFSS data are from the MRFSS web site.
Note: Size limit = 20" TL in 1992 and increased to 24" TL in 1999.

Approximately 51% of landings were from the commercial sector and 49% were from the recreational sector during 1999-2005. The mean length of gag taken with all commercial gear ranged from 32 to 33 inches TL during 1999-2006 (Figure 4-2). The mean length of gag taken by headboat and recreational fishermen was smaller ranging from 26 to 31 inches TL during 1999-2006. There has been on an increasing trend in the average size of gag taken by commercial and recreational fishermen since 1986.

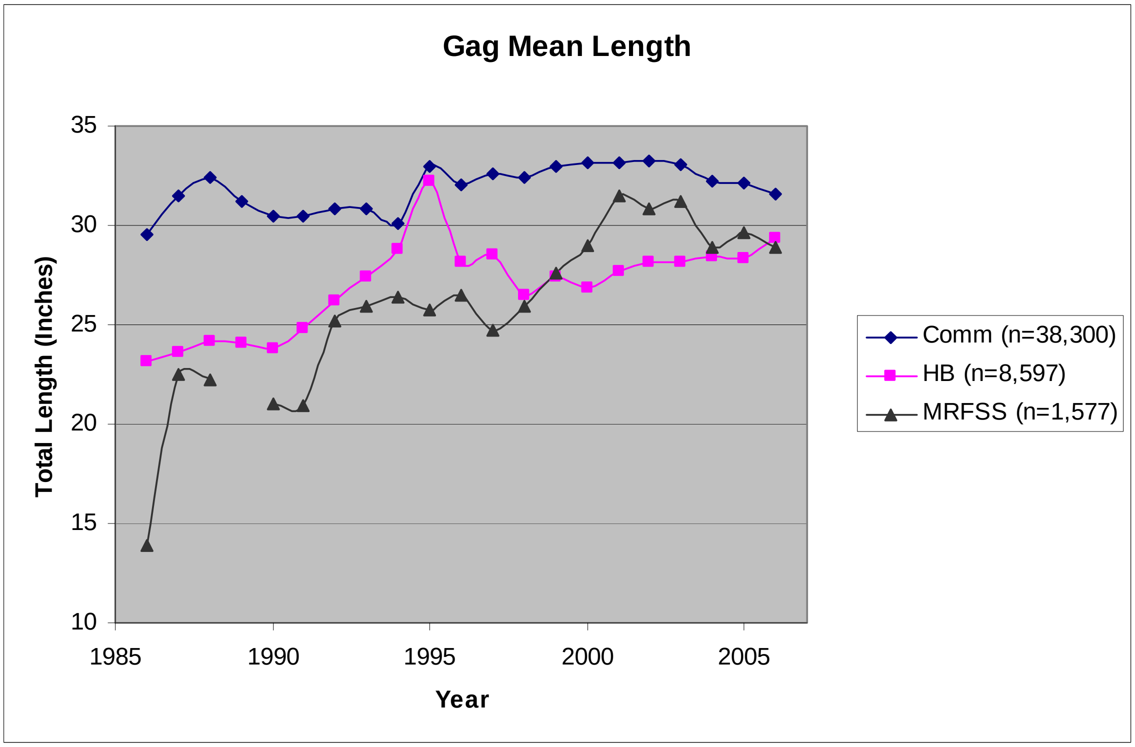


Figure 4-2. Mean lengths (inches, total length) of gag taken by commercial, headboat, and recreational (MRFSS) fishermen during 1984-2006.
Note: Size limit = 20" TL in 1992 and increased to 24" TL in 1999.

Note: Additional data are provided in **Appendix E**.

4.1.2 Management Reference Point Alternatives

Maximum Sustainable Yield (MSY) for Gag

Alternatives are shown because the current definition for MSY is being replaced with a formula approved by the Council (Table 4-7). In the future, this will not be an action item unless the Council decides to change how MSY is calculated; the actual value will be updated from the most recent SEDAR assessment.

Optimum Yield (OY) for Gag

Alternatives are shown because the current definition for OY is being replaced with a formula approved by the Council (Table 4-7). In the future, this will not be an action item unless the Council decides to change how OY is calculated; the actual value will be updated from the most recent SEDAR assessment.

Table 4-7. MSY and OY alternatives for gag.

Alternatives	Equation	F_{MSY} & F_{OY} Values	MSY & OY Values
Alternative 1 (no action)	MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks.	$\mathbf{F_{MSY}}$ = 0.18*	Not specified
	OY equals the yield produced by F_{OY}. $F_{45\%SPR}$ is used as the F_{OY} proxy.	$\mathbf{F_{OY}}$ = 0.11*	Not specified
Alternative 2 (preferred)	MSY equals the yield produced by F_{MSY}. MSY and F_{MSY} are defined by the most recent SEDAR.	0.237**	1,238,000 lbs gutted weight
	OY equals the yield produced by F_{OY}. If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. Gag are not overfished.	See subalts. below	
Alternative 2a		OY=(65%)(F_{MSY})	1,188,000 lbs gutted weight**
Alternative 2b (preferred)		OY=(75%)(F_{MSY})	1,217,000 lbs gutted weight**
Alternative 2c		OY=(85%)(F_{MSY})	1,230,000 lbs gutted weight**
*Source: Powers 1999 ** Source: Table 36. SEDAR 10 (2006)			

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = (1-M)*SSB_{MSY}. This formula is recommended in the Technical Guidance Document developed by NMFS (Restrepo *et al.* 1998) and represents 1 minus the natural mortality multiplied by the spawning stock biomass at maximum sustainable yield. This value from Table 36 in SEDAR 10 (2006) is 6,816,000 pounds gutted weight (Table 4-8).

Table 4-8. Criteria used to determine the overfished and overfishing status of gag.

DETERMINATION	SSB_{2005}	MSST	F_{2004}	MFMT	STATUS
OVERFISHED?	7,470,000	6,816,000			Not Overfished (B_{2005}/MSST = 1.096)
OVERFISHING?			0.310	0.237	Overfishing (F_{2004}/MFMT = 1.309)

Source: Tables 36 and 44 in SEDAR 10 (2006).

4.1.2.1 Biological Effects of Management Reference Point Alternatives

Defining MSY and OY for gag will not directly affect the biological or ecological environment, including protected ESA-listed species, because these parameters are not used in determining immediate harvest objectives. However, MSY and OY are reference points used by managers to assess fishery performance over the long term. As a result, redefined management reference points could require regulatory changes in the future as managers monitor the long term performance of the stock with respect to the new reference point. Therefore, these parameter definitions would affect subject stocks and the ecosystem of which they are a part, by influencing decisions about how to maximize and optimize the long-term yield of fisheries under equilibrium conditions and triggering action when stock biomass decreases below a threshold level. The biological effects of the choice of management reference points are described below.

MSY Alternative 1 would retain the SPR based MSY definition established for the gag stock in Snapper Grouper Amendment 11 (1998d). This SPR-based definition specify a fixed fishing mortality rate, which would reduce the spawning biomass per recruit to 30% of the unfished level.

MSY in **Alternative 1** is defined as the yield produced by F_{MSY} where $F_{30\%SPR}$ is used as the F_{MSY} proxy. In **Alternative 1**, F_{MSY} is estimated to equal the $F_{30\%SPR}$ proxy; however, MSY is not specified. MSY is a function of certain characteristics of the current fish population, such as its age and size structure. **Preferred Alternative 2** offers the best estimate of the true F_{MSY} and the only estimate of MSY.

The Council's **Preferred Alternative 2** would redefine the MSY of the gag stock to equal the value recommended by the most recent SEDAR assessment (SEDAR 10 2006).

Preferred Alternative 2 would improve the scientific basis for managing gag because it is a biomass estimate based on the best available science. Designation of MSY may make it more likely management actions can be taken to reduce fishing pressure on a stock experiencing unsustainable fishing mortality or is overfished. Therefore, stocks with reference points based on SEDAR assessments are expected to provide the strongest positive environmental effects.

OY Alternative 1 would retain the OY definition established in the Snapper Grouper FMP Amendment 11 (SAFMC 1998d); however, the value for OY was not specified. Not designating an OY value or designating one not based upon the best available science (**OY Alternative 1**) would have adverse, indirect effects on the gag stock. The SPR-based definition identifies a fixed fishing mortality rate, which would reduce the spawning biomass per recruit to 45% of the unfished level. Powers (1999) estimated $F_{45\%SPR}$ as 0.11.

The more conservative the estimate of OY, the larger the sustainable biomass. The biomass of the population would be least when the rate of fishing mortality is equal to F_{MSY} and would be greatest when the fishing mortality rate was equivalent to 65% of F_{MSY}. Therefore, a larger sustainable biomass associated with a fishing mortality rate at 65% of F_{MSY} would be good for the stock, but could have negative social and economic effects, in the short term, because longer and/or harder short-term reductions in harvest would be needed to achieve larger sustainable biomass.

Like Alternative 1, **Alternatives 2a-2c** would specify fixed exploitation rates. However, the rates defined by **Alternatives 2a-2c** relate directly to what is expected to produce MSY (F_{MSY}), consistent with the definition of OY provided in the Magnuson-Stevens Act and as discussed in the National Standard Guidelines at 50 CFR 600.310(b). These alternatives would indirectly benefit the biological and ecological environment by providing a more precise estimation of OY based upon the recent stock assessment.

Alternatives 2a-2c are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Alternative 2a** represents the most precautionary OY of those considered for each unit. This alternative defines OY to equal the average yield associated with fishing at 65 percent of F_{MSY}. This OY definition would provide the largest buffer between MSY and OY relative to the other alternatives and, consequently, the greatest assurance that management measures designed to achieve OY would be effective in sustaining gag over the long term.

The Council's **Preferred Alternative 2b** defines OY as the average yield associated with fishing at 75% of F_{MSY}. This definition reduces slightly the safety margin between MSY and OY relative to **Alternative 2a**. Restrepo *et al.* (1998) state "that fishing at 75% of F_{MSY} would result in equilibrium yields at 94% of MSY or higher, and equilibrium biomass levels between 125% and 131% of B_{MSY} – a relatively small sacrifice in yield for a relatively large gain in biomass." A simple deterministic model described in Mace (1994) to evaluate the effects of fishing at 75% of F_{MSY} indicates that the ratios are consistent across a broad set of life history characteristics ranging from species such as snowy grouper with low natural mortality rates to more productive species like vermilion snapper and black sea bass. Restrepo *et al.* (1998) determined the ratio between the yield fishing at 75% of F_{MSY} relative to fishing at F_{MSY} would range from 0.949 and 0.983. Restrepo *et al.* (1998) also indicate fishing at this rate under equilibrium conditions is expected to reduce the risk of overfishing by 20-30%. Gag are vulnerable to overfishing because they are long-lived, late to mature, form spawning aggregations, and protogynous. Therefore, the biological and ecological effects of this definition for gag are still expected to be positive.

Alternative 2c defines OY as the average yield associated with fishing at 85% of F_{MSY}. This is the least conservative of those OY alternatives considered because it would further reduce the precautionary buffer between OY and MSY. Therefore, this definition would provide the least amount of indirect benefits to the biological and ecological environment of all the alternatives, and could make it more difficult to sustain gag over the long term.

4.1.2.2 Economic Effects of Management Reference Point Alternatives

Defining the MSY and OY for gag does not alter the current harvest or use of the resource. Specification of these measures merely establishes benchmarks for fishery and resource evaluation from which additional management actions for the species would be based, should comparison of the fishery and resource with the benchmarks indicate that management adjustments are necessary. The impacts of these management adjustments will be evaluated at the time they are proposed. As benchmarks, these parameters would not limit how, when, where, or with what frequency participants in the fishery engage the resource. This includes participants who directly utilize the resource (principally commercial vessels, for-hire operations, and recreational anglers), as well as participants associated with peripheral and support industries.

Since there would be no direct effects on resource harvest or use, there would be no direct effects on fishery participants, associated industries, or communities. Direct effects only accrue to actions that alter harvest or other use of the resource. Specifying MSY and OY, however, establishes the platform for future management, specifically from the perspective of bounding allowable harvest levels. In this sense, MSY and OY may be considered to have indirect effects on fishery participants.

Fishery management decisions influence public perception of responsible government control and oversight. These perceptions in turn influence the public's response to management. This response may be positive, such as cooperative participation in the management process, public hearings, and data collection initiatives, or negative, such as non-cooperation with data initiatives. Other responses, such as legal action or pursuit of political relief from management action, are neither inherently positive nor negative. Such approaches could result in more efficient and improved management. Conversely, they could tie up management resources. Although such approaches are well within the rights of citizens and advocacy groups, these approaches could also be viewed as supplanting the current fishery management system. From the perspective that the current system is expected to result in the best and most effective management due to its transparency, opportunity for public involvement, and reliance on best available scientific information, management through other means may be less desirable, though quantifying why may be difficult. Positive responses support the efficient use of both the natural resource and the economic and human capital resources dedicated to the management process. Negative responses harm the integrity of the information on which management decisions are based, induces inefficient use of management resources, and may prevent or delay efficient use of the natural resource. The specific benefits and costs of these responses cannot be calculated.

Although disagreement with the exact specifications contained in the MSY and OY alternatives may occur, any of the alternatives would establish the required platform from which future action can be taken and, thus, should generally induce satisfaction with management of the resource. However, the alternatives vary in implications for total allowable harvest and constituents who favor harvests that are more liberal would likely prefer the alternatives in the decreasing order of the potential harvest implied by the alternative specifications, while those who favor harvests that are more conservative would likely hold the opposing preferences. The net effect of the behavioral responses from these opposing constituent groups cannot be determined.

Administrative costs of fishery management accrue to the time and labor involved in developing new regulations, permitting systems, or other management actions. To the extent that each of the MSY and OY alternatives provide fishery scientists and managers with specific objective and measurable criteria to use in assessing the status and performance of the fishery, the impacts of the various alternatives on administrative costs are indistinguishable. However, the more conservative (lower) the equivalent allowable harvest level, the greater the potential for harvest overages, necessitating additional management action with attendant administrative costs at least in the short run.

OY is the long-term goal of fisheries management, and as such, it sets the level of potential economic benefits fishery participants can derive from the fishery. OY levels specified in this amendment are mainly biological measures that can be translated to harvest levels. Given harvest levels at specified OY, the corresponding level of economic benefits derivable therefrom highly depends on the management system adopted for the fishery. A controlled access system, for example an IFQ, in the commercial fishery is apt to generate more economic benefits than an open access system given the same OY and harvest level. In general, harvest levels would be driven up to the allowable maximum under an open access system as fishermen attempt to get as much share of the allowable harvest as they can. On the other hand, there is some possibility that harvest levels under a controlled access system would fall below the allowable maximum if the fishing industry deems it unprofitable to go for a higher harvest level. Thus, there is greater chance that a high OY level may not be sustainable under an open access system. The key issue in this discussion is that OY be set at more sustainable level and that a given OY and corresponding harvest level may be more sustainable under a controlled access system than under an open access system.

OY is not specified in **Alternative 1.** Under **Preferred Alternative 2**, OY ranges from 1.188 million pounds (**Alternative 2a**) to 1.230 million pounds (**Alternative 2c**). With the possible exception of Alternative 1, all OY alternatives set harvest levels higher than the current landings. Among the sub-options for **Preferred Alternative 2**, the highest OY level would likely generate higher economic benefits in the short-run. Noting, however, that the fishery although under some form of controlled access pretty much operates like an open access fishery, the highest level is probably not an ideal choice because it may not be sustainable over the long run. A better choice from a long-term economic perspective is either **Alternative 2a** or **Alternative 2b**.

4.1.2.3 Social Effects of Management Reference Point Alternatives

Defining the MSY, OY, or MSST for a species or species complex would not cause direct social impacts because it would not place specific controls on the amount or manner in which the resources are harvested. These parameters simply provide management targets and thresholds needed to assess the status and performance of the fishery. All current direct, indirect, consumptive, and non-consumptive uses of the resources will be unaffected. Evaluation of the resource relative to the benchmarks, however, may trigger harvest and/or effort controls, which would directly impact the individuals, social networks, and associated industries related to the fishery, inducing short-term adverse economic impacts until less restrictive management is allowable.

Designation of these benchmarks, therefore, establishes the foundation for subsequent regulatory change. Regulatory change may cause some of the following direct and indirect 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; 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.

A major indirect effect of fisheries management on the fishing community and related sectors is 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 the community. The fact that “the science” can cause relatively large reductions in harvests is particularly disconcerting to many fishermen and concerned stakeholders. The potential for unemployment and financial uncertainty looms large in their envisioned future. An attitude of defeat and resignation among fishermen has been noted in the snapper grouper fishery, and it is not known to what extent mental health may be affected by proposed regulatory change. This “lack of enthusiasm” for fishery management, however defined, coupled with confusion about scientific premises and concepts, has direct and indirect effects on other elements in the fishery, such as enforcement efforts and compliance with current and future regulations. This can lead to inefficient use of resources, ineffectual regulations, and failure to meet management targets, which may precipitate additional restrictions.

Data deficiencies and the complexity of the task make it difficult to determine the biological reference points with certainty. The selection of a particular benchmark has potential implications on resource users depending upon its accuracy relative to the true value. Selection of the wrong alternative, while protecting the resource, may subject the human environment to overly restrictive regulations, increasing the risk to the economic viability of participants in the fishery and associated industries. Alternatively, the erroneous choice of a less conservative alternative when more conservatism is warranted could result in short term increased economic benefits to fishery participants, but lead to reduced stock sustainability, ultimately leading to more severe social and economic disruptions than would occur under more conservative management. In general, however, the higher the MSY and OY, the greater the allowable, long-term sustainable yield for the fishery and, hence, the greater the long-term social benefits of a sustainable and healthy resource.

Since none of the alternative MSY and OY specifications imply harvest reductions, each implies the potential for increased social benefits once the resource is rebuilt. Among the MSY alternatives, MSY is not specified in **Alternative 1**. **Preferred Alternative 2** is based on the new value from SEDAR 10 and MSY equals 1.238 million pounds. This is based on the most recent information, is more accurately reflective of harvest patterns in the fishery and, thus, is expected to provide the social benefits of a stable and sustainable fishery.

Among the OY alternatives, OY is not specified in **Alternative 1**. **Alternative 2c** would allow the largest harvests and provide the greatest long-term social benefits, if the specified difference between OY and MSY is sufficient to capture the environmental variability of the resource. **Preferred Alternative 2b**, however, may provide a better hedge against harvest overages, thereby supporting more stable harvests and social benefits. **Alternative 2a** would be more restrictive on the fishery and, if unnecessarily conservative, it would generate the least long-term social benefit.

MSST has been updated through SEDAR 10 (2006). Given that current biomass is above this level, no social impacts are expected.

4.1.2.4 Administrative Effects of Management Reference Point Alternatives

The potential administrative effects of these alternatives differ in that the scenarios defined by each vary in terms of the implied restrictions required to constrain the fisheries to the respective benchmarks. Of the two MSY alternatives, only **Preferred MSY Alternative 2** identifies a specific harvest level.

In theory, the larger the allowable harvest, the less restrictive and administratively burdensome subsequent management is needed to be. From this perspective, **MSY** and **OY Alternative 1** would allow the largest harvest, and therefore less restriction. However, the more conservative the estimate of OY, the larger the sustainable biomass, which translates into a lower administrative burden. **Preferred OY Alternative 2b** represents an intermediate level of restriction compared to that of **Alternatives 2a** and **2c**. **Alternative 2a** reflects the highest level of restriction, based on 65% of F_{msy}, and **Alternative 2c** reflects the lowest level of restriction, based on 85% of F_{msy}. The **Preferred OY Alternative 2b** would establish an intermediate safety margin relative to **Alternatives 2a** and **2c**. However, it would reduce the possible administrative burden of justifying the potentially excessively conservative management position embodied by **Alternative 2a**, and correcting the problems induced by the potential management programs that could lead to overfishing under **OY Alternative 2c**.

For gag, the Council has previously specified a formula for calculating MSST and SEDAR 10 (2006) provides a value of 6,816,000 (lbs gutted weight).

4.1.2.5 Council Conclusions

The Council has proposed formulas for specifying the Maximum Sustainable Yield (MSY) and Optimum Yield (OY). The actual values are to come from SEDAR assessments, and in the future this will not be an action item. The value will simply be updated based on the most recent SEDAR stock assessment.

The formula to calculate the Minimum Stock Size Threshold (MSST) was previously specified by the Council. This is not an action item; the value is being updated from the most recent SEDAR stock assessment.

The Council has proposed MSY, MSST, and MFMT values based on the best available data from the most recent SEDAR Assessments. The Council's Scientific and Statistical Committee (SSC) has approved the assessment.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternatives should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative.

The Council concluded their proposed Optimum Yield (OY) of 75% of the fishing mortality rate that will produce MSY (F_{MSY}) best meets the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.1.3 Gag Catch Total Allowable Catch

Gag is not overfished but biomass is less than the biomass that produces MSY (B_{MSY}). The Council's Scientific and Statistical Committee (SSC) recommended a restriction in harvest to F_{OY}, which is equal to the yield associated with 75% of F_{MSY}. This corresponds to a Total Allowable Catch (TAC) of 694,000 pounds gutted weight for all sectors (Table 4-9). Therefore, as biomass increases, the yield at F_{OY} is expected to increase during 2009-2014. The Council recommended catch levels remain at 694,000 pounds gutted weight until modified by future action. The next assessment, as SEDAR Update, is scheduled for late 2011. Setting harvest levels at the catch associated with F_{OY} would decrease the probability that overfishing will occur.

The Council evaluated one alternative, other than the no action alternative, based on their preferred alternative for OY as 75% of F_{MSY}. Other alternatives were considered for OY, which in turn would have resulted in other values for TAC. Therefore additional TAC values were linked to the OY decision so actually more than this one value for TAC was under consideration. The preferred alternative is based on the yield at 75%F_{MSY}, which was the Council's preferred alternative for OY. The Council also considered OY alternatives for 65%F_{MSY} and 85%F_{MSY}, which could correspond to TACs above and below those specified in the preferred alternative.

Table 4-9. Gag total allowable catch (TAC).

Alternatives	TAC (pounds gutted weight)
Alternative 1 (no action)	Do not specify a total allowable catch (TAC).
Alternative 2 (preferred)	Set the Total Allowable Catch (TAC) = 694,000 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.
*Source: SEDAR 10 (2006)	

4.1.3.1 Biological Effects

Preferred Alternative 2 would establish a TAC based on the yield at F_{OY} rather than the yield at F_{MSY}. Setting TAC at the yield at F_{OY} would increase the probability that overfishing would not occur and ensure that the stock did not become overfished.

SEDAR 10 (2006) evaluated stock projections under five scenarios starting in 2008. Each scenario applied the current fishing mortality rate (F) in years 2005–2007. Starting in 2008, the five projection scenarios included: (1) current F, (2) F_{MSY}, (3) 85% of F_{MSY}, (4) 75% of F_{MSY}, and (5) 65% of F_{MSY}. The Council's SSC recommended the Council restrict harvest to the F_{OY}, which is equal to the yield associated with 75% of F_{MSY}. This would correspond to a total allowable catch (TAC) of 694,000 pounds gutted weight for all sectors (Table 4-9).

The gag stock in the Atlantic is undergoing **overfishing** as of 2004 (last year of data in the stock assessment). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For gag the most recent estimate of the fishing mortality rate (F) is from 2004 and was = 0.310. The Council is using the fishing mortality rate that would produce the maximum sustainable yield (F_{MSY} = 0.237) as the maximum fishing mortality threshold. Comparing these two numbers:

- F_{2004}/MFMT = 0.310/0.237 = 1.309

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

The gag stock in the Atlantic was not **overfished** as of the start of 2005. This means that the spawning stock biomass (pounds of spawning fish in the water) has not been reduced below the level that could rebuild to produce the maximum sustainable yield in 10 years. The Council compares the current spawning stock biomass (SSB) to the level of spawning stock biomass that could be rebuilt to the level to produce the MSY in 10 years. This is referred to as the minimum stock size threshold or MSST. For gag, the estimated level of spawning stock biomass in 2005 was 7,470,000 pounds gutted weight (gw). The minimum stock size threshold (MSST) = 6,816,000 pounds gw. Comparing these two numbers:

- SSB_{2005}/MSST = 7,470,000/6,816,000 = 1.096

This comparison is referred to as the **overfished ratio**. If the ratio is less than 1, then the stock is overfished.

Gag are vulnerable to overfishing because they live for at least 26 years, change sex from female to male later in life, and form spawning aggregations at locations known to fishermen. During the 1990s, gag off the Southeastern U.S. was exhibiting many of the symptoms of an exploited population. Harris and Collins (2000) reported a lower age at first maturity and a significant increase in the observed mean length at age in the South Atlantic gag population in 1994-95 in comparison with data from 1976-82. Increased fishing pressure was suggested as a contributing factor in the described life history changes (Harris and Collins 2000). During the same period, McGovern *et al.* (1998) found the sex ratio decreased from 19.6% males in 1976-82, to 5.5% males in 1994-95. The size at 50% maturity also declined in the later period.

There is some indication from a more recent life history study the status of the population has improved since the 1990s (Reichert and Wyanski 2005). The SEDAR 10 (2006) stock assessment also suggested despite continued overfishing, the condition of the gag stock has improved since the middle 1990s, perhaps in response to management measures. Despite the apparent improved condition of the stock, gag is experiencing overfishing and the stock assessment indicates gag is approaching an overfished condition. Adverse trends in the size at age, size/age at maturity, size/age at transition, and percentage of males would be expected for gag if status quo regulations are maintained. See Sections

3.2.1.1 and 4.1.5.1 for a more complete description of gag life history and vulnerability to overfishing.

Setting TAC equal to the yield at F_{OY} rather than F_{MSY} would ensure overfishing ends and reduces the probability that the stock did not become overfished. With **Preferred Alternative 2**, a reduction in fishing mortality and subsequent increase in biomass would be expected to restore the natural population structure of the stock, reverse the trends of decreasing males and mean length documented in recent studies, and benefit the ecosystem in which gag occur.

4.1.3.2 Economic Effects

Total Allowable Catch (TAC) is specified in this amendment to end overfishing of gag. **Alternative 1**, which does not provide a catch level, may be ruled out since it does not address the current overfishing condition of gag. **Preferred Alternative 2** sets the catch level at 694,000 pounds, and this is expected to correct the current overfishing condition of gag.

The setting of TACs is akin to setting management reference points in the sense that it sets the bounds for stipulation of management measures to control harvest to the specified TAC. In this sense, it does not have direct economic impacts, but being closer to the actual management measures than management reference points, its indirect impacts are more predictable in terms of direction and relative magnitude than those of management reference points.

TAC levels are provided in this amendment to address the overfishing condition of gag stocks. **Alternative 1**, which does not provide a catch level, may be ruled out since it does not address the current overfishing condition of gag. **Preferred Alternative 2** sets the catch level at 694,000 pounds gutted weight, and this is expected to end overfishing of gag. Relative to the 2001-2006 average gag harvest, the fishery is expected to face a harvest reduction of 41%. It may thus be expected that stringent management measures would have to be implemented for the gag fishery. The resulting short-run economic impacts of these stringent management measures on fishing participants may be expected to be substantially negative for the gag fishery as a whole. On the other hand, the long-term economic impacts may be expected to be substantially positive and in fact should be more positive as to outweigh short-run negative effects and the shrinking effects of a discount factor.

The actual harvest reduction to the commercial and recreational sectors would depend on some other measures in this amendment, such as the commercial/recreational allocation, quota, quota closures, bag limits, size limits, and seasonal closures. The economic impacts of these other measures are discussed in pertinent sections of this amendment. It may only be stated at this juncture that harvest reductions could result in more than proportionate reductions in economic benefits.

4.1.3.3 Social Effects

The setting of TAC is almost similar to the setting of management reference points in the sense that it mainly has indirect social impacts, because it would not place specific controls on the amount or manner in which the resources are harvested. However, unlike management reference points, a TAC provides specific harvest levels that would set narrowly defined effort control measures, which would directly impact the individuals, social networks, and associated industries related to the fishery.

Alternative 1 does not provide for TAC setting. Although this would result in maintaining short-run social interactions and structures, it could have more disruptive social implications if the gag stock experience more overfishing and become overfished since by then more strict management measures would have to be implemented.

Preferred Alternative 2 sets a TAC for gag at a level 41% below current harvest levels in the fishery. More stringent measures in terms of harvest and effort controls result from this alternative, with possibly large concomitant disruption in the business and lives of fishing participants and associated industries and communities. Such disruption may be deemed short-run in nature, but if the duration of this disruption becomes lengthy, fishing related businesses in the commercial and recreational sectors could cease to operate. For current fishing participants to benefit from the more constrained gag fishery, long-term benefits would not only have to be substantial but they also would have to accrue over a relatively short time.

The more specific social implications of the TAC for gag are discussed in particular sections defining actual management measures.

4.1.3.4 Administrative Effects

Alternative 1 would not establish a TAC for gag. In the short-term there would be no administrative impacts under this alternative; however, in the long-term, if a TAC is not specified the likelihood that overfishing would continue is very high. If overfishing were allowed to persist, additional management measures would be required in order to comply with the ending of overfishing provisions found in the Magnuson-Stevens Act, which in turn would create a significant administrative burden. Under **Preferred Alternative 2,** a TAC would be established to end overfishing. The catch level to end overfishing has been established for gag based on yield at F_{oy} and would be 694,000 (lbs gutted weight) for 2009 onwards. This would represent a large reduction in harvest. A minimal administrative burden would be incurred under this alternative and would take the form of the development of outreach materials.

4.1.3.5 Council Conclusions

The Council has proposed a Total Allowable Catch (TAC) based on the best available data from the most recent SEDAR Assessments. The Council's Scientific and Statistical Committee (SSC) has approved the assessment and recommended that the Council restrict harvest to this level. The Council concluded their proposed TAC is sufficiently conservative to prevent overfishing in the future.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative.

The Council concluded their proposed TAC best meet the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.1.4 Interim Gag Allocation Alternatives and Resulting Commercial Quota & Recreational Allocation

Alternative 1 (no action). Do not define interim allocations for gag. Status quo based on landings from 2004-2005.

Alternative 2 (preferred). Define interim allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1999-2003. The allocation would be 51% commercial and 49% recreational (Table 4-10). This alternative would establish a commercial quota of 353,940 pounds gutted weight and a recreational allocation of 340,060 pounds gutted weight.

Alternative 3. Define interim allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-1998. The allocation would be 66% commercial and 34% recreational (Table 4-10). This alternative would establish a commercial quota of 458,040 pounds gutted weight and a recreational allocation of 235,960 pounds gutted weight.

Alternative 4. Define allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 61% commercial and 39% recreational (Table 4-10). This alternative would establish a commercial quota of 423,340 pounds gutted weight and a recreational allocation of 270,660 pounds gutted weight.

Table 4-10. Commercial quotas and recreational allocations for gag (pounds gutted weight) based on the catch level required to end overfishing.

		Alternative 1		Alternative 2 (preferred)		Alternative 3		Alternative 4	
Year	**TAC**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**
2009 Onwards	694,000	353,940	340,060	353,940	340,060	458,040	235,960	423,340	270,660

Allocation Alternatives 2-4 are compared to the average 2004-2006 landings in Table 4-11 to determine the percentage reduction to each sector (Table 12).

Table 4-11. Historical gag landings.

Gag Landings (gutted weight)				Total	Total
Year	Commercial	Headboat	MRFSS	Recreational	Landings
2001	532,000	53,000	455,000	508,000	1,040,000
2002	534,000	51,000	266,000	317,000	851,000
2003	560,000	32,000	519,000	551,000	1,111,000
2004	551,000	82,000	517,000	599,000	1,150,000
2005	568,681	71,736	468,814	540,550	1,109,231
2006	520,824	46,537	437,493	484,031	1,004,854
Avg 04-06	546,835	66,758	474,436	541,194	1,008,028

Source: 2001-2004 data are from the SSC based on gutted weight in the SEDAR 10 (2006) assessment; 2005 and 2006 data are from ALS and converted to gutted weight.

Table 4-12. Percentage reductions by sector across the alternative gag allocations.

Alternative	Commercial Reduction	Recreational Reduction
2 (**Preferred**)	35%	37%
3	16%	56%
4	23%	50%

4.1.4.1 Biological Effects of Allocation Alternatives

Alternative 1 would not specify a commercial or recreational allocation for gag. If an allocation was not specified then it would not be possible to identify the allowable catch in the recreational sector; however, the commercial quota could be specified as the status quo assuming 51% of the landings are from the commercial sector. This alternative would also perpetuate the existing levels of risk to ESA-listed protected species.

Alternatives 2-4 would range from 51% commercial/49% recreational (**Preferred Alternative 2**) to 66% commercial/34% recreational (**Alternative 3**). **Preferred Alternative 2** includes 1999-2003 and incorporates the last minimum size limit change to 24" TL which became effective on 2/24/99. **Alternative 3** includes 1986-1998, which is before the 24" TL size limit but it does include the increase to 20" TL in 1992. **Alternative 4** includes 1986-2005 and incorporates both size limit changes. **Preferred Alternative 2**, which includes data from 1999-2003 results in the same allocation as would occur if data from 2004-2005 (**Alternative 1**) were used and therefore reflects proportions taken most recently by the commercial and recreational sectors. However, **Alternative 1** would not specify a commercial or recreational allocation for gag. **Preferred Alternative 2** (51% commercial/49% recreational is the closest to the Snapper Grouper Advisory Panel's (AP) September 2007 recommendation for a 50/50 allocation. The AP examined the allocation tables and noted the distribution of catch was about 50/50 in recent years and they felt this was fair among the two sectors. The AP changed their position at the June 2008 meeting to support **Alternative 4** to allocate more to the commercial sector to moderate impacts. **Alternative 3** uses data from 1986-1998 and results in a 66% commercial and 34% recreational allocation and includes landings data before the regulations from Amendment 9 were implemented. **Alternative 4** represents the longest time series of data including the time period prior to Amendment 9 when commercial landings were dominant to more recent years when landings have been fairly evenly split between sectors.

Preferred Alternative 2 would specify commercial and recreational allocations at percentages that have occurred in recent years. As a result, there would be no increase in gag bycatch. Further, as a reduction in fishing mortality is needed to end overfishing of gag (and vermilion snapper), a reduction in the number of dead discards would be expected if there was a reduction in fishing effort. The magnitude of reduction in dead discards would depend on the management measures selected.

SEDAR 10 (2006) indicated release mortality for gag was higher for the commercial sector (40%) than the recreational sector (25%). Therefore, one might expect alternatives that allocate a greater percentage of harvest to the commercial sector could result in a greater number of dead discards. However, the SEDAR 10 (2006) assessment indicated the number of gag discarded was much lower for the commercial sector (average 3,655 individuals 2000-2004) compared to the recreational sector (average 24,378 individuals 2000-2004). Therefore, **Alternatives 3 and 4**, which would allocate a greater percentage of the catch to the commercial sector would probably not increase the magnitude of dead discards unless fishermen incidentally caught gag when harvesting co-occurring species. Commercial fishermen may be able to avoid gag by modifying their method of fishing and where they deploy gear.

The overall impacts of **Alternatives 2-4** on protected species are uncertain. Sea turtle abundance in the South Atlantic changes seasonally and the impact of fishing effort shifts, if any, resulting from these alternatives is difficult to predict. Current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be reinitiated to address any increased levels of risk to ESA-listed species.

4.1.4.2 Economic Effects of Allocation Alternatives

4.1.4.2.1 *General Discussion*

The various allocation alternatives for gag would determine the distribution of harvest reductions to the commercial and recreational sector due to the proposed catch level to end overfishing of gag. These alternatives were generated through an examination of sector harvests for different harvest years rather than an attempt to identify the allocation that maximized net benefits, or in the present case minimized net losses, because application of the maximum benefit analysis is not possible at this time with available data.

Under **Alternative 1** (no action), each sector would be expected to experience equal percent reduction in harvests regardless of the base period chosen although the absolute amount of harvests would depend on the sector's harvest during the base period. The percent reductions to each sector under **Alternatives 2 to 4** as presented in Table 4-12 above are: 35% commercial, 37% recreational for **Preferred Alternative 2**; 16% commercial, 56%recreational for **Alternative 3**; and, 23% commercial, 50% recreational for **Alternative 4**. For analytical purposes, these reductions were computed relative to the average 2004-2005 harvests of the commercial and recreational sectors. Since under **Alternative 1** the harvest reduction for each sector would be about 40% each, **Alternatives 2 to 4** would favor the commercial sector since all percent reductions would be below the 40% mark. The farther away the commercial percent reduction is from 40%, the greater the harvest reduction would be for the recreational sector. Thus **Alternative 3**, which would reduce commercial harvest the least, would result in the greatest reduction for the recreational sector. If allowable harvest increases over time, **Alternatives 2 to 4** would also imply that the commercial sector would gain more than the recreational sector.

To the extent that **Alternatives 2 to 4** would favor the commercial sector, each alternative may be expected to reduce the losses to this sector but only at the expense of the recreational sector. Whether the trade-offs in benefits/losses would result in net gain to society cannot be determined in the absence of a quantitative model that shows the respective sector's marginal benefit curves. Also in the absence of such a model, it would not be possible to rank the various alternatives based on net economic benefits to society. At any rate, some quantitative implications of the various alternatives are presented below to provide some insights into the magnitude of effects.

4.1.4.2.2 *Commercial Sector*

Estimates of economic effects on the commercial sector were derived using a simulation model developed by Waters (2008 pers. comm.). A more detailed description of the model can be found in **Appendix H**. Estimates of net operating revenues were generated by subtracting trip costs from total revenues. Trip costs were predicted based on gear specific cost functions. If trip revenues exceeded trip costs after accounting for the expected effects of proposed regulations on trip-level harvests, then short-term economic losses were measured as the resulting reduction in trip revenues. Conversely, if the combination of proposed alternatives would cause trip revenues to fall below trip costs, then the trip was recorded as not taken, and losses were measured as a reduction in net operating revenues, which included the loss in revenues from all species minus the savings of trip costs not incurred.

It should be noted that this analytical approach might overestimate actual impacts. The analysis relies on actual historic trip records from 2001 to 2006. Models of how fishing behavior might change in response to increased restrictions for individual species are not available for the South Atlantic snapper grouper fishery. As a result, while changes in harvests and revenues on historic trips can be examined to identify which trips would remain profitable, it is not currently possible to identify how fishing behavior might change, targeting substitute species in order to maintain revenues. In essence, the current model can only eliminate trips, or allow them to occur with decreased revenues, but neither more trips nor trips with substituted revenues can be modeled at this time. Since this limitation applies to all of the management measures on the commercial sector, it is not expected to affect ranking of the alternatives. Caution is necessary, however, if an attempt is made to compare these values with those generated for the recreational sector.

The model used logbook records, including the economic add-on survey, supplemented by ALS ex-vessel price information and Bureau of Labor Statistics data on price indices. Since the model is fishery-wide, the effects of each alternative were estimated in conjunction with alternatives from other actions in this amendment. The baseline scenario refers to the model run using all the no action alternatives and assuming all preferred alternatives of previous amendments whether or not they have been implemented

Simulation results of the various allocation alternatives are presented in the next two tables, one by gear type and the other by area. Only the baseline scenario is presented in terms of absolute numbers (in 2005 dollars) while the alternatives are shown as differences from the baseline. In addition, two types of vessel trips are presented, one pertains to vessel trips landing at least one pound of gag and the other to vessel trips landing at least one pound of any snapper grouper species. The ranking of alternatives is unaffected by consideration of two types of vessel trips.

The effects of the various allocation alternatives are generally higher for vessel trips landing at least one pound of gag than for those landing at least one pound of any snapper grouper species (Table 4-13 and Table 4-14). This indicates that many vessel trips would likely be unaffected by a change in commercial gag allocations considered in this amendment. Reductions in net operating revenues for vessel trips landing at least one pound of gag would range from $51 thousand (1.2%) (**Alternative 3**) to $870 thousand (21%) in **Preferred Alternative 2**. The range of effects would be substantially lower for vessel trips landing at least one pound of any snapper grouper species, i.e., from 0.2% to

3.3%, or from $39 thousand to $634 thousand. The ranking of alternatives in terms of economic effects exactly matches with the relative percent landings reduction expected from the various alternatives, but the differences in magnitude of economic impacts are substantially different. For example, the expected percent reduction harvest is 16% for **Alternative 3** and 35% for **Preferred Alternative 2**, but the corresponding reductions in net operating revenues would be 1.2% ($48 thousand) for **Alternative 3** and 21% ($845 thousand) for **Alternative 2**.

As can perhaps be expected, vessel trips generating larger net operating revenues using a certain gear type would bear larger losses, in absolute magnitude but not necessarily in percentage terms, than other vessel trips using different gear types. Among vessel trips landing at least one pound of gag, vertical line vessel trips generated the largest net operating revenues and so would also bear the largest share of losses, and this is true regardless of the alternative considered (Table 4-13). In percentage terms, vessel trips using traps/pots and trolling lines would experience larger reductions than vertical line vessel trips. This large percentage reduction is more a function of the small net operating revenues these vessel trips generated before any possible allocation changes. Percentage revenue reductions by vertical line vessel trips would essentially determine the overall percentage reduction from each allocation alternative. It should be noted, however, that although trap/pot and trolling vessel trips generated small revenues, the relatively large percentage reductions in their net operating revenues could have significant effects on their net profitability. In terms of percentage reductions, trap/pot and trolling vessel trips would experience substantial reductions in their net operating income, followed by the larger net revenue generators, vertical line and diving vessel trips. Vessel trips using longlines and other gear would appear to be marginally affected by gag allocation changes.

Although the overall ranking of alternatives mentioned earlier would also apply to each vessel trip categorized according to gear usage, there are expected variations in each alternative's effects on vessel trips with different gear. **Preferred Alternative 2** would exact the largest percentage reductions on trolling vessel trips, then on trap/pot vessel trips, vertical line vessel trips, diving vessel trips, and vessel trips using other gear. **Alternative 3** would hit diving vessel trips hardest, then trolling and trap/pot vessel trips, and then vertical line vessel trips. **Alternative 4** would hit trap/pot vessel trips hardest, then trolling vessel trips, followed by diving vessel trips, and vertical line vessel trips. All alternatives would have little effect on longline vessel trips, and only **Preferred Alternative 2** would affect vessel trips using other gear types.

Table 4-13. Reductions in commercial vessels' net operating revenues from the various gag allocation alternatives, in thousand 2005 dollars, by gear type.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
	Vessel trips landing at least one pound of gag							
Baseline	486	3,553	35	12	14	43	0	4,143
Alt. 2 (Pref)	-85	-764	0	-1	-4	-17	0	-870
Alt. 3	-9	-41	0	0	0	-1	0	-51
Alt. 4	-27	-173	0	0	-2	-4	0	-206
	Vessel trips landing at least one pound of any snapper grouper species							
Baseline	634	8,131	544	388	305	347	3	10,351
Alt. 2 (Pref)	-51	-579	0	-1	2	-6	0	-634
Alt. 3	-6	-33	0	0	0	-1	0	-39
Alt. 4	-17	-133	0	0	1	-2	0	-152

As may be expected, the economic effects of various allocation alternatives would vary by area and would partly be determined by the importance of gag in those areas (Table 4-14). Under **Alternatives 2 and 4**, North Carolina vessels would experience the largest percentage reductions in net operating revenues 23.3% and 5.3%, respectively, for trips landing at least one pound of gag. In terms, however, of dollar reductions South Carolina would experience the largest loss of $342 thousand and $81 thousand, respectively, under **Alternative 2** and **Alternative 4**. Dollar and percentage reductions would fall off going southward to the Florida Keys. For **Alternative 3,** the largest reduction would fall on Georgia/Northeast Florida, followed by South Carolina, North Carolina, and the rest of Florida. A slightly different situation would occur when considering trips landing at least one pound of any snapper grouper species. For this case, all alternatives would result in the largest percentage reduction on South Carolina vessels, with North Carolina vessels following closely except for **Alternative 3** where Georgia/Northeast Florida vessels would experience the second largest reduction in net operating revenues.

Table 4-14. Reductions in commercial vessels' net operating revenues from the various gag allocation alternatives, in thousand 2005 dollars, by area.

	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
	Vessel trips landing at least one pound of gag						
Baseline	1,169	1,553	946	456	19	0	4,143
Alt. 2(Pref)	-272	-342	-184	-70	-2	0	-870
Alt. 3	-12	-19	-15	-4	0	0	-51
Alt. 4	-62	-81	-43	-20	0	0	-206
	Vessel trips landing at least one pound of any snapper-grouper						
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
Alt. 2(Pref)	-205	-263	-89	-39	-38	0	-634
Alt. 3	-10	-15	-8	-3	-3	0	-39
Alt. 4	-45	-62	-22	-11	-12	0	-152

4.1.4.2.3 *Recreational Sector*

In the absence of recreational fishery model comparable to that for the commercial sector, estimates of economic impacts on the recreational sector were generated by measuring potential changes in producer and consumer surplus using available information. Some of this information was taken from other fisheries outside of the South Atlantic Council's area of jurisdiction. The major parameters used in calculating producer surplus are for-hire net revenues per angler per trip to captain and crew of $150 for charterboats and $67 for headboats. These values are based on the for-hire survey conducted in the Gulf of Mexico. Another parameter used in calculating producer surplus is a keep elasticity of 1.46 that is taken to represent the percent change in target trip demand relative to the percent change in the keep rate. This value was generated by a study of the Gulf red snapper fishery. For consumer surplus estimation, the major parameter used is the value of a one fish change in the harvest per target trip of $3.03. This value is based on a recreational demand study conducted for reef fish in the Southeast.

The focal point of estimating consumer and producer surpluses is the 2001-2006 average target trips for gag and other species. It should be pointed out at this stage that for the 2001-2006 period, target effort differed substantially from catch effort, as noted in the discussion of the affected environment. In fact, target effort for gag and other species registered at very low levels especially when taking into account area distribution. At any rate, target effort is used since it presents a more reasonable proxy for demand for gag trips than catch effort. Target effort was represented by target trips for gag and other species.

Producer surplus was proxied by the net operating revenue of for-hire vessels, or more specifically by the net revenue to captain and crew per individual passenger trip. The estimated value of one fish was used to calculate consumer surplus. To estimate a change in producer surplus, the projected percent change in catch rate was first translated into a percent change for target trip demand via the keep rate elasticity. The percent change in target trip demand was then applied to target trips to arrive at the change in target trips. This latter value was subsequently multiplied by the corresponding producer surplus for charterboat and headboat to arrive at the change in charterboat and headboat producer surplus. Estimating the change in consumer surplus followed a similar procedure except that the estimation proceeded in determining the change if demand for fish with the latter multiplied by consumer surplus per fish. To do this, catches in pounds were converted to catches in number of fish using the 2001-2006 gag average weight. For more details on the estimation of consumer and producer surplus, please see **Appendix I**.

Estimates of changes (reductions in the present case) in producer and consumer surplus are presented in the next two tables, one by fishing mode (Table 4-15) and the other by area (Table 4-16). Baseline numbers were estimated as the sum of producer/consumer surplus derived from gag, vermilion snapper, and other species. In terms of relative magnitudes, the economic effects of various allocation alternatives on the recreational sector may be considered mirror images of those on the commercial sector. That is, **Alternative 3** would result in the largest reduction for the recreational sector and least for the commercial sector; **Preferred Alternative 2** would result in the least reduction for the recreational sector and largest for the commercial sector. Naturally, **Alternative 4** would fall in between the two other alternatives. If only the commercial and recreational values were strictly comparable, it would have been straightforward to calculate the net effects and thus determine the economically best allocation ratio. At any rate, the values presented in Tables 4-15 and 4-16 are deemed to provide some possible levels of the economic effects of the various allocation alternatives.

Total reductions in recreational economic values would range from $361 thousand for **Preferred Alternative 2** to $546 thousand for **Alternative 3** (Table 4-15). This range is not as wide as the one found for the commercial sector where the losses ranged from $51 thousand to $870 thousand (Table 4-13). The comparative range of effects between the commercial and recreational sectors appears to indicate that the commercial sector may be more sensitive to changes in allocation than the recreational sector. One should not construe this to imply that for gag allocation, decisions should be mainly based on the magnitude of economic effects on the commercial sector. Economic consequences on the recreational sector could also be large, as the tabulated results would indicate.

On balance, a greater portion of the economic value reductions would fall on the for-hire segment of the recreational sector. Two factors contribute to this situation. First reductions in producer surplus would be larger than consumer surplus. Second, the for-hire sector would lose both producer and consumer surplus, whereas the private mode would only lose consumer surplus. Overall producer surplus reductions would range from $316 thousand for **Preferred Alternative 2** to $478 thousand for **Alternative 3**. Overall reductions in consumer surplus would be less than a third of those in producer surplus. The charterboat segment would bear most of the reductions in producer surplus, ranging from $256 thousand for **Preferred Alternative 2** to $387 thousand for **Alternative 3**. Reductions in consumer surplus would be mostly borne by the private mode and would range from $31 thousand for **Preferred Alternative 2** to $47 thousand for **Alternative 3**.

Table 4-15. Reductions in producer and consumer surplus from the various gag allocation alternatives, in 2005 dollars, by fishing mode.

	Charterboats		Headboats		Private	
	Prod. Surp.	Cons. Surp.	Prod. Surp.	Cons. Surp.	Cons. Surp.	Total Effects
Baseline	537	286	173	1,526	1,055	3,577
Alt. 2 (Pref)	-256	-8	-60	-6	-31	-361
Alt. 3	-387	-13	-91	-9	-47	-546
Alt. 4	-345	-11	-81	-8	-42	-488

Florida would bear more than 90% of the reductions in recreational economic values, ranging from $286 thousand for **Preferred Alternative 2** to $434 thousand for **Alternative 3** (Table 4-16). Considering that Florida registered most of recreational gag harvests, this result is rather expected. The second largest reductions in producer and consumer surplus would fall on North Carolina, followed by South Carolina, and then by Georgia. In general, reductions in producer and consumer surplus by the various states would be proportional to the respective states' overall harvest of gag and accompanying producer and consumer surplus.

Table 4-16. Reductions in producer and consumer surplus from the various gag allocation alternatives, in 2005 dollars, by area.

	Florida		Georgia		South Carolina		North Carolina		Total Effects
	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	
Baseline	564	965	11	331	55	793	81	778	3,577
Alt. 2	-256	-30	-4	-2	-20	-2	-35	-11	-361
Alt. 3	-388	-46	-6	-3	-31	-4	-53	-16	-546
Alt. 4	-346	-41	-6	-2	-27	-3	-48	-15	-488

4.1.4.3 Social Effects of Allocation Alternatives

As discussed in Section 4.1.4.2, each gag allocation alternative to the status quo would result in economic losses to both the commercial and recreational sectors. Appropriate changes in social benefits would be expected to similarly result. No alternative allocation has been identified that would benefit one sector while not harming the other sector.

In addition to the expected adverse economic effects on the commercial sector, any allocation would be accompanied with effects that cannot be quantified. If these unquantifiable effects are compounded as the magnitude of the allocation increases, substantially increased adverse social impacts could accrue to the commercial sector as a result of **Preferred Alternative 2** relative to the other alternatives. Allocation away from historical distributions is a particularly divisive issue in fisheries, regardless of the amount of quantitative justification the allocation may appear to have. This is particularly true when incomes and livelihoods become affected. While appropriate data on business failure/exit does not exist, anecdotal information point to the increasing difficulty commercial fishermen have remaining in fisheries in general due to increased fuel costs, stagnant or declining ex-vessel prices, decreasing dock space and numbers of fish houses, fewer or more restrictive species options, and generally more restrictive management measures. Similar pressures exist for for-hire business operators. However, all of the allocation alternatives, while mitigating the effects of some of these pressures on the recreational sector, would exacerbate these pressures on the commercial sector. While none of the allocation alternatives to the status quo would be neutral to the commercial sector, lower adverse social impacts to the commercial sector and associated industries and communities would be expected to accrue to those alternatives that result in the lowest allocation away from the commercial sector.

4.1.4.4 Administrative Effects of Allocation Alternatives

Alternatives 2, 3, and **4** would increase the administrative burden on NOAA Fisheries Service, as landings would need to be monitored in relation to the commercial and recreational portion of the allocation for overages and commercial quota purposes. However, there would be no measurable difference amongst **Alternatives 2, 3** and **4** in the degree to which the administrative burden would increase. Each allocation alternative, with the exception of the status-quo alternative, would require the establishment of a more sophisticated quota/allocation monitoring mechanism.

4.1.4.5 Council Conclusions

The Council has proposed an interim allocation based on average landings from the years 1999-2003 (Preferred Alternative 2) because this reflects proportions taken most recently by the commercial and recreational sectors.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and endorsed a 50%/50% allocation. However, at their June 2008 meeting the AP changed their support to 61% commercial/39% recreational to (Alternative 4) to moderate economic and social impacts on the commercial sector.

The Council concluded their proposed allocation is fair and equitable based on the information available. This set of years results in an allocation similar to the landings of recent years. Using this allocation would have the recreational and commercial sectors sharing the cost of reduction more equitably based on their relative catches. The Council also concluded this allocation best meets the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.1.5 Management Alternatives

The Council has chosen multiple preferred alternatives to modify management measures currently in place.

Alternative 1. No action. **Current Regulations:**

(i) Current gag commercial regulations = 24 inch total length size limit; March & April - no harvest above bag limit & no sale; vessels with longlines may only possess deepwater species; limited entry program with 2 for 1 provision.

(ii) Current gag recreational regulations = 24 inch total length size limit; within 5 grouper bag limit only 2 may be gag or black grouper; March & April – no sale.

Alternative 2 (Preferred). Establish a gag spawning season closure January through April that applies to both the commercial (20% reduction) and recreational (31% reduction) sectors; no fishing for and/or possession of gag would be allowed. In addition, no fishing for and/or possession of the following species would be allowed: black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 3. Establish a 1,000 pound gutted weight gag commercial trip limit.

Alternative 3a. Establish a 1,000 pound gag gutted weight commercial trip limit with a fishing year start date of May 1. In addition, during March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. [See Table 4-17a]

Table 4-17a. Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM and March and April closure.

	Preferred Allocation 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	5,500	0	0
Directed quota	**348,440**	**458,040**	**423,340**

Notes: **Allocation Alternative 2 is preferred.** PQBM is rounded to the nearest 500 lbs. Weight is in pounds gutted weight. Assumes after trip limit is met or after quota met there is no directed catch and incidental catch due to targeting co-occurring species. After quota met, assumed 20% of trips would not be made and fishermen can avoid 20% of gag.

Alternative 3b. Establish a 1,000 pound gag commercial trip limit with a fishing year start date of January 1. In addition, during February, March and April no fishing for and/or possession of the following species would be allowed: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. [See Table 4-17b]

Table 4-17b. Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM and February, March, and April closure.

	Preferred Allocation 2	Allocation Alternative 3	Allocation Alternative 4
Commercial quota	353,940	458,040	423,340
PQBM	3,500	0	0
Directed quota	**350,440**	**458,040**	**423,340**

Notes: **Allocation Alternative 2 is preferred.** PQBM is rounded to the nearest 500 lbs. Weight is in pounds gutted weight. Assumes after trip limit is met or after quota met there is no directed catch and incidental catch due to targeting co-occurring species. After quota met, assumed 20% of trips would not be made and fishermen can avoid 20% of gag.

Alternative 4 (Preferred). Directed Commercial Gag Quota. Establish the following directed commercial gag quota (quota after PQBM has been subtracted) for 2009 onwards until modified. After the directed commercial gag quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession is limited to the bag limit: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. [See Table 4-18].

Table 4-18. Commercial quotas associated with allocation alternatives for gag taking into consideration estimate of PQBM and impacts of the January through April closure.

With Jan-April Gag Seasonal Closure			
	Preferred Allocation Alt 2	Allocation Alt 3	Allocation Alt 4
Commercial quota	353,940	458,040	423,340
PQBM	1,000	0	0
Directed quota	**352,940**	**458,040**	**423,340**
With no Jan-April Gag Seasonal Closure			
	Preferred Allocation Alt 2	Allocation Alt 3	Allocation Alt 4
Commercial quota	353,940	458,040	423,340
PQBM	7,000	1,000	1,000
Directed quota	**346,940**	**457,040**	**422,340**

Notes: Different values of PQBM could be used in the future. PQBM is rounded to the nearest 1,000 lbs. Weight is in pounds gutted weight.

Alternative 5. Divide the directed commercial gag quota into two regions: Allocate 63.3% to North and South Carolina (223,411 pounds gutted weight) and 36.7% to Georgia and Florida (129,529 pounds gutted weight). Each region's directed quota (after adjustment for PQBM) would be tracked by dealer reporting. After the commercial quota is met in either region, all purchase and sale is prohibited in that region and harvest and/or possession is limited to the bag limit in that region.

Alternative 6. South of the Miami-Dade/Monroe County line, no fishing for and/or possession of the following species would be allowed during June 1-December 31: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. No fishing for and/or possession of gag would be allowed year-round south of the Miami-Dade/Monroe County line. Fishing for black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney would be allowed January 1 – May 31 for the Southern region. Note: This alternative would apply to both the recreational and commercial fisheries.

Alternative 7. Recreational measures:

Alternative 7a (Preferred). Reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black grouper (combined) to 1 gag or black grouper (combined) within the grouper aggregate bag limit, and exclude the captain and crew on for-hire vessels from possessing a bag limit for groupers. This plus the January through April spawning closure would result in a 36% reduction in harvest.

Alternative 7b. Close the month of December to recreational harvest and/or possession of gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. This alternative would retain the existing 5-grouper aggregate bag limit and 2 gag or black grouper (combined) bag limit. The December through April closure would result in a 42% reduction in harvest.

Note: The exclusion of captain and crew on for-hire vessels from possessing a bag limit for groupers applies to the aggregate bag limit that includes tilefish.

4.1.5.1 Biological Effects of Management Alternatives

<u>Alternative 1. No Action</u>

Alternative 1 would retain the current regulations used to manage catches of gag, and perpetuate the existing level of risk to protected species. In general, regulations include a commercial size limit, recreational size limit, recreational bag limit, and commercial seasonal closure. In addition, the *Oculina* Bank HAPC is closed to bottom fishing off of the coast of Florida (an area where the species is known to occur). Furthermore, a limited access system is in place in the commercial sector.

Quotas, seasonal closures, and bag limits are designed to reduce the number of targeted fishing trips or time spent pursuing a species. When properly designed, these types of measures are generally expected to benefit the environment in the short-term and long-term by limiting the extent to which a stock is targeted. However, the extent to which such benefits are realized depends on to what extent fishing effort changes or shifts in response to the select management measure. For example, discard mortality can limit the amount by which fishing mortality is reduced if fishermen continue to target co-occurring species after the catch quota or limit has been achieved, or they fish within the closed area. As a result, proposed management measures for gag in Amendment 16 take into consideration dead discards that would be estimated to occur during a seasonal closure or after a quota is met. In addition, bag limit analyses takes into consideration the expected increase in dead discards as part of the harvest estimation.

To determine the actual environmental effects of the no action alternative on gag, one must examine current trends in harvest levels, stock biomass levels, and life history characteristics, then predict the direction of future trends under status quo management. The recent SEDAR assessment determined the gag stock in the South Atlantic is not overfished and is currently undergoing overfishing (SEDAR 10 2006). However, biomass of the stock is less than the biomass associated with MSY and the stock is approaching an overfished condition.

Gag are vulnerable to overfishing because they live for at least 30 years (SEDAR 10 2006), change sex from female to male later in life, and form spawning aggregations at locations known to fishermen. During the 1990s, gag off the Southeastern U.S. was exhibiting many of the symptoms of an exploited population. Harris and Collins (2000) reported a lower age at first maturity and a significant increase in the observed mean length at age in the South Atlantic gag population in 1994-95 in comparison with data from 1976-82. Increased fishing pressure was suggested as a contributing factor in the described life history changes (Harris and Collins 2000). During the same period, McGovern *et al.* (1998) found the sex ratio decreased from 19.6% males in 1976-82, to 5.5% males in 1994-95. The size at 50% maturity also declined in the later period.

There is some indication from a more recent life history study the status of the population has improved since the 1990s. Reichert and Wyanski (2005) found size at maturity during 2004-05 occurred at significantly larger sizes than during 1994-95. Age at maturity also increased since 1994-95, albeit less dramatically than for size at maturity. The percentage of males and individuals undergoing transition in the population increased from 5.5% in 1994-95 to 8.2%; however, the current percentage is still much lower than the revised estimate of 19.4% for samples collected during 1976-82. Sex transition has occurred at progressively larger sizes and younger ages since 1977-82, a trend that is also probably related to the increasing growth rates over time.

The SEDAR 10 (2006) stock assessment also suggested, despite continued overfishing, the condition of the gag stock has improved since the middle 1990s, perhaps in response to management measures. Figure 51 from the SEDAR 10 (2006) assessment showed a substantial decline in fishing mortality since 1990 with a second decline occurring after 1998 when the minimum size limit was increased to 24 inches TL and a two-month commercial spawning season closure was put into place (Figure 4-3). Fishing mortality was only slightly greater than F_{MSY} in 2004.

Figure 51. Gag- Base run with constant catchability: Estimated fishing mortality and exploitation rates. A) Fully selected fishing mortality rate and B) Exploitation rate of fish age 2^+. Solid horizontal line represents the level corresponding to MSY and the horizontal dashed lines represent the 10th and 90th percentiles of the MSY level. The 90th percentile line is hidden by the solid MSY line.

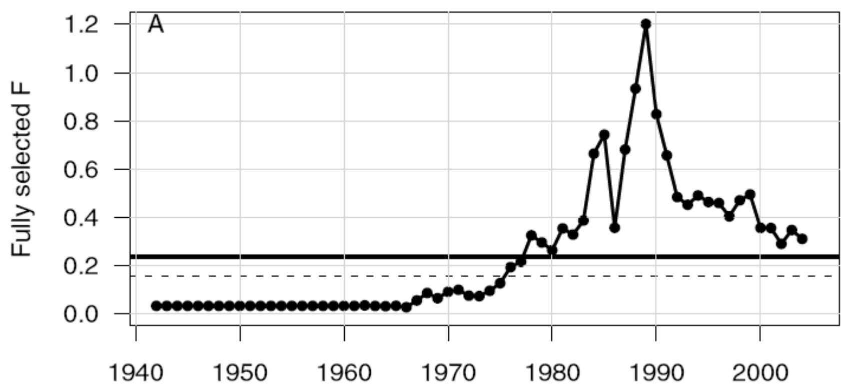


Figure 4-3. Figure 51 from the SEDAR 10 (2006) stock assessment showing trends in gag fishing mortality.

Figure 55 from the SEDAR 10 (2006) stock assessment showed an increasing trend in biomass since the mid-1990s, also suggesting an improved condition of the stock (Figure 4-4). Despite the apparent improved condition of the stock, gag is experiencing overfishing and the stock assessment indicates gag is approaching an overfished condition. Furthermore, red grouper and black grouper have been experiencing overfishing since 1998 (http://www.nmfs.noaa.gov/sfa/domes_fish/StatusoFisheries/2007/2007StatusofUSFisheries_Report_to_Congress.pdf). Adverse trends in size at age, size/age at maturity, size/age at transition, and percentage of males would be expected for gag if status quo regulations are maintained.

Gag and other shallow water grouper species are protogynous, functioning first as females and then transforming to males at older ages and larger sizes (McGovern *et al.* 1998). If protogynous fish are removed from the population at small sizes and young ages, the sex ratio can become abnormally skewed because fish are unable to transform into males. Shapiro (1987) suggested sex change is socially mediated in many protogynous species where the cues for sexual transition may be provided by the loss of larger males in a group of fish.

Figure 55. Gag- Base run with constant catchability: Estimated biomass time series. A) Total biomass and B) Spawning stock biomass (male mature biomass + female mature biomass). The solid horizontal line represents the level corresponding to MSY and the horizontal dashed lines represent the 10th and 90th percentiles of the MSY level.

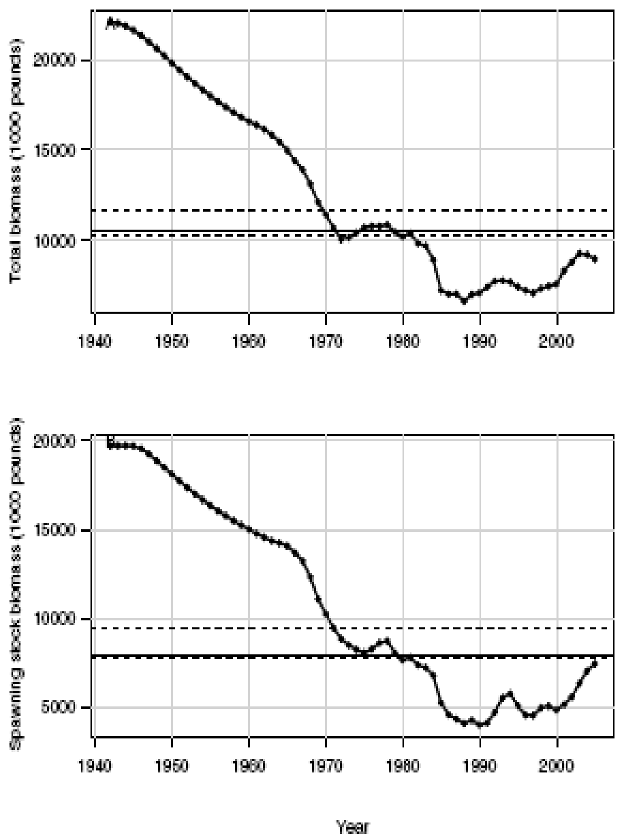


Figure 4-4. Figure 55 from SEDAR 10 (2006) stock assessment showing trends in gag biomass.

Some species, including gag, scamp, and black grouper aggregate annually in the same locations to spawn, making them available for fishermen to target and to remove them in large numbers (Coleman *et al*. 2000). Furthermore, gag and other grouper species are often associated with structure such as live bottom and rocky outcrops, easily recognized with a fathometer and can be repeatedly located with the use of GPS. The largest members of an aggregation are often the most aggressive and may be the first to be removed by fishing gear (Thompson and Monroe 1974; Gilmore and Jones 1992). Because many grouper species (e.g., gag, black grouper, red hind, tiger grouper, and scamp) are aggregated for only a portion of the year, the sociodemographic factors responsible for sex change are only in place for a short period. Therefore, in the presence of heavy fishing pressure, it may not be possible for protogynous species, which form temporary spawning aggregations, to maintain a natural sex ratio since larger males are removed from the population when aggregations are not intact.

A decline in the number of males in a population may affect the reproductive fitness of grouper species. For example, large, aggressive males tend to have favorable genetic characteristics that allow them to live for long periods of time, achieve large sizes, successfully reproduce, etc. Removal of specimens with the best genetic makeup may result in males having less desirable genetic characteristics to engage in successful mating encounters. In an unfished population where large, dominant males are not removed, sex reversal of large females may be naturally inhibited by the presence of these large males. This may allow the population to maintain greater numbers of older females, which have the highest fecundity (Gilmore and Jones 1992). Fishing such a population may indirectly result in more females transforming into males to take advantage of the absence of the dominant males and in an overall reduction in the period of successful mating for any particular fish, therefore reducing fecundity of the population (Gilmore and Jones 1992).

It is possible egg production potential of a protogynous stock subjected to selective removal of only males might not be affected as severely as a gonochoristic species where males and females are removed at the same rate. In protogynous species where the sex ratio is skewed toward females, egg production is very high. Therefore, fishing would not necessarily reduce fecundity if it removed only males. This assumes there would be enough males present in aggregations to fertilize eggs of all the females. However, most groupers are subject to fisheries targeting large fish. Therefore, not only are males being selected but also large females with the greatest reproductive potential are removed.

Fishing can indirectly affect fish reproduction by disrupting courtship and mating behaviors in spawning aggregations. These courtship displays can involve elaborate swimming behavior, color changes, and territorial behavior. Disruption of these displays and behaviors could negatively affect reproductive success (Shapiro 1987). Spawning aggregations are made up of fish, which normally reside elsewhere but travel to the spawning location each year. If the location of these sites is learned from previous generations, then depletion of larger individuals could result in decreased site fidelity from later generations because the younger fish cannot find the spawning site (Coleman *et al*. 2000).

Many species of snappers and groupers are extremely vulnerable to overexploitation. Species such as gag, scamp, black grouper, and red grouper are slow growing, long lived, and mature at large sizes, which can result in the capture of large numbers of immature fishes. For example, the minimum size for gag (24” TL) is also the size at which 50% of the fish are mature. Although the average size of gag landed by commercial fishermen is greater than 24 inches TL, immature fish are being caught, particularly in the recreational sector.

Overfishing gag also can indirectly affect populations of co-occurring species who share the same habitat. For example, the average size at age, size/age at maturity, size/age at transition, and sex ratio of co-occurring species can change as a result of a reduced need to compete for resources and selective removal of individuals by the fishing gear. Gag are taken with vermilion snapper, scamp, red grouper, red porgy, speckled hind, warsaw grouper, and others. When fishing reduces the abundance of conspecifics or other species that share available resources, the remaining fishes have access to more food and habitat, resulting in higher growth rates and larger size at age (Pitcher and Hart 1982, Rothschild 1986).

There is variability in size and growth within fish populations. As fishing pressure intensifies, individuals with a genetic makeup for achieving large sizes may be selectively removed from the population because of gear selectivity or economic value, leaving behind fishes with a genetic disposition for smaller size and slower growth. The overall effect of this heavy, sustained fishing pressure on a fish population can be a reduction in the growth rate, a change in size at age, a decrease in the size and age at transition from female to male (for protogynous species), a decrease in the percentage of males, a decline in the size and age at maturity and first reproduction, a decrease in the size and age structure of the population, a decrease in fecundity, and a decline in the number of spawning events. Snapper grouper species with a shorter lifespan, such as black sea bass and red porgy, would be expected to respond to fishing pressure sooner than species such as gag, which has a longer lifespan. Continued overfishing may ultimately disrupt the natural community structure of the reef ecosystems that support gag and co-occurring species.

Russ (1991) defines ecosystem overfishing of a multi-species stock as occurring when "fishing is of such intensity that it results in changes in the relative abundance of species or the species composition of the community". Often, the biomass of some stocks decreases (such as those targeted by fishing gear), while the biomass of some other stocks increases in response (such as an increase in abundance of a competitor of the fished species or of a species preyed upon by the fished species). Fishing pressure targeting larger fish often results in a shift toward persistence of small individuals of the targeted species. These smaller individuals may occupy a different trophic level than they would if they grew to their normal adult size (Jennings *et al*. 2002). However, Russ (1991) found that "there is usually an overall reduction in CPUE since species that increase in biomass do not "compensate" for declines in others".

Competitor, predator, and prey relationships in marine ecosystems are complex and poorly understood. As a result, the exact nature and magnitude of the ecological effects of management measures are difficult to accurately predict or distinguish. There is evidence that during the mid-1990s, reef communities in the South Atlantic may have been altered by selective fishing pressure that targeted commercially valuable species. McGovern *et al*. (1999) used fishery-independent data collected during 1983-1996 in the South Atlantic to determine temporal trends in CPUE and mean length of many snapper grouper species. Increases in the abundance of gray triggerfish, tomtate, and bank sea bass may have been, in part, due to changes in reef fish community structure, which resulted from heavy fishing pressure on other reef species (i.e., red porgy, vermilion snapper, black sea bass, and various grouper species) (McGovern *et al*. 1999). Removal of some heavily fished species may have resulted in greater availability of food and habitat for the remaining reef species, while a decrease in abundance of apex predators such as large groupers may have reduced mortality on prey species.

Koenig *et al*. (2000) report that directed harvest and habitat destruction related to fishing activities have changed population demographics in an area off the South Atlantic coast identified as the Experimental *Oculina* Research Reserve (Koenig *et al*. 2000). Commercially important species, including gag, black sea bass, scamp, and greater amberjack, accounted for 76% of the observed reef fish videotaped during submersible dives in the area in 1980. However, those species comprised 5% of the reef fish observed in submersible dives at the same location in 1995 (Koenig *et al*. 2000). The *Oculina* HAPC closed area currently provides a biological benefit to snapper grouper species that cannot be quantified at this time. This area allows species like gag to achieve their natural age and size structure in the absence of fishing. Recent evidence indicates there has been an increase in abundance of many species including gag since the area was closed (Koenig 2001).

All the alternatives to status quo management evaluated for gag are intended to end overfishing. As a result, they are expected to directly and significantly benefit the biological environment by assisting in restoring stock status and population demographics to more natural conditions.

<u>Alternative 2. Spawning Season Closures</u>
Preferred Alternative 2 would close the commercial and recreational fishery for gag and other shallow water groupers (black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney) during January through April of each year.

Off the southeastern United States, gag spawn from December through May, with a peak in March and April (McGovern *et al.* 1998). There some evidence that spawning may occur earlier off Florida than areas north. Gag probably make annual late-winter migrations to specific locations to form spawning aggregations and many of these locations are known by fishermen. McGovern *et al.* (2005) found gag were capable of extensive movement and suggested movement may be related to spawning. Gilmore and Jones (1992) indicated gag may be selectively removed from spawning aggregations because they are the largest and most aggressive individuals and the first to be taken by fishing gear.

In 1998, the Council took action to reduce fishing mortality and protect spawning aggregations of gag and black grouper. Actions included a March-April spawning season closure for the commercial sector. While a March-April commercial closure may offer some protection to spawning aggregations including the selective removal of males, a January-April spawning season closure (**Preferred Alternative 2)** would provide greater protection. Although gag spawn during December through May, aggregations are in place before and after spawning activity (Gilmore and Jones 1992). Therefore, males can be removed from spawning aggregations early in the spawning season and this could affect the reproductive output of the aggregation if there were not enough males present in an aggregation for successful fertilization of eggs. **Preferred Alternative 2** would also close the fishery for other shallow water groupers including black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney, which are also known to spawn during January-April (see Section 3.2.1). (Note: Red grouper and black grouper are listed as overfishing in the Stock Status Report to Congress.)

Like gag, the other shallow water grouper species are vulnerable to overfishing because they change sex, many are long lived, and some species (e.g., gag, black grouper, scamp, red hind, and tiger grouper) are known to form spawning aggregations at locations known to fishermen (Section 3.2.1). Therefore, extending the spawning season closure to other shallow water groupers could have positive biological effects including protecting spawning aggregations, increasing the percentage of males, enhancing reproductive success, and increasing the magnitude of recruitment.

In September 2007, the Snapper Grouper Advisory Panel (AP) recommended a January to March spawning closure, during which harvest and possession be prohibited. Their rationale was there is some spawning during January off Florida and gag form aggregations before spawning. Therefore, an earlier closure would help to protect males before they begin to spawn. There was some discussion during the AP meeting about adding two weeks on both ends of the current March/April closure.

The AP also felt any closure should be applied the commercial and recreational sectors. Extending the spawning season closure to the recreational sector would have positive biological benefits since approximately half of the gag are landed by recreational fishermen. Although recreational fishermen generally catch gag in shallower water than commercial fishermen, it is likely some spawning locations of gag are being targeted by recreational fishermen. Furthermore, gag are reported to form pre-spawning aggregations in shallow water before moving offshore to spawn, which would make them available to recreational fishermen. In addition to protecting gag while aggregated and during the spawning season, a seasonal closure could prevent high harvest rates during periods of cold water intrusion. During 2003, cold water upwelling may have caused gag to move inshore en masse where they may have become susceptible to harvest in large numbers by divers.

Gag are part of a multispecies fishery. Therefore, some bycatch of gag would be expected during a seasonal closure when fishermen target co-occurring species such as vermilion snapper, scamp, greater amberjack, red grouper, and others (Tables 4-19 and 4-20). However, since **Preferred Alternative 2** would close all shallow water groupers during January through April, bycatch of gag would likely be decreased since fishermen would not be targeting other co-occurring grouper species.

Table 4-19. Species taken on commercial trips with gag during 2003-2005. Source NMFS Logbook.

Species	trips	mean	sum
SNAPPER,VERMILION	2,268	481	1,091,995
SCAMP	2,308	182	420,633
AMBERJACK,GREATER	1,594	262	417,058
GROUPER,RED	2,272	175	397,988
TRIGGERFISH,GRAY	1,830	125	228,653
JACK,ALMACO	1,094	181	197,845
SNAPPER,RED	1,966	96	188,736

Table 4-20. Species taken on headboat trips with gag during 1999-2005. Source NMFS Headboat.

Species	trips	mean	sum
Vermilion Snapper	3287	97	320,279
Black Sea Bass	4822	55	264,794
White Grunt	3505	53	186,991
Yellowtail Snapper	4011	32	128,381
Tomtate	1462	46	67,170
Lane Snapper	3937	11	44,563
Gray Triggerfish	3802	9	35,832
Gray Snapper	4360	8	35,096
Banded Rudderfish	485	40	19,421
Blue Runner	1337	14	18,607
Spottail Pinfish	572	29	16,410
Red Porgy	655	25	16,396
Bigeye	1186	13	15,529
Sharpnose Shark	2034	8	15,288
Red Snapper	2724	5	13,406
Bank Sea Bass	607	19	11,355
Knobbed Porgy	1328	8	10,566
King Mackerel	2365	4	9,472
Bluestriped Grunt	878	11	9,396
Scamp	1252	7	8,538
Red Grouper	2677	3	7,983

Furthermore, a spawning season closure for the recreational sector could reduce bycatch since most of the gag caught by recreational fishermen are discarded because they are less than the 24” TL minimum size limit (Tables 4-21 and 4-22). In contrast, commercial fishermen generally fish in deeper water and catch gag larger than the minimum size limit. SEDAR 10 (2006) estimate 25% of gag discarded by recreational fishermen do not survive.

Table 4-21. Average gag MRFSS landings 2001-2006 (A+B1 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	5,170	5,134	0	0	37
2	4,480	4,103	9	194	174
3	6,853	2,955	398	637	2,863
4	3,702	1,602	80	132	1,888
5	5,078	2,342	267	86	2,382
6	6,827	4,624	14	459	1,730

Table 4-22. Average gag MRFSS landings 2001-2006 (B2 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	15,750	15,712	0	0	38
2	12,067	11,006	0	128	933
3	9,732	8,109	325	603	695
4	12,029	11,151	58	44	775
5	18,958	14,688	273	1,155	2,842
6	29,673	27,349	175	1,477	672

Methodology for determining incidental catch of gag during a closure is provided in **Appendix C**. Briefly, six steps were taken to determine the effectiveness of a commercial seasonal closure. First, NMFS logbook data were examined to determine the species most commonly taken on trips with gag. Second, trips were identified that caught at least 100 pounds of the most common species taken identified in step 1. Third, landings of gag on trips identified in step 2 that targeted co-occurring species were determined. This would be considered to be incidental catch of gag. Fourth, incidental catch was compared to actual catch to determine percentage that would still be caught during a closed season. Fifth, the portion of the gag incidental catch that would die when no retention was allowed was determined by applying a commercial release mortality rate of 40% (SEDAR 10 2007). Sixth, effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings.

To determine the effectiveness of a recreational seasonal closure seven steps were taken. First, MRFSS and Headboat data were examined to determine the most common species taken on trips with gag during the proposed January through April closure. Second, trips were identified that caught at least 1 individual of the most common species taken identified in step 1. Third, landings of gag on trips identified in step 2 that targeted co-occurring species were determined. This would be considered to be incidental catch of gag. Fourth, incidental catch was compared to actual catch to determine percentage that would still be caught during a closed season. Fifth, the portion of gag incidental catch that would die when no retention was allowed was determined by applying a release mortality rate of 25% (SEDAR 10 2007). Sixth, the magnitude of incidental catch was determined if the number of trips was reduced and if fishermen were able to avoid gag. Seventh, effectiveness of closure was estimated by comparing the magnitude of dead discards to actual landings if a closure did not occur.

If the closure were 100% effective, the reductions expected for gag are shown in Table 4-23. If the closure were less than 100% effective, the reductions expected for gag would be those shown in Table 4-24.

The impacts of **Preferred Alternative 2** on protected resources are likely to reduce impacts to protected species; however, the extent of those reductions is uncertain. In the event closed seasons reduce snapper grouper fishing effort, the likelihood of adverse impacts from the fishery occurring to protected species may be reduced. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

Table 4-23. Percent reductions from spawning season closures (100% effective) by sector.

Months	Commercial	Headboat	MRFSS Private	MRFSS Charterboat	MRFSS All Modes	MRFSS & Headboat
March/April	0.70%	20.20%	15.30%	19.80%	16.40%	16.80%
Feb/Mar/April	11.00%	26.20%	24.90%	28.00%	25.50%	25.50%
Jan/Feb/Mar/April	21.40%	31.90%	34.40%	36.30%	34.60%	34.30%

Table 4-24. Percent reductions from spawning season closures (less than 100% effective; effectiveness shown by sector) by sector.

Months	Commercial (95%)	Headboat (89%)	MRFSS Private (89%)	MRFSS Charterboat (89%)	MRFSS (89%)	MRFSS & Headboat (89%
March/April	0.70%	18.00%	13.60%	17.60%	14.60%	14.90%
Feb/Mar/April	10.50%	23.30%	22.10%	24.70%	22.70%	22.70%
Jan/Feb/Mar/April	20.30%	28.40%	30.60%	32.30%	30.80%	30.50%

<u>Alternative 3. Establish a 1,000 pound gutted weight gag commercial trip limit</u>
Alternative 3 would establish a 1,000 pound gutted weight trip limit for gag and would close the commercial fishery for gag and other shallow water groupers (black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney) after a quota was met. There are different quotas associated with **Alternative 3a** (Table 4-17a) and **Alternative 3b** (Table 4-18b) depending on which allocation alternative the Council selects. Currently the Council's **Preferred Allocation Alternative 2** would designate 51% of the total allowable catch to the commercial sector and 49% to the recreational sector.

Alternatives 3a and 3b also differ in when the fishing year would start and the length of the spawning season closure for gag and other shallow water groupers. Under **Alternative 3a**, gag and shallow water groupers would be closed during March-April and the fishing year would start on May 1. Assuming there would be no decrease in fishing effort, the biological effects of **Alternative 3a** would be similar to **Preferred Alternative 2** because it is expected with a May 1 fishing year start date, the quota would be met sometime in December. Therefore, the commercial fishery for gag and other shallow water groupers would likely be closed during January through April.

Off the southeastern United States, gag spawn from December through May, with a peak in March and April (McGovern *et al.* 1998). There is some evidence spawning may occur earlier off Florida than areas north. Gag probably make annual late-winter migrations to specific locations to form spawning aggregations and many of these locations are known by fishermen. McGovern *et al.* (2005) found gag were capable of extensive movement and suggested movement may be related to spawning. Gilmore and Jones (1992) indicated gag may be selectively removed from spawning aggregations because they are the largest and most aggressive individuals and the first to be taken by fishing gear.

In 1998, the Council took action to reduce fishing mortality and protect spawning aggregations of gag and black grouper. Actions included a March-April spawning season closure for the commercial sector. While a March-April commercial closure may offer some protection to spawning aggregations including the selective removal of males, a January-April spawning season closure that could be provided by **Alternative 3a** would provide greater protection. Although gag spawn during December through May, aggregations are in place before and after spawning activity (Gilmore and Jones 1992). Therefore, males can be removed from spawning aggregations early in the spawning season and this could affect the reproductive output of the aggregation if there were not enough males present in an aggregation for successful fertilization of eggs. Therefore, if effort remained at current levels and the gag fishery closed in November or December, then greater protection would be provided to gag spawning aggregations than in the no-action **Alternative 1**. **Alternative 3a** would also close the fishery after a quota is met and during March-April for other shallow water groupers including black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney, which are also known to spawn during January-April (see Section 3.2.1).

Like gag, the other shallow water grouper species are vulnerable to overfishing because they change sex, many are long lived, and some species (e.g., gag, black grouper, scamp, red hind, and tiger grouper) are known to form spawning aggregations at locations known to fishermen (Section 3.2.1). In addition, gag are taken on trips with other grouper species including scamp and red grouper. Therefore, closures for shallow water grouper species during the spawning season could have positive biological effects including protecting spawning aggregations, increasing the percentage of males, enhancing reproductive success, and increasing the magnitude of recruitment.

During June 2008, the Snapper Grouper Advisory Panel (AP) recommended the Council consider **Alternative 3a**, which would start the fishing year May 1 rather than January 1 and establish a 1,000 pound gutted weight trip limit. The AP indicated **Alternative 3a** would have economic benefits as it would allow fishermen to fish for gag through January or February if effort decreased due to increased gas prices but would be identical to **Amendment 2** if effort remained at current levels and the quota was met in November or December. The AP's intent of the 1,000 pound gutted weight trip limit is to extend the duration of the fishing year and reduce the market disruption of closing the fishery early. Although logbook data indicate there were few trips that exceeded 1,000 pounds gutted weight of gag, the 1,000 pound gutted weight trip limit could extend the fishing season to some degree. Trip limits have the potential to increase discards if fishermen continue to pursue co-occurring species after achieving the trip limit; however, since logbook data indicate fishermen infrequently land more than 1,000 lbs gutted weight on a trip, few discards would be expected and high grading is not likely. Nevertheless, the quota proposed in **Alternatives 3a and 3b** takes into consideration dead discards that would be estimated to occur during a seasonal closure, after a quota is met, or after a trip limit is met.

The Council's SSC refers to increased dead discards associated with new management measures such as trip limits, quotas, or seasonal closures as post quota bycatch mortality (PQBM). Tables 4-17a and 4-17b provide estimates of dead discards that could occur with a 1,000 lb gutted weight trip limit and after a quota was met. The SSC and Council approved the methodology for determining the magnitude of PQBM at their December 2007 meeting. However, they recommended the Snapper Grouper Advisory Panel (AP) review the methodology to provide an estimate of the number of trips that might not be taken to target snapper grouper species during a closure for vermilion snapper or gag and provide an estimate of the ability of fishermen to avoid vermilion snapper or gag by modifying fishing techniques. The Council and the Council's AP recommended that estimates for PQBM assume that fishing trips, which previously caught gag or vermilion snapper, would be reduced by 20% after a quota is met and fishermen can avoid 20% of the gag or vermilion snapper by using different techniques.

If effort was reduced, the biological benefits of **Alternative 3a** would be less than **Preferred Alternative 2** because fishing would be occurring when gag and other shallow water grouper species are in spawning condition and more vulnerable to fishing gear than during other times of the year. However, the biological benefits of **Alternative 3a** would be greater than the no action **Alternative 1** because the quota would be reduced and if fishing extended into January and February then, presumably, effort would be reduced resulting in less impact on shallow water grouper stocks than is currently occurring.

Alternative 3b, which would maintain the January 1 start date but close all shallow water groupers during February through April was also suggested by the AP because there were some fishermen who indicated in south Florida, gag are available on a seasonal basis during January. Work conducted by McGovern *et al.* (2005) indicate gag can move large distances from South Carolina and North Carolina to areas off of South Florida presumably to spawn. Therefore, the seasonal appearance of gag off of South Florida could be related to spawning activity. These fish could be vulnerable to capture in large numbers, particularly if they are in aggregations (Gilmore and Jones 1992). As a result, the biological benefits of **Alternative 3b** would be less than **Preferred Alternative 2**

since gag and other shallow water species in spawning condition could be targeted by commercial fishermen in January. The biological benefits of **Alternative 3b** would also be less than **Alternative 3a** under the current level of effort since it is anticipated the fishery would close sometime in November or December with the May 1 start date being considered in **Alternative 3a**. However, if effort were to decrease, the biological effects of **Alternatives 3a** and **3b** could be similar.

The biological effects of **Alternatives 3a and 3b** could be different if combined with **Alternative 5**, which would establish regional quotas. **Alternative 5** would allocate 63.3% of the commercial quota to North and South Carolina and 36.7% to Georgia and Florida. The rationale for having regional quotas is fishermen off Florida could have an advantage and catch part of the quota early in the year when bad weather would prevent fishermen from catching gag off North Carolina and South Carolina. The Council examined monthly gag landings and found the percentage of annual gag landings among states was similar after the proposed January-April spawning season closure (**Preferred Alternative 2**) would take place. However, if the fishing year started on January 1, with a February through April closure (**Alternative 3b**), fishermen in Florida could begin catching gag sooner than fishermen off of North Carolina and South Carolina due to better weather conditions. Therefore, under **Alternative 3b** it might be reasonable to combine it with a regional quota to prevent fishermen in Florida and Georgia from catching more than their historic proportion of the quota.

If effort remained at current levels, the biological effects of **Alternative 3a** would be similar to **Preferred Alternative 2** since the quota would likely be met in November or December. Therefore, there would be no need to have regional quotas since proportions of gag harvest in Florida, South Carolina, and North Carolina is similar after May 1. However, if fishing of gag continued into January and February, fishermen in Florida could have an advantage in catching a greater proportion of the quota than fishermen in North Carolina and South Carolina, which could warrant combining **Alternative 3a** with **Alternative 5**.

After the commercial quota was met in a particular region, all purchase and sale would be prohibited in that region and harvest and/or possession would be limited to the bag limit in the region. However, there is a chance that harvest could continue in a closed region and gag would be landed in the region where harvest is still allowed. This could result in some localized depletion but would not be expected to negatively affect the population.

The Council did not support **Alternative 3a or 3b** because they felt gag and black grouper could be vulnerable to capture in large numbers if the season was open during January and February, particularly if they are in aggregations. Furthermore, other shallow water grouper species in spawning condition could be targeted by fishermen during January and February when they might be particularly vulnerable to capture.

<u>Alternative 4. Directed Commercial Quota</u>
Preferred Alternative 4 would establish a directed quota, after PQBM has been subtracted, of 352,940 lbs gutted weight for 2009 onwards until modified. After the

commercial quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession is limited to the bag limit: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. Based on the preferred allocation alternative, the commercial quota reduction proposed in **Preferred Alternative 4** would initially (in 2009) reduce commercial catches by 35% of the average landings recorded from 2004 to 2006 (Tables 4-11 to 4-12). A reduction in fishing mortality and subsequent increase in biomass would be expected to restore the natural population structure of the stock and reverse the trends of decreasing males and mean length documented in recent studies. A reduction in fishing mortality would benefit the ecosystem in which gag occur, as described above.

There is concern that if a quota is met for gag before the end of the year, discards of gag could occur when fishermen target vermilion snapper, scamp, greater amberjack, red grouper, gray triggerfish, and others. **Preferred Alternative 4** takes efforts to reduce the magnitude of incidentally caught gag by closing all shallow water groupers when the gag quota is met. As some of these grouper species (i.e., scamp, red grouper, and others) are taken on trips with gag, it is expected that this action would reduce mortality of incidentally caught gag and benefit other shallow water grouper species. As described previously, shallow water grouper species are vulnerable to overfishing because they are protogynous, many are long-lived, some form spawning aggregations.

Tables 4-25 and 4-26 provide estimates of dead discards that could occur after a quota was met if only a quota was put into place. If the seasonal closure for gag is not extended and one assumes there would be no reduction in effort after a quota is met and fishermen cannot avoid gag, then the magnitude of dead discards would be approximately 14,000 lbs gutted weight, which would be subtracted from the quota. However, it is likely that there will be some decrease in effort and that fishermen will be able to fish differently of for other species in areas where gag do not occur. The SSC and Council approved the methodology for PQBM analyses at their December 2007 meeting. However, they recommended the Snapper Grouper Advisory Panel (AP) review the methodology to provide an estimate of the number of trips that might not be taken to target snapper grouper species during a closure for vermilion snapper or gag and provide an estimate of the ability of fishermen to avoid vermilion snapper or gag by modifying fishing techniques. The Council and the Council's AP recommended that estimates for PQBM assume that fishing trips, which previously caught gag, would be reduced by 20% after a quota is met and fishermen can avoid 20% of the gag by using different techniques. If the commercial seasonal closure for gag were extended from January through April, the magnitude of discards to be subtracted from the quota would be approximately 1,000 lbs gutted weight if fishing trips that previously caught gag are reduced by 20% after a quota is met and fishermen can avoid 20% of the gag by using different techniques. PQBM is estimated at 831 pounds gutted weight in Table 4-26 but was rounded to the nearest 1,000 pounds. The methodology for determining PQBM is described in **Appendix C**. Effectiveness of the seasonal closure is considered separately and addressed under **Preferred Alternative 2**.

The impacts of **Preferred Alternative 4** on protected resources are uncertain, but may benefit protected species. If instituting a commercial quota is effective in reducing effort, the risk of adverse affects to protected species from interactions with fishery is likely to decrease. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

<u>Alternative 5. Divide the directed commercial quota into two regions</u>
Alternative 5 would allocate 63.3% of the commercial quota identified in **Preferred Alternative 2** to North and South Carolina, and 36.7% to Georgia and Florida based on the 1999-2005 commercial landings by State (Table 4-27). The biological effects of **Alternative 5** would be similar to **Preferred Alternative 4**. After the commercial quota was met in a particular region, all purchase and sale would be prohibited in that region and harvest and/or possession would be limited to the bag limit in the region. However, there is a chance that harvest could continue in a particular region and gag would be landed in the region where harvest is still allowed. This could result in some localized depletion but would not be expected to negatively affect the population.

The rationale for having regional quotas is that fishermen off Florida could have an advantage and catch part of the quota early in the year when bad weather would prevent fishermen from catching gag off North Carolina and South Carolina. However, the Council felt regional quotas were not needed with a January-April seasonal closure since by May the weather would allow fishing in all regions. The Council examined monthly gag landings and found the percentage of annual gag landings among states was similar after the proposed January-April spawning season closure would take place.

The impacts of **Alternative 5** on protected resources are uncertain. If fishermen continue to fish after the quota has been met, or if effort simply shifts from a closed region to an open region, then the alternative is unlikely to reduce the risk of adverse affects to protected species from interactions with the fishery. However, if regional quotas are effective in limiting the fishing effort after the quota is met, then the risk of interactions between protected resources and the fishery will likely be reduced for the closed region. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

Table 4-25. Incidental catch of gag assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods if there is no seasonal closure.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	34,798	27,838	16,703	6,681	20,456	16,365	9,819	3,928	15,244	12,195	7,317	2,927	11,733	9,386	5,632	2,253
Dead Discards	13,919	11,135	6,681	2,672	8,182	6,546	3,928	1,571	6,098	4,878	2,927	1,171	4,693	3,755	2,253	901

Table 4-26. Incidental catch of gag assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods. Includes effect of expanding seasonal closure to January through April.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	4,816	3,853	2,312	925	2,597	2,078	1,247	499	2,640	2,112	1,267	507	1,510	1,208	725	290
Dead Discards	1,927	1,541	925	370	1,039	831	499	199	1,056	845	507	203	604	483	290	116

Table 4-27. Regional quotas by region for three allocation alternatives.

Year	**Annual**	**Preferred Allocation Alternative 2. 51%C/49%R**			**Allocation Alternative 3. 66%C/34%R**			**Allocation Alternative 4. 61%C/39%R**		
		Commercial	**FL-GA**	**SC-NC**	**Commercial**	**FL-GA**	**SC-NC**	**Commercial**	**FL-GA**	**SC-NC**
	Catch Limit	**Quota**	**36.70%**	**63.30%**	**Quota**	**36.70%**	**63.30%**	**Quota**	**36.70%**	**63.30%**
		(gutted weight)	(gutted weight)	(gutted weight)	(gutted weight)	(gutted weight)	(gutted weight)	(gutted weight)	(gutted weight)	(gutted weight)
2009	694,000	353,940	129,896	224,044	458,040	168,101	289,939	423,340	155,366	267,974
Current Seasonal Closure										
PQBM		7,000	2569	4431	1,000	367	633	1,000	367	633
Directed Quota		346,940	127,327	219,613	457,040	167,734	289,306	422,340	154,999	267,341
Jan-Apr Seasonal Closure										
PQBM		1,000	367	633	0	0	0	0	0	0
Directed Quota		352,940	129,529	223,411	458,040	168,101	289,939	423,340	155,366	267,974

Alternative 6. South of the Miami-Dade/Monroe County line, no fishing for and/or possession of the following species would be allowed during June 1-December 31: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. No fishing for and/or possession of gag would be allowed year-round south of the Miami-Dade/Monroe County line. Fishing for black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney would be allowed January 1 – May 31 for the Southern region. Note: This alternative would apply to both the recreational and commercial fisheries.

The Snapper Grouper AP asked the Council to consider something similar to **Alternative 6** because gag is a minor species in Monroe County, Florida relative to other shallow water grouper species (i.e., black grouper and red grouper). Fishermen indicated they would be willing to forego any gag landings in Monroe County as long as they could fish for other shallow water grouper species during January 1 through May 31.

Commercial landings

Analysis of ALS commercial data for 2003 through 2007 indicates gag made up 1.2% of the landings of shallow water grouper species for the Atlantic side of Monroe County, Florida (Table 4-28). Monroe County shallow water grouper landings are dominated by black grouper and red grouper (Table 4-29). Closure of gag for the whole year and other shallow water groupers during June through December would decrease harvest of all shallow water groupers by 46.8% in Monroe County, Florida. Some fishing mortality for shallow water grouper species would still be expected when fishermen target co-occurring species; however, since all shallow water grouper species would be closed during June through December, bycatch would be reduced.

Table 4-28. Commercial landings (lbs gutted weight) of gag and other shallow water grouper species from the Atlantic portion of Monroe County, Florida.

Year	Gag Jan-Dec	Other SWG Jan-Dec	Other SWG June-Dec
2003	1,248	220,471	103,397
2004	5,035	369,342	174,783
2005	3,745	312,564	121,958
2006	1,001	112,282	63,795
2007	2,181	110,867	56,869
Average	2,642	225,105	104,160

Table 4-29. Average commercial landings (lbs gutted weight) of shallow water grouper species from the Atlantic portion of Monroe County, Florida during 2003-2007.

Species	Monroe
Black grouper	121,088
Red Grouper	96,628
Scamp	5,588
Gag	2,642
Red Hind	1,571
Yellowfin Grouper	155
Graysby	55
Rock hind	15
Yellowmouth Grouper	5

Because commercial landings of gag are low in Monroe County, a complete closure of the species would only reduce harvest by 0.5% when compared to the magnitude of gag landed in the all of the South Atlantic (Table 4-30). Relative to the whole South Atlantic, a June through December closure for other shallow water grouper species in Monroe County, Florida would represent a 12.6% reduction in harvest of shallow water grouper species in the South Atlantic (Table 4-30).

Table 4-30. Commercial landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including the Atlantic portion of Monroe County, Florida during 2003-2007.

Year	Gag	Other SWG
2003	547,509	801,298
2004	544,288	848,071
2005	563,620	766,067
2006	517,929	747,797
2007	604,212	964,981
Average	555,512	825,643

Headboat Landings

Headboat landings of gag during 2003 through 2007 were generally very small in Monroe County with the exception of 2004 and 2005, averaging 20,587 lbs gutted weight; landings of other shallow water grouper species were also low and averaged 41,276 lbs gutted weight (Table 4-31). Headboats appear better able to target gag as their gag landings exceed black grouper whereas the reverse is true in the commercial and MRFSS sectors. Red grouper, gag, and black grouper are the most abundant shallow water grouper species taken by headboat fishermen in Monroe County, Florida (Table 4-32). Closure of gag for the whole year and other shallow water groupers during June through December would decrease harvest of shallow water groupers by 72.4% for the headboat fishery in Monroe County; however, some bycatch mortality of gag and other grouper species would be expected due to incidental catch when targeting. Since all shallow water grouper species would be closed during June through December, bycatch would likely be reduced.

Table 4-31. Headboat landings (lbs gutted weight) of gag and other shallow water grouper species from the Atlantic portion of Monroe County, Florida during 2003-2007.

Year	Gag Jan-Dec	Other SWG Jan-Dec	Other SWG June-Dec
2003	3,536	20,312	12,853
2004	42,248	66,787	42,711
2005	25,834	62,202	34,936
2006	6,165	30,579	20,187
2007	9,452	26,502	14,814
Average	17,447	41,276	25,100

Table 4-32. Average headboat landings (lbs gutted weight) of shallow water grouper species from Monroe County, Florida during 2003-2007.

Species	Total lbs ww	Average lbs gw
Red Grouper	138,278	27,656
Gag	102,937	20,587
Black grouper	70,256	14,051
Rock Hind	13,993	2,799
Scamp	11,223	2,245
Graysby	4,063	813
Yellowmouth Grouper	2,016	403
Yellowfin Grouper	2,010	402
Red Hind	1,328	266
Coney	362	72

Headboat landings of gag throughout the South Atlantic average 59,023 lbs gutted weight during 2003-2007 (Table 4-33). A complete closure of the gag taken by headboats in Monroe County would reduce harvest of gag by 29.5% when compared to gag landed in the all of the South Atlantic. Relative to the whole South Atlantic, a June through December closure for other shallow water grouper species in Monroe County, Florida would represent an 18.6% reduction in harvest of shallow water grouper species in the South Atlantic (Table 4-33).

Table 4-33. Headboat landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including Monroe County, Florida.

Year	Gag	Other SWG
2003	27,536	87,860
2004	82,474	162,478
2005	71,737	148,722
2006	46,537	108,863
2007	66,830	165,213
Average	59,023	134,627

MRFSS

MRFSS landings (A+B1) of gag in number of fish retained in Monroe County during 2003 through 2007 averaged 1,875 fish, whereas, landings of other shallow water grouper species averaged 24,350 fish (Table 4-34). Closure of gag for the whole year and other shallow water groupers during June through December would decrease harvest of shallow water grouper by 66.9% for the private and charter fishery in Monroe County; however, some bycatch mortality of gag and other grouper species would be expected due to incidental catch when targeting. Since all shallow water grouper species would be closed during June through December, bycatch would likely be reduced. Black grouper and red grouper were the most commonly caught shallow water grouper species during 2003-2007 (Table 4-35).

Table 4-34. MRFSS landings (number A+B1) of gag and other shallow water grouper species from Monroe County, Florida.

Year	Gag Jan-Dec	Other SWG Jan-Dec	Other SWG June-Dec
2003	3,143	41,914	27,725
2004	2,065	27,731	13,573
2005	328	11,988	10,684
2006	1,880	24,202	20,401
2007	1,960	15,916	5,977
Average	1,875	24,350	15,672

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

Table 4-35. Percentage of shallow water grouper species taken by fishermen (MRFSS) in Monroe County, Florida during 2003-2007. Based on number of fish inspected rather than expanded values.

Species	Percent
Black grouper	49.9%
Red grouper	37.8%
Gag	6.5%
Rock hind	2.6%
Scamp	1.3%
Yellowfin grouper	0.8%
Red hind	0.7%
Yellowmouth grouper	0.2%
Coney	0.1%
Graysby	0.1%

MRFSS landings of gag throughout the South Atlantic averaged 41,695 individuals (A+B1) during 2003-2007 (Table 4-36). A complete closure of the gag taken by recreational anglers (excluding headboats) in Monroe County would reduce harvest of gag by 4.5% when compared to gag landed in the all of the South Atlantic. Relative to the whole South Atlantic, a June through December closure for other shallow water grouper species in Monroe County, Florida would represent a 21.1% reduction in harvest of shallow water grouper species in the South Atlantic (Table 4-36).

Table 4-36. MRFSS landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including Monroe County, Florida.

Year	Gag	Other SWG
2003	42,117	43,411
2004	44,412	61,188
2005	38,157	65,027
2006	36,975	82,685
2007	46,816	119,536
Average	41,695	74,369

For the whole recreational sector (MRFSS and headboat combined), a closure of the fishery for gag in Monroe County would reduce harvest by 7 percent (Table 4-37).

Table 4-37. Landings (lbs gutted weight) of gag in South Atlantic versus Monroe County, Florida. Monroe County numbers converted to lbs using relationship of numbers to pounds for South Atlantic gag.

	South Atlantic	Monroe	percent
HB	59,023	17,447	29.6%
MRFSS	494,525	21,281	4.3%
Total	553,548	38,728	7.0%

While the proposed management measures would represent a substantial reduction in harvest of shallow water grouper species from Monroe County, fishermen could still target shallow water grouper species during January through June when some of the species would be in spawning condition. Black grouper and red grouper dominate commercial and MRFSS catches in Monroe County (Tables 4-29 and 4-35). Species most commonly caught in Monroe County in the headboat fishery are red grouper, gag, and black grouper (Table 4-32). Black grouper, gag, and scamp form spawning aggregations with peak spawning of females occurring from January to March for black grouper and gag (Crabtree and Bullock 1998; McGovern *et al.* 1998). Red grouper do not appear to form spawning aggregations but spawning in the South Atlantic occurs during February-June, with a peak in April (Burgos 2001). Therefore, **Alternative 6** could allow fishermen to harvest black grouper from spawning aggregations making them vulnerable to capture. Further, this alternative would allow capture of red grouper in spawning condition.

Preferred Alternative 2 and Alternative 3 would specify different seasonal closures for gag and other shallow water groupers for areas north of Monroe County than those proposed for Monroe County in **Alternative 6**. As a result, there is a chance when shallow water grouper are closed in Monroe County during June through December, fishermen might move north to target grouper species. Similarly, fishermen from areas north might move into Monroe County during January through April when harvest of shallow water grouper species excluding gag, would be allowed in Monroe County but not the rest of the South Atlantic. The degree to which effort could shift is unknown but it could result in some localized depletion.

Alternative 7. Recreational Measures

Preferred Alternative 7a and **Alternative 7b** include management measures that would reduce bag limits, exclude captain and crew from retaining a bag limit; and impose a shallow water grouper seasonal closure for the recreational sector (Tables 4-38 and 4-39). **Preferred Alternative 7a** and **Alternative 7b** differ in that **Alternative 7b** would add December to the January through April seasonal closure. The Snapper Grouper AP recommended reducing the gag bag limit from 2 to a maximum of 1 within the 5-grouper aggregate bag limit; they also recommended reducing the 5-grouper aggregate bag limit to 3 with a maximum of 1 being gag or black grouper and excluding the captain and crew on for-hire vessels.

Bag limits have some desirable characteristics as management tools. They are commonly used management measures and are readily understood by fishermen. Violations of bag limits are readily apparent by simply counting the number of fish that are retained, which aids in enforcement of fishery regulations. The rationale for bag limits is that they reduce the amount of harvest and are often used in conjunction with size limits to achieve a desired reduction.

There are a number of shortcomings with bag limits. Once bag limits are reached, some fishermen may continue to fish, keeping larger fish and throwing smaller, dead fish back. The snapper grouper fishery represents many species occupying the same location at the same time. Fishermen could continue to target other co-occurring species and throw back fish that have bag limits, many of which will die. It would be expected fishermen would continue to target the largest, most desirable species. Therefore, there still could be a problem with removing the larger, faster growing fish, reducing genetic variability, and reducing the variability in the age structure of the population that ensures against recruitment failure.

Preferred Alternative 7a would also exclude the captain and crew on for-hire vessels from possessing a bag limit for groupers. The Advisory Panel supports this action. While this action would not prevent captain and crew from fishing for snapper grouper species including grouper species, excluding the captain and crew from possessing the bag limit would provide a slight reduction in harvest. The combined effect of reducing the gag and black grouper bag limit to 1 fish, reducing the grouper aggregate bag limit to 3 fish, excluding captain and crew on for-hire vessels from possessing groupers, and a January through April spawning closure would provide a reduction in recreational harvest of 36%. These reductions take into consideration a 25% release mortality rate and continued non-compliance with the bag limit.

Alternative 7b would add the month of December to the recreational spawning seasonal closure. Recreational harvest and/or possession of gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney would be prohibited. This alternative would retain the existing 5-grouper aggregate bag limit and 2 gag or black grouper bag limit but would not exclude captain and crew from possessing groupers. The December through April closure, combined with reducing the bag limits, would result in a 42% reduction in recreational harvest. These reductions take into consideration a 25% release mortality rate and continued non-compliance with the bag limit.

Table 4-38. Estimate of harvest reduction associated with reducing the aggregate bag limit from 5 to 3, gag and black grouper from 2 to 1, and gag from 2 to 1.

	Estimated Harvest Reductions				
Species	Headboat	Private	Charter	MRFSS	Combined
Aggregate	0.7	1.3	2.5	1.6	1.4
Gag and Black	2.1	3.1	6.6	4.0	3.8
Gag	2.3	5.4	6.1	5.6	5.3
Gag w/ aggregate*	3.3	5.4	8.4	6.1	5.9
Gag w/ agg & black*	3.8	5.4	10.7	6.7	6.4

SOURCE: Data from 1999-2005 for (1) headboat, (2) private MRFSS, (3) charter MRFSS, (4) private/charter MRFSS combined, and (5) all recreational sectors combined. Notes: Assumes a release mortality of 25% for gag, black grouper, red grouper, scamp, tiger grouper, yellowfin grouper, coney, sand tilefish, graysby, rock hind, red hind, and yellowmouth grouper. Assumes 100% release mortality for snowy grouper golden tilefish, blueline tilefish, yellowedge grouper, and misty grouper. **Assumes non-compliance with bag limit.**
*Includes effect on gag of reducing aggregate bag limit to 3 fish and black grouper to 1 fish.

Table 4-39. Same as Table 4-38, except analyses **exclude captain and crew** from retaining any grouper species **with bag limit.** Release mortality rate = 25%.

	Estimated Harvest Reductions				
Species	Headboat	Private	Charter	MRFSS	Combined
Aggregate	0.7	1.3	3.3	1.8	1.6
Gag and Black	2.4	3.1	9.2	4.6	4.4
Gag	2.6	5.4	6.5	5.7	5.4
Gag w/ aggregate*	3.6	5.4	8.7	6.2	5.9
Gag w/ agg & black*	4.1	5.4	11.1	6.8	6.5

Notes: Adjustments not made to private sector of MRFSS. **Assumes non-compliance**.
*Includes effect on gag of reducing aggregate bag limit to 3 fish and black grouper to 1 fish.

Alternatives 3-7 ultimately seek to alter fishing effort. Therefore, the impacts of these alternatives on protected species will depend on the extent to which these measures reduce fishing effort. If these measures do reduce fishing effort, the likelihood of adverse impacts from the fishery occurring to protected species may be reduced, and these alternatives may be beneficial to protected species. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be reinitiated to address any increased levels of risk to ESA-listed species.

4.1.5.2 Economic Effects of Management Alternatives

4.1.5.2.1 *General Discussion*

The alternatives in this section have varying applicability by sector. **Alternatives 1, 2, and 6** would apply to both the commercial and recreational sectors; **Alternatives 3, 4, and 5** would apply to the commercial sector only; and **Alternative 7** would apply to the recreational sector only.

Management alternatives for gag are generally designed to keep the commercial and recreational sectors within their respective allocation of total allowable catch levels. If successful, they are expected to generate benefits in the future that would outweigh their short-run costs. The following discussions deal only with the economic costs of management measures in the short-run. No attempt is made to compare them with the expected future benefits.

Preferred Alternative 2 provides for a spawning closure that would add two more months to the current two-month closure for the commercial fishery and would establish a four month closure for the recreational fishery. If effectively enforced, a fishery closure would protect spawning gag and reduce the expected harvest in both the commercial and recreational sectors. As discussed, however, in the biological effects above, some level of bycatch mortality would still occur even with 100% effective enforcement. Part of the bycatch problem is the level of compliance fishermen may undertake. Compliance is here taken to mean not only with respect to harvest limitation but also with respect to bycatch minimization. The latter involves costs that fishermen would have to include in their decision when altering their fishing behavior to address the bycatch issue. This cost item cannot be determined. Apart from the bycatch issue, a closure affects the commercial and recreational sectors in different ways although both sectors are banned from harvesting gag. Without harvest, the commercial sector is essentially shut out of the fishery, although some vessels could still make the trips if revenues from other species are still sufficient to cover costs. On the other hand, recreational trips, with the possible exception of for-hire trips solely targeting gag, can still occur albeit with reduced quality of fishing experience from non-possession of caught gag.

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the January through April spawning closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

Alternative 3a would establish a 1,000-pound commercial trip limit, a fishing year start date of May 1, and spawning closure for gag and other grouper species during March and April. **Alternative 3b** would establish a 1,000-pound commercial trip limit, a fishing year start date of January 1, and spawning closure for gag and other grouper species during February, March, and April. The closure component of these two alternatives would have similar general effects as **Alternative 2**. The 1,000-pound trip limit would tend to slow down but not totally eliminate the derby nature that would potentially characterize fishery from a lower TAC/quota relative to historical commercial landings. The change in fishing year would generally have distributional effects, with areas historically catching larger amounts of gag during the new opening month being provided with greater opportunity to maintain their harvest levels before the entire quota is reached. Because this alternative was added at the June 2008 Council meeting after development of the DEIS, the analysis and discussion of the expected effects of **Alternatives 3a and 3b** are provided in Section 4.1.5.2.3.

Preferred Alternative 4 would impose a single overall quota on the commercial sector. Even under the current controlled access management system of the fishery, a derby can still occur especially with low and strictly binding quota levels such as the ones contemplated in this amendment. One major consequence of a derby condition is the increase in cost and possible reduction in ex-vessel price when gag are landed within a short period. There are some short-term measures, such as trip limits, that can partially mitigate the economic consequences of a derby fishery.

Alternative 5 would divide the commercial quota into two sub-quotas: North/South Carolina sub-quota and Georgia/Florida sub-quota. This subdivision of the commercial quota would not solve the potential derby problem that might occur in the fishery, although it probably would alleviate certain disparities among vessels located in one or the other region in harvesting gag. Since the quota is monitored based on area of landing, there is the possibility for some vessels traditionally landing in the region subject to quota closure to land their fish in the open region. This naturally would involve additional cost in addition to the possibility these vessels may not secure the necessary state permit to land their catch in that area. This potential cost/permit issue could help achieve the intent of this alternative to prevent a major geographical redistribution of catch under a derby fishery. Additional analysis of the expected effects of this alternative in conjunction with alternative spawning closures is provided in Section 4.1.5.2.3.

Alternative 6, which is applicable to both the recreational and commercial sectors, would prohibit fishing/possession of gag south of the Miami-Dade/Monroe County line but would allow fishing/possession of other grouper species from January 1 through May 31 in that area. For gag, this alternative may appear more restrictive than the others, but its potential adverse impacts would be low considering the generally low harvest of gag in the subject area. At the same time, it would allow vessels to catch/land other grouper species caught in the area from January 1 through May 31. Because this alternative was added at the June 2008 Council meeting after development of the DEIS, the analysis and discussion of the expected effects of Alternative 6 is provided in Section 4.1.5.2.3.

Preferred Alternative 7a would reduce the recreational aggregate bag limit for grouper and the individual species bag limit within the aggregate bag limit. In addition, it would ban the for-hire captain and crew from possessing a grouper bag limit. **Alternative 7b** would add a December recreational harvest closure to the spawning closure under **Alternative 2** and not change the bag limits. The bag limit reduction would not necessarily result in trip cancellation but it would reduce the quality of fishing experience. Thus, it would likely reduce consumer surplus more than producer surplus. The prohibition on the captain and crew from possessing a bag limit would impinge on producer surplus.

4.1.5.2.2 *Commercial Sector*

Simulation runs for the various alternatives affecting the commercial sector are presented in Table 4-40 by gear type and Table 4-41 by area. The model run for **Preferred Alternative 2** was conducted assuming a 51% allocation to the commercial sector. Six model runs were performed for **Preferred Alternative 4**. The first 3 runs were done using the three allocation alternatives. The second 3 runs were done for each of the three allocation alternatives in conjunction with the spawning closure. Similarly, six runs were performed for **Alternative 5**, with the first 3 assuming the various allocation alternatives and regional sub-quotas, and the second 3 assuming the various allocation alternatives with regional sub-quotas in conjunction with the spawning closure. Alternatives with letter suffix a, b, and c corresponds to 51%, 66%, and 61% commercial allocations. Alternatives with a letter suffix S include the spawning closure measure. Each table provides lots of information, so only the major features are highlighted here.

There are several issues worth noting with respect to the information provided in Table 4-40. First, the economic effects of **Alternatives 4a-4c** were reported in Table 4-13 during the discussion about allocation. The one thing worth recalling from earlier discussions, which holds true in the present case, is that the effects on trips landing at least one pound of gag would be larger than those on trips landing at least one pound of any snapper grouper species.

Second, the ranking of the various alternatives in terms of economic impacts would largely be conditioned by the allocation alternatives. Under any set of alternatives, the allocation most favorable to the commercial sector (66%) would provide the least amount of reductions in net operating revenues and the lowest allocation (51%) would yield the largest reductions.

Third, the quota alternatives, regardless of whether they are single or regional quotas, would bring about the sharp contrast in economic effects conditioned by the allocation alternatives. For example, a 51% commercial allocation would result in net operating revenue reductions of $870 thousand (21%) under a single quota (**Alternative 4a**) or $991 thousand (23.9%) under a regional quota (**Alternative 5a**). A 66% allocation would reduce net operating revenues by $51 thousand (1.2%)under a single quota (**Alternative 4b**) or $218 thousand (5.3%) under a regional quota (**Alternative 5b**).

Fourth, a spawning closure, whether combined with a single quota or regional quota, would tend to neutralize the differential effects of the various allocation alternatives. For example, under a single quota with spawning closure (signified as **S** after alternative), the resulting net operating revenue reductions corresponding to commercial allocations of 51%, 66%, and 61% would respectively be $834 thousand or 20.1% (**Alternative 4aS**),

$723 thousand or 17.4% (**Alternative 4bS**), and $723 thousand or 17.4% (**Alternative 4cS**). The differences in percentage reductions from the various allocation alternatives would not be as wide with spawning closure as with quota only alternatives. In fact, a 61% and 66% allocation would produce the same net operating revenue reductions under a spawning closure.

Fifth, and based on the fourth issue just discussed, it would appear that the spawning closure alternative would exercise stronger effects than quotas. On a conceptual basis, arguments can be presented that a quota closure may be more limiting than a seasonal closure as well as arguments pointing the other way. It may be argued, for example, that fishermen would have more flexibility in planning their fishing operations under a spawning or seasonal closure than under a quota closure. A spawning/seasonal closure is generally known well ahead of the actual closure whereas an imminent quota closure is known only within a short period before the actual closure. On the other hand, a spawning/seasonal closure, by prohibiting fishing during a fixed period of time, may be more limiting than a variable quota closure where the quota is met later, the season may be extended beyond the fixed spawning/seasonal closed season. Other than additional regulations such as trip limits or potentially a higher quota, a quota closure may or may not happen depending on the variations and volatilities of fish abundance and market/economic conditions. If fish abundance is low, a quota closure may not occur; if abundance is high, a quota closure may occur. In addition, under dire economic conditions such as recessions or high fuel prices, fishing activities may be low so as not to trigger a quota closure. The major advantage of a spawning/seasonal closure critically hinges on the flexibility it affords the fishing public in terms, for example, of shifting effort from the closed to the open season. The current model cannot capture this effort response, and this may partly explain the current model's results. However, more importantly, an examination of historical fishing effort and harvests showed that the chosen fixed spawning/seasonal closure would be more limiting than a quota closure. Thus, model results presented in Table 4-40 reflect the more limiting effects of a spawning closure particularly when the quota is relatively higher as in the case of a 66% versus a 61% allocation.

Sixth, the distributive effects of the spawning closure alternative would be markedly different from those of the quota alternatives. In **Alternative 4a** (quota only), for example, the largest percentage reduction would fall on trolling vessel trips but in **Alternative 2** (spawning closure only) longline vessel trips would take that place. Longline vessel trips, in fact, would remain virtually unaffected under a single overall quota (**Alternative 4a**). Despite this wide disparity in the distribution of percentage reductions between the spawning closure and single quota alternatives, vertical line and diving vessel trips would suffer the largest losses in absolute magnitudes primarily because these vessel trips registered the largest harvests of gag among vessel trips using different gear types.

Lastly, conditional on the allocation chosen, some ranking of the various alternatives may be made. At a commercial allocation of 51%, the alternatives may be ranked in descending order as follows: **Alternative 4aS** (or **Alternative 2**), **Alternative 4a**,

Alternative 5aS, and **Alternative 5a**. At a 66% allocation, the ranking in descending order would be **Alternative 4b**, **Alternative 5b**, and **Alternatives 4bS and 5bS**. At a 61% allocation, the ranking in descending order would be **Alternative 4c**, **Alternative 5c**, **Alternative 4cS,** and **Alternative 5cS**.

As can be gleaned from Table 4-41, there are marked differences in the area distribution of economic impacts from various management alternatives. There are two general issues worth noting regarding the area distribution of economic impacts. First, a single quota would tend to effect distinctly clear differences in the area distribution of economic impacts whereas a regional quota would tend to equalize the economic impacts among the various areas. This statement is premised on comparing alternatives with identical commercial allocation. Take the case of **Alternative 4a**, which provides for a single quota with 51% commercial allocation, and **Alternative 5a**, which provides for a regional quota with 51% commercial allocation.

Under **Alternative 4a** and reading the table from left to right, the reductions in net operating revenues would be $272 thousand (23.3%) for North Carolina, $342 thousand (22%) for South Carolina, $184 thousand (19.5%) for Georgia/Northeast Florida, $70 thousand (15.4%) for Central/South Florida, and $2 thousand (10.5%) for the Florida Keys. In contrast, **Alternative 5a** would result in the following distribution of economic impacts: $278 thousand (23.8%) for North Carolina, $346 thousand (22.3%) for South Carolina, $258 thousand (27.3%) for Georgia/Northeast Florida, $105 thousand (23%) for Central/South Florida, and $5 thousand (26.3%) for the Florida Keys. Although one can still observe differential economic impacts in moving from **Alternative 4a** to **Alternative 5a**, these impacts would be more evenly distributed among the various areas under a regional quota (**Alternative 5a**) than under a single quota (**Alternative 4a**). A similar conclusion could be inferred if comparisons were instead made between **Alternative 4b** and **Alternative 5b** or between **Alternative 4c** and **Alternative 5c**.

Second and as already noted previously, a spawning closure would tend to neutralize the economic effects of various allocation alternatives. Hence, if a spawning closure were combined with a regional quota, the resulting economic impacts would be neutralized across areas and allocations. Since the contrast between a single quota and regional quota has already been discussed, it is instructive to proceed to contrasting the economic effects of a regional quota without spawning closure with those of a regional quota with spawning closure.

Table 4-40. Reductions in commercial vessels' net operating revenues from various alternatives on gag spawning closure, overall quotas, and regional quotas, in thousand 2005 dollars, by gear type.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
Vessel Trips Landing At Least One Pound Of Gag								
Baseline	486	3,553	35	12	14	43	0	4,143
Spawning closure								
Alt. 2 (Pref)	**-123**	**-671**	**-18**	**-4**	**-4**	**-14**	**0**	**-834**
	Single quota							
Alt. 4a	-85	-764	0	-1	-4	-17	0	-870
Alt. 4b	-9	-41	0	0	0	-1	0	-51
Alt. 4c	-27	-173	0	0	-2	-4	0	-206
Single quota with spawning closure								
Alt. 4aS (Pref)	**-123**	**-671**	**-18**	**-4**	**-4**	**-14**	**0**	**-834**
Alt. 4bS	-110	-575	-18	-4	-3	-12	0	-723
Alt. 4cS	-110	-575	-18	-4	-3	-12	0	-723
Regional quota								
Alt. 5a	-132	-829	-9	-2	-4	-16	0	-991
Alt. 5b	-43	-171	0	0	-1	-3	0	-218
Alt. 5c	-72	-346	0	0	-2	-8	0	-429
Regional quota with spawning closure								
Alt. 5aS	-116	-819	-18	-4	-5	-16	0	-978
Alt. 5bS	-110	-575	-18	-4	-3	-12	0	-723
Alt. 5cS	-110	-600	-18	-4	-4	-13	0	-749
Vessel Trips Landing At Least One Pound Of Any snapper grouper Species								
Baseline	634	8,131	544	388	305	347	3	10,351
Spawning closure								
Alt. 2 (Pref)	**-103**	**-717**	**-11**	**-4**	**0**	**-13**	**0**	**-848**
Single quota								
Alt. 4a	-51	-579	0	-1	2	-6	0	-634
Alt. 4b	-6	-33	0	0	0	-1	0	-39
Alt. 4c	-17	-133	0	0	1	-2	0	-152
Single quota with spawning closure								
Alt. 4aS (Pref)	**-103**	**-717**	**-11**	**-4**	**0**	**-13**	**0**	**-848**
Alt. 4bS	-94	-651	-11	-4	0	-12	0	-770
Alt. 4cS	-94	-651	-11	-4	0	-12	0	-770
Regional quota								
Alt. 5a	-45	-408	-2	-1	0	-6	0	-462
Alt. 5b	-13	-85	0	0	0	-1	0	-100
Alt. 5c	-25	-159	0	0	0	-3	0	-186
Regional quota with spawning closure								
Alt. 5aS	-98	-751	-11	-4	0	-13	0	-877
Alt. 5bS	-94	-651	-11	-4	0	-12	0	-770
Alt. 5cS	-94	-661	-11	-4	0	-12	0	-781

Consider **Alternatives 5a and 5b** and contrast them with **Alternatives 5aS and 5bS**. In order to avoid clutter, the following discussions use percentages without dollar levels, and these percentages can be readily calculated from the table. Under **Alternative 5a**, the percent reductions in net operating revenues for North and South Carolina would, respectively, be 23.7% and 22.3%under a 51% commercial allocation; the reductions would fall down to 5% and 4.5%, respectively, for North and South Carolina under a 66% allocation (**Alternative 5b**). Under **Alternative 5aS**, the respective percent reductions for North and South Carolina would be 18.9% and 24.5% under a 51% commercial allocation. These percentage reductions would respectively drop down to 10% and 15.1% under a 66%allocation (**Alternative 5bs**). Although there are still large differences due to the different allocation ratios under a quota with spawning closure (**Alternatives 5aS and 5bS**), the change in percent reductions would not be as dramatic as with the alternatives without spawning closure (**Alternatives 5a and 5b**). What is even more interesting in comparing the two sets of alternatives is the resulting effects on the other areas. Under **Alternative 5a**, the respective percent reductions for Georgia/Northeast Florida, Central/South Florida, and the Florida Keys would be 27.3%, 23%, and 26.3% with a 51% commercial allocation. Under **Alternative 5b**, these percent reductions would respectively decrease to 6.6%, 6.1%, and 0% with a 66% allocation. In contrast, a regional quota with spawning closure would virtually neutralize the differential effects of the allocation alternatives. Under **Alternative 5aS**, the respective percent reductions for Georgia/Northeast Florida, Central/South Florida, and the Florida Keys would be 23.3%, 32.9%, and 36.8%with a 51%allocation. On the other hand, the respective percent reductions under **Alternative 5bS** would be 22.7%, 32.7%, and 36.8% with a 66% allocation. These percentage reductions are only marginally different from those under a different allocation ratio.

Table 4-41. Reductions in commercial vessels' net operating revenues from various alternatives on gag spawning closure, overall quotas, and regional quotas, in thousand 2005 dollars, by area.

	North Carolina	**South Carolina**	**Georgia and northeast FL**	**Central and south FL**	**Florida Keys**	**Other**	**Total**
Vessel trips landing at least one pound of gag							
Baseline	1,169	1,553	946	456	19	0	4,143
	Spawning closure						
Alt. 2 (Pref)	**-149**	**-284**	**-237**	**-157**	**-7**	**0**	**-834**
	Single quota						
Alt. 4a	-272	-342	-184	-70	-2	0	-870
Alt. 4b	-12	-19	-15	-4	0	0	-51
Alt. 4c	-62	-81	-43	-20	0	0	-206
	Single quota with spawning closure						
Alt. 4aS (Pref)	**-149**	**-284**	**-237**	**-157**	**-7**	**0**	**-834**
Alt. 4bS	-117	-235	-214	-149	-7	0	-723
Alt. 4cS	-117	-235	-214	-149	-7	0	-723
	Regional quota						
Alt. 5a	-278	-346	-258	-105	-5	0	-991
Alt. 5b	-59	-70	-62	-28	0	0	-218
Alt. 5c	-117	-146	-120	-44	-2	0	-429
	Regional quota with spawning closure						
Alt. 5aS	-221	-380	-220	-150	-7	0	-978
Alt. 5bS	-117	-235	-214	-149	-7	0	-723
Alt. 5cS	-128	-250	-214	-149	-7	0	-749
Vessel trips landing at least one pound of any snapper grouper species							
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
	Spawning closure						
Alt. 2 (Pref)	**-185**	**-298**	**-156**	**-109**	**-100**	**0**	**-848**
	Single quota						
Alt. 4a	-205	-263	-89	-39	-38	0	-634
Alt. 4b	-10	-15	-8	-3	-3	0	-39
Alt. 4c	-45	-62	-22	-11	-12	0	-152
	Single quota with spawning closure						
Alt. 4aS (Pref)	**-185**	**-298**	**-156**	**-109**	**-100**	**0**	**-848**
Alt. 4bS	-166	-262	-145	-104	-94	0	-770
Alt. 4cS	-166	-262	-145	-104	-94	0	-770
	Regional quota						
Alt. 5a	-143	-189	-72	-40	-18	0	-462
Alt. 5b	-25	-39	-23	-9	-3	0	-100
Alt. 5c	-50	-77	-37	-16	-6	0	-186
	Regional quota with spawning closure						
Alt. 5aS	-203	-324	-149	-104	-96	0	-877
Alt. 5bS	-166	-262	-145	-104	-94	0	-770
Alt. 5cS	-170	-268	-145	-104	-94	0	-781

4.1.5.2.3 *Recreational Sector*

Unlike the commercial sector, the recreational sector would not be subject to quotas and quota closures. In this respect, the management measures consisting of spawning/seasonal closure (**Preferred Alternative 2 and Alternative 7b**) and bag limits with spawning closure (**Preferred Alternative 7a**) are assumed to achieve their expected harvest reductions. With this assumption, the economic impacts of the various alternatives for the recreational sector were estimated without regard to allocation ratios. The spawning season provision that applies to all three alternatives was assumed to apply to gag and other species considered in this amendment. The addition of effects on these other species would result in larger impacts than those under the allocation alternatives that focused solely on the recreational gag fishery.

The overall economic impacts of **Preferred Alternative 7a and Alternative 7b** would not significantly differ from each other, but these impacts would be substantially higher than those for **Preferred Alternative 2**. Total economic impacts would be about $835 thousand for **Preferred Alternative 7a** and $814 thousand for **Alternative 7b** whereas they would about $647 thousand for **Preferred Alternative 2** (Table 4-42). Higher economic impacts for **Preferred Alternative 7a and Alternative 7b** were as expected because they would impose additional measures over the spawning closure of **Preferred Alternative 2**. Hence, the alternatives in terms of overall impacts may be ranked in descending order as follows: **Preferred Alternative 2**, **Alternative 7b**, and **Preferred Alternative 7a**.

In all three alternatives, reductions in consumer surplus would be substantially higher than reductions in producer surplus, mainly because there are three sources of consumer surplus and only two for producer surplus. Losses in producer surplus would be about 78% of those of consumer surplus for all alternatives. Charterboats would incur larger losses than headboats for all three alternatives, with the charterboat losses mostly coming from reductions in producer surplus. These differential losses came out as expected given the estimated higher producer surplus value per trip and historically more target trips for charterboats. Among anglers, those using private boats would lose more than those fishing on for-hire vessels. Given the assumed equality of consumer surplus per fish across all fishing modes, the larger effects on private mode anglers would be mainly driven by the larger number of target trips historically taken by private anglers. The losses to charterboats across the alternatives would follow a pattern similar to that for the overall losses. That is, charterboats would lose least under **Preferred Alternative 2** and highest under **Preferred Alternative 7a**. Similar patterns would hold for headboats and anglers.

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the January through April spawning closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

Table 4-42. Reductions in producer and consumer surplus from various alternatives on gag spawning closure and bag limits, in thousand 2005 dollars, by fishing mode.

	Charterboats		**Headboats**		**Private**	
	Prod. Surp.	Cons. Surp.	Prod. Surp.	Cons. Surp.	Cons. Surp.	**Total Effects**
Baseline	537	286	173	1,526	1,055	3,577
Alt. 2 (Pref)	**226**	**48**	**59**	**149**	**165**	**647**
Alt. 7a (Pref)	**292**	**62**	**76**	**192**	**212**	**835**
Alt. 7b	285	61	74	187	207	814

The distribution of economic impacts presented in Table 4-43 shows that Florida would bear the largest overall reductions in consumer and producer surplus in all alternatives. This would be followed in order by North Carolina, South Carolina, and Georgia. This distribution of economic impacts directly correlates with the various states' baseline producer and consumer surplus. A similar distributional configuration would hold for reductions in producer surplus as well as for reductions in consumer surplus.

Some results are worth noting when reductions are converted to percent changes, which can be calculated from numbers in the table. Relative to total effects (i.e., relative to the rightmost column in the table), the ordering of percent reductions from highest to lowest would still be Florida (59%), North Carolina (25.8%), South Carolina (13%), and Georgia (2.2%). These percent reductions would be the same for all alternatives, since the same proportions were used in all alternatives to allocate total reduction in consumer/producer surplus to the various states. Consider now the distribution of baseline producer and consumer surplus-- 42.7% for Florida, 24% for North Carolina, 23.7% for South Carolina, and 9.6% for Georgia. Although the ordering of percent reductions mimics the ordering of percent distribution in the baseline, the magnitudes depict a different scenario. These magnitudes imply that Florida and North Carolina would bear more than their proportionate share of reductions in producer and consumer surplus whereas South Carolina and Georgia would experience proportionately less reductions. The main reason for these seemingly unexpected results is the inclusion of vermilion snapper producer/consumer surplus in the baseline figures, which would remain unaffected by measures affecting gag and other species. Both Florida and North Carolina have more gag and other species consumer/producer surplus than vermilion snapper producer/consumer surplus whereas the reverse is true for both South Carolina and Georgia.

Since the various alternatives would result in more consumer surplus losses than producer surplus losses as discussed earlier with respect to economic impacts by mode, it is not surprising that each state would lose more consumer surplus than producer surplus. One result that stands out in the table is that Florida would experience consumer surplus losses slightly higher than producer surplus. For other states, the difference in consumer surplus and producer surplus losses would be rather wide.

Table 4-43. Reductions in producer and consumer surplus from various alternatives on gag spawning closure and bag limits, in thousand 2005 dollars, by area.

	Florida		Georgia		South Carolina		North Carolina		Total Effects
	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	
Baseline	564	965	11	331	55	793	81	778	3,577
Alt. 2 (Pref)	**231**	**249**	**4**	**14**	**19**	**87**	**32**	**178**	**814**
Alt. 7a (Pref)	**298**	**321**	**5**	**18**	**25**	**112**	**41**	**230**	**1,050**
Alt. 7b	290	313	5	18	24	109	40	224	1,024

Note: P.Sur = Producer Surplus and C.Sur = Consumer Surplus.

4.1.5.2.4 *New Alternatives*

The Council added these alternatives after the first round of public hearings. The new alternatives were analyzed in the SDEIS and the public commented during a second round of public hearings. Although the consideration of regional quotas is listed as a single alternative, the modeling results are categorized for clarity as **Alternative 5a** (March-April spawning closure) and **Alternative 5b** (February-April spawning closure).

Commercial Sector

The expected economic effects of the new gag management alternatives (**Alternatives 3a, 3b, and 6**) on the commercial sector were analyzed using NMFS logbook data for 2001-2006. Expected single-year changes in net operating revenues (2005 dollars) for the 2009 fishing year relative to the status quo (baseline) were estimated and are provided in Tables 4-44 through 4-47. Since the changes are single-year, they would be expected to re-occur in subsequent years, as modified by adaptive fishing behavior. Net operating revenues were calculated as trip revenues minus trip costs (e.g., fuel, oil, bait, ice, and other supplies; excludes fixed costs and labor). The analyses generated estimates of economic performance of all vessel trips projected to land at least one pound of gag (Tables 4-44 and 4-46) and trips projected to land at least one pound of any snapper grouper species (SG) (Tables 4-45 and 4-47). Changes in net operating revenues were summarized separately by geographic area (Tables 4-44 and 4-45) and by gear type across all areas (Tables 4-46 and 4-47). Each alternative was evaluated using the alternative 51% (**Preferred Alternative 2**), 66% (**Alternative 3**), and 61% (**Alternative 4**) allocation rates. Because the vertical line sector dominates harvests in the commercial SG fishery, only the geographic area results will be summarized in the following discussion. The geographic area designations indicate where the fish are projected to be landed.

Alternatives 3a and **3b,** which would establish different spawning closures and fishing season start dates, were modeled assuming a single regional quota and a 1,000-lb trip limit (gutted weight). Under these assumptions, **Alternative 3a** (May 1 fishing year start date and March-April spawning closure) is expected to result in an annual reduction in net operating revenues from the status quo of approximately $199,000-$613,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South

Carolina ($108,000-$252,000) and Georgia-Northeast Florida ($45,000-$168,000). In terms of percentage reductions, the Florida Keys (5-26%) and Central-South Florida (7-23%) are projected to experience the largest reductions in annual net operating revenues. The percentage impacts are calculated by dividing the expected reduction in net operating revenues by the appropriate baseline value. For example, the expected total effect of **Alternative 3a** (51% allocation) is a reduction in net operating revenues of $613,000. Compared to the baseline net operating revenues of $4.143 million, **Alternative 3a** is expected to result in a reduction in net operating revenues of approximately 15 percent ($613,000/$4.143 million). Note that the percentage impacts for this alternative and all subsequent alternatives below may not match actual calculations using the numbers reported in the table due to rounding of the results in the tables.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 3a** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $388,000-$737,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($175,000-$300,000) and North Carolina ($74,000-$138,000). In terms of percentage reductions, South Carolina (8-14%) and Georgia-Northeast Florida (5-10%) are projected to experience the largest reductions in annual net operating revenues.

Alternative 3b (January 1 fishing year start date and February-April spawning closure) is expected to result in an annual reduction in net operating revenues from the status quo of approximately $482,000-$668,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South Carolina ($201,000-$271,000) and Georgia-Northeast Florida ($133,000-$174,000). In terms of percentage reductions, the Florida Keys (26%) and Central-South Florida (19-23%) are projected to experience the largest reductions in annual net operating revenues.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 3b** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $621,000-$755,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($254,000-$305,000) and North Carolina ($114,000-$156,000). In terms of percentage reductions, South Carolina (12-14%) and Georgia-Northeast Florida (9-10%) are projected to experience the largest reductions in annual net operating revenues.

Table 4-44. Reductions in commercial vessels' net operating revenues due to gag management alternatives, in thousand 2005 dollars, by area, gag trips.

	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
Vessel trips landing at least one pound of gag							
Baseline	1,169	1,553	946	456	19	0	4,143
	Single quota, trip limit (1,000 lbs), spawning closure, alternative allocations						
	May 1 start date, March-April closure						
Alt. 3a, 51%	-82	-252	-168	-105	-5	0	-613
Alt. 3a, 66%	-13	-108	-45	-32	-1	0	-199
Alt. 3a, 61%	-18	-127	-56	-39	-2	0	-241
	January 1 start date, February-April closure						
Alt. 3b, 51%	-114	-271	-174	-104	-5	0	-668
Alt. 3b, 66%	-55	-201	-133	-88	-5	0	-482
Alt. 3b, 61%	-56	-202	-133	-89	-5	0	-484
	Regional quotas, trip limit (1,000 lbs), spawning closure, alternative allocations						
	January 1 start date, March-April closure						
Alt. 5a, 51%	-143	-318	-155	-109	-5	0	-730
Alt. 5a, 66%	-18	-120	-67	-49	-1	0	-256
Alt. 5a, 61%	-41	-162	-87	-59	-3	0	-352
	January 1 start date, February-April closure						
Alt. 5b, 51%	-187	-366	-176	-110	-5	0	-843
Alt. 5b, 66%	-55	-201	-133	-88	-5	0	-482
Alt. 5b, 61%	-70	-213	-133	-88	-5	0	-508
	Monroe County Zone, single quota, trip limit (1000 lbs), alternative allocations[1]						
	January-April spawning closure						
Alt. 6a, 51%	-144	-283	-237	-157	-19	0	-839
Alt. 6a, 66%	-117	-235	-214	-149	-19	0	-734
Alt. 6a, 61%	-117	-235	-214	-149	-19	0	-734
	February-April spawning closure						
Alt. 6b, 51%	-113	-270	-174	-104	-19	0	-679
Alt. 6b, 66%	-55	-201	-133	-88	-19	0	-495
Alt. 6b, 61%	-55	-201	-133	-88	-19	0	-496
	March-April spawning closure						
Alt. 6c, 51%	-82	-249	-167	-103	-19	0	-618
Alt. 6c, 66%	-12	-108	-45	-32	-19	0	-215
Alt. 6c, 61%	-18	-125	-55	-38	-19	0	-256

[1]The trip limit and closures only apply north of Monroe County.

Note: The analyses for January through April did not include the 1,000 lb trip limit.

Table 4-45. Reductions in commercial vessels' net operating revenues due to gag management alternatives, in thousand 2005 dollars, by area, snapper grouper trips.

	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
Vessel trips landing at least one pound of any snapper grouper species							
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
	Single quota, trip limit (1,000 lbs), spawning closure, alternative allocations						
	May 1 start date, March-April closure						
Alt. 3a, 51%	-138	-300	-135	-86	-77	0	-737
Alt. 3a, 66%	-74	-175	-72	-36	-31	0	-388
Alt. 3a, 61%	-81	-191	-78	-41	-39	0	-430
	January 1 start date, February-April closure						
Alt. 3b, 51%	-156	-305	-136	-87	-72	0	-755
Alt. 3b, 66%	-114	-254	-116	-76	-61	0	-621
Alt. 3b, 61%	-115	-256	-116	-76	-62	0	-624
	Regional quotas, trip limit (1,000 lbs), spawning closure, alternative allocations						
	January 1 start date, March-April closure						
Alt. 5a, 51%	-132	-294	-121	-81	-47	0	-675
Alt. 5a, 66%	-76	-181	-80	-44	-30	0	-410
Alt. 5a, 61%	-89	-208	-89	-52	-34	0	-472
	January 1 start date, February-April closure						
Alt. 5b, 51%	-171	-336	-135	-84	-66	0	-794
Alt. 5b, 66%	-114	-254	-116	-76	-61	0	-621
Alt. 5b, 61%	-120	-259	-116	-76	-61	0	-632
	Monroe County Zone, single quota, trip limit (1000 lbs), alternative allocations[1]						
	January-April spawning closure						
Alt. 6a, 51%	-183	-297	-155	-109	-119	0	-864
Alt. 6a, 66%	-166	-262	-145	-104	-119	0	-794
Alt. 6a, 61%	-166	-262	-145	-104	-119	0	-794
	February-April spawning closure						
Alt. 6b, 51%	-156	-304	-135	-86	-119	0	-800
Alt. 6b, 66%	-114	-254	-116	-76	-119	0	-678
Alt. 6b, 61%	-114	-254	-116	-76	-119	0	-679
	March-April spawning closure						
Alt. 6c, 51%	-138	-296	-133	-85	-119	0	-771
Alt. 6c, 66%	-74	-174	-72	-35	-119	0	-474
Alt. 6c, 61%	-81	-190	-78	-41	-119	0	-508

[1]The trip limit and closures only apply north of Monroe County.

Note: The analyses for January through April did not include the 1,000 lb trip limit.

Table 4-46. Reductions in commercial vessels' net operating revenues from various alternatives on gag spawning closure, overall quotas, and regional quotas, in thousand 2005 dollars, by gear type, gag trips.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
Vessel trips landing at least one pound of gag								
Baseline	486	3,553	35	12	14	43	0	4,143
	Single quota, trip limit (1,000 lbs), spawning closure, alternative allocations							
	May 1 start date, March-April closure							
Alt. 3a, 51%	-94	-500	-6	-4	-2	-7	0	-613
Alt. 3a, 66%	-34	-163	-1	0	0	-1	0	-199
Alt. 3a, 61%	-39	-199	-1	0	0	-1	0	-241
	January 1 start date, February-April closure							
Alt. 3b, 51%	-98	-553	-6	0	-2	-9	0	-668
Alt. 3b, 66%	-76	-394	-6	0	-1	-5	0	-482
Alt. 3b, 61%	-76	-396	-6	0	-1	-5	0	-484
	Regional quotas, trip limit (1,000 lbs), spawning closure, alternative allocations							
	January 1 start date, March-April closure							
Alt. 5a, 51%	-90	-619	-9	0	-3	-9	0	-730
Alt. 5a, 66%	-46	-207	-2	0	0	-1	0	-256
Alt. 5a, 61%	-53	-294	-2	0	0	-2	0	-352
	January 1 start date, February-April closure							
Alt. 5b, 51%	-102	-720	-6	0	-3	-11	0	-843
Alt. 5b, 66%	-76	-394	-6	0	-1	-5	0	-482
Alt. 5b, 61%	-76	-419	-6	0	-1	6	0	-508
	Monroe County Zone, single quota, trip limit (1000 lbs), alternative allocations[1]							
	January-April spawning closure							
Alt. 6a, 51%	-123	-672	-21	-4	-4	-14	0	-839
Alt. 6a, 66%	-111	-582	-21	-4	-3	-12	0	-734
Alt. 6a, 61%	-111	-582	-21	-4	-3	-12	0	-734
	February-April spawning closure							
Alt. 6b, 51%	-98	-560	-10	0	-2	-9	0	-679
Alt. 6b, 66%	-76	-403	-10	0	-1	-5	0	-495
Alt. 6b, 61%	-77	-404	-10	0	-1	-5	0	-496
	March-April spawning closure							
Alt. 6c, 51%	-92	-503	-10	-4	-2	-7	0	-618
Alt. 6c, 66%	-35	-174	-5	0	0	-1	0	-215
Alt. 6c, 61%	-40	-210	-5	0	0	-2	0	-256

[1]The trip limit and closures only apply north of Monroe County.

Note: The analyses for January through April did not include the 1,000 lb trip limit.

Table 4-47. Reductions in commercial vessels' net operating revenues from various alternatives on gag spawning closure, overall quotas, and regional quotas, in thousand 2005 dollars, by gear type, snapper grouper trips.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
Vessel trips landing at least one pound of snapper grouper								
Baseline	634	8,131	544	388	305	347	3	10,351
	Single quota, trip limit (1,000 lbs), spawning closure, alternative allocations							
	May 1 start date, March-April closure							
Alt. 3a, 51%	-85	-632	-6	-4	0	-10	0	-737
Alt. 3a, 66%	-37	-339	-3	-4	0	-5	0	-387
Alt. 3a, 61%	-43	-375	-3	-4	0	-6	0	-430
	January 1 start date, February-April closure							
Alt. 3b, 51%	-86	-651	-6	-4	1	-10	0	-755
Alt. 3b, 66%	-70	-534	-6	-4	0	-8	0	-621
Alt. 3b, 61%	-70	-537	-6	-4	0	-8	0	-624
	Regional quotas, trip limit (1,000 lbs), spawning closure, alternative allocations							
	January 1 start date, March-April closure							
Alt. 5a, 51%	-76	-582	-5	-4	0	-8	0	-675
Alt. 5a, 66%	-43	-356	-3	-4	0	-5	0	-410
Alt. 5a, 61%	-49	-412	-3	-4	0	-5	0	-472
	January 1 start date, February-April closure							
Alt. 5b, 51%	-81	-693	-6	-4	0	-10	0	-794
Alt. 5b, 66%	-70	-534	-6	-4	0	-8	0	-621
Alt. 5b, 61%	-70	-544	-6	-4	0	-8	0	-632
	Monroe County Zone, single quota, trip limit (1000 lbs), alternative allocations[1]							
	January-April spawning closure							
Alt. 6a, 51%	-111	-729	-11	-3	0	-10	0	-864
Alt. 6a, 66%	-103	-668	-11	-3	0	-9	0	-794
Alt. 6a, 61%	-103	-668	-11	-3	0	-9	0	-794
	February-April spawning closure							
Alt. 6b, 51%	-99	-683	-8	-3	0	-8	0	-800
Alt. 6b, 66%	-85	-576	-8	-3	0	-7	0	-678
Alt. 6b, 61%	-85	-576	-8	-3	0	-7	0	-679
	March-April spawning closure							
Alt. 6c, 51%	-96	-656	-8	-3	0	-8	0	-771
Alt. 6c, 66%	-58	-402	-7	-3	0	-5	0	-474
Alt. 6c, 61%	-62	-431	-7	-3	0	-5	0	-508

[1]The trip limit and closures only apply north of Monroe County.

Note: The analyses for January through April did not include the 1,000 lb trip limit.

Alternative 5 (regional quotas for North Carolina+South Carolina and Georgia+Florida) was re-evaluated to examine the effects of regional quotas in tandem with a 1,000-lb trip limit and alternative spawning closures. Although the consideration of regional quotas is listed as a single alternative, the modeling results are categorized for clarity as **Alternative 5a** (March-April spawning closure) and **Alternative 5b** (February-April spawning closure). Under a March-April spawning closure (**Alternative 5a**), regional quota management is projected to result in an annual reduction in net operating revenues from the status quo of approximately $256,000-$730,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South Carolina ($120,000-$318,000) and Georgia-Northeast Florida ($67,000-$155,000). In terms of percentage reductions, the Florida Keys (5-26%) and Central-South Florida (11-24) are projected to experience the largest reductions in annual net operating revenues.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 5a** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $410,000-$675,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($181,000-$294,000) and North Carolina ($76,000-$132,000). In terms of percentage reductions, South Carolina (8-13%) and Georgia-Northeast Florida (6-9%) are projected to experience the largest reductions in annual net operating revenues.

Under a February-April spawning closure (**Alternative 5b**), regional quota management is projected to result in an annual reduction in net operating revenues from the status quo of approximately $482,000-$843,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South Carolina ($201,000-$366,000) and Georgia-Northeast Florida ($133,000-$176,000), though North Carolina is expected to experience a larger reduction than Georgia-Northeast Florida under a 51% allocation of $187,000. In terms of percentage reductions, the Florida Keys (26%) and Central-South Florida (19-23%) are projected to experience the largest reductions in annual net operating revenues.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 5b** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $621,000-$794,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($254,000-$336,000) and Georgia-Northeast Florida ($116,000-$135,000). In terms of percentage reductions, South Carolina (12-15%) and Georgia-Northeast Florida (9-10%) are projected to experience the largest reductions in annual net operating revenues.

Similar to **Alternative 5**, although **Alternative 6** (Monroe County, Florida separate management conditions) is presented as a single alternative, its potential effects were evaluated assuming different spawning season closures in the rest of the South Atlantic. As such, the results were summarized for clarity as **Alternative 6a** (January-April spawning closure), **Alternative 6b** (February-April) spawning closure, and **Alternative 6c** (March-April spawning closure). Alternatives 6b and 6c also assumed a single regional quota, and **Alternatives 6b and 6c** included a 1,000-lb trip limit. Under a January-April spawning closure (**Alternative 6a**), establishing separate management regulations for Monroe County is projected to result in an annual reduction in net operating revenues from the status quo of approximately $734,000-$839,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South Carolina ($235,000-$283,000) and Georgia-Northeast Florida ($214,000-$237,000). In terms of percentage reductions, the Florida Keys (100%) and Central-South Florida (33-34%) are projected to experience the largest reductions in annual net operating revenues. It should be noted that the result for the Florida Keys is so dramatic (100% reduction in net annual operating revenues) since the prohibition of gag harvests for the whole year would result in no trips landing at least one pound of gag, hence no revenues would be generated by trips meeting this harvest criteria. Vessels that previously harvested gag would still be expected to operate and harvest other species. However, their performance would be reflected, minus customary gag revenues, in the results for trips projected to harvest at least one pound of SG species.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 6a** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $794,000-$864,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($262,000-$297,000) and Georgia-Northeast Florida ($145,000-$155,000). In terms of percentage reductions, South Carolina (12-13%) and Georgia-Northeast Florida (11-12%) are projected to experience the largest reductions in annual net operating revenues.

Under a February-April spawning closure (**Alternative 6b**), establishing separate management regulations for Monroe County is projected to result in an annual reduction in net operating revenues from the status quo of approximately $495,000-$679,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South Carolina ($201,000-$270,000) and Georgia-Northeast Florida ($133,000-$174,000). In terms of percentage reductions, the Florida Keys (100%) and Central-South Florida (19-23%) are projected to experience the largest reductions in annual net operating revenues.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 6b** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $678,000-$800,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($254,000-$304,000) and Georgia-Northeast Florida ($116,000-$135,000). In terms of percentage reductions, South Carolina (12-14%) and Georgia-Northeast Florida (9-10%) are projected to experience the largest reductions in annual net operating revenues.

Under a March-April spawning closure (**Alternative 6c**), establishing separate management regulations for Monroe County is projected to result in an annual reduction in net operating revenues from the status quo of approximately $215,000-$618,000 across the three alternative commercial allocation ratios for trips projected to harvest at least one pound of gag (Table 4-44). The largest reductions in absolute dollars are projected to occur in South Carolina ($108,000-$249,000) and Georgia-Northeast Florida ($45,000-$167,000). In terms of percentage reductions, the Florida Keys (100%) and Central-South Florida (7-23%) are projected to experience the largest reductions in annual net operating revenues.

Examining trips projected to harvest at least one pound of SG species (Table 4-45), **Alternative 6c** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $474,000-$771,000 across the three alternative commercial allocation ratios. The largest reductions in absolute dollars are projected to occur in South Carolina ($174,000-$296,000) and the Florida Keys ($119,000), though Georgia-Northeast Florida is also projected to experience reductions of $72,000-$133,000. In terms of percentage reductions, South Carolina (8-13%) and Georgia-Northeast Florida (5-10%) are projected to experience the largest reductions in annual net operating revenues.

Recreational Sector

Alternative 6 would prohibit all harvest of gag in the EEZ south of the Dade/Monroe County, Florida, line from January through May and all harvest of all species in the Shallow Water Grouper (SWG) complex, which includes gag, from June through December. Thus, gag harvests would be prohibited year-round. Headboat harvest data for 2003-2007 were evaluated to examine the relative importance of gag and SWG to the total harvest of all species in by headboats fishing in the South Atlantic off Monroe County. Harvests from headboat statistical area 12 (vessels ported in Key Largo – Key West) and statistical area 17 (vessels ported on the east coast that fish off the Dry Tortugas) were summarized and used to approximate South Atlantic Monroe County landings. It is noted that these landings do not necessarily capture the full area-fished considerations of the prohibition since they represent all harvests regardless of whether the fish are captured in state water or EEZ waters, nor do they include harvests by vessels ported north of the Monroe County line that travel south and fish off Monroe County, or vessels that are ported in west Florida ports that may fish in the South Atlantic, nor do they support any determination of what part of the harvests by east coast-ported vessels may come from Gulf of Mexico waters. Attributing all harvests to the EEZ will result in overestimation of affected harvests, though the estimates would be appropriate if compatible state regulations were implemented. Not including harvests by vessels ported north of Monroe County that fish off Monroe County or vessels from the west coast that fish in South Atlantic waters will result in an underestimation of affected harvests. Including harvests from Gulf waters by vessels ported in the Atlantic will result in overestimation of affected harvests. In total, the net effect of these over- and underestimations is unknown. Nevertheless, these data represent the best available tabulation of headboat harvest activity in the area. It should also be noted that all data represent landed fish, so the terms "harvests" and "landings" equally represent landed fish and do not include estimates of fish that are caught and released (alive or dead).

On average, over the 2003-2007 fishing years for the months January through May, gag represented less than 1% (0.61%; approximately 1,100 fish) of total harvests of all species harvested (approximately 179,000 fish) by the headboat sector in Monroe County in terms of numbers of fish landed and approximately 6% in terms of landed weight (approximately 14,000 lbs, whole weight, of approximately 239,000 lbs total weight). On an annual basis, gag represents slightly less of total fish harvests (0.47%; approximately 1,600 fish of approximately 343,000 total fish) and approximately 5% of total landed weight (approximately 21,000 lbs, whole weight, of approximately 449,000 lbs total weight). As a result, for the purpose of this analysis, gag is characterized as a relatively insignificant species to the headboat sector during January-May and generally throughout the year in terms of numbers of fish harvested, but is relatively more important in terms of pounds harvested. For comparison, yellowtail snapper is the most frequently harvested species by these vessels, accounting for approximately 30% of all fish harvested and 28% of all pounds harvested annually, followed by white grunt (31% and 19%, respectively) and gray snapper (9% and 11%, respectively).

All SWG species comprised approximately 2.5% of all fish landed by South Atlantic Monroe County headboats on average from 2003-2007 for the June-December months (approximately 3,000 fish of approximately 179,000 total fish) and approximately 12.3% in total pounds (approximately 18,500 lbs, whole weight, of approximately 239,000 lbs total weight).

Similar information of the same specificity is not available for shore (which would be included if compatible state regulations were adopted though intercepts of shore harvested SWG in the South Atlantic are minimal, with only approximately 22,000 pounds and 8,000 pounds recorded in 2007 and 2003, respectively, and no landings recorded in 2004-2006), private angler, and charterboat harvests, which are assessed through the Marine Recreational Fisheries Statistics Survey (MRFSS), due to the manner in which the data are collected and tabulated. Specifically, Monroe County data are treated as a common harvest area, i.e., no separation of Gulf of Mexico harvest versus South Atlantic harvest occurs, and all harvests from Monroe County are included in the Gulf of Mexico sub-region. Nevertheless, estimates of Monroe County gag, SWG, and all species harvested were generated for 2003-2007 using MRFSS post-stratification routines by the Southeast Fisheries Science Center (Steve Turner and Vivian Matter, personal communication). It should be noted that since they are post-stratified estimates, these are not official MRFSS estimates and they encompass harvests from both Gulf of Mexico and South Atlantic waters. Further, weight totals do not include weights for all species because the absence of intercept weights prevented the calculation of average weights for all species (this mostly encompassed grunts, ballyhoo, and scad). Hence, the weight estimates should be viewed with caution. In addition, the absence of weight estimates for all species will result in an overestimation of the relative importance of gag or SWG to total harvests since the true harvest weight of all fish will be greater than the estimate generated. The extent of this overestimation is unknown.

Over the 2003-2007 fishing years, gag accounted for approximately 0.2% of all MRFSS harvests in terms of numbers of fish (approximately 6,000 fish of approximately 3.6 million total fish) and approximately 0.6% in terms of pounds harvested (approximately 49,000 lbs, whole weight, of approximately 8.3 million pounds total weight) for January-

May. For the entire year, gag accounted for even smaller portions of total harvest, approximately 0.1% (approximately 9,000 fish of approximately 7.6 million total fish) and 0.5% (approximately 79,000 lbs, whole weight, of approximately 17.5 million lbs total weight), respectively. For SWG over the same fishing years, total SWG harvests (including gag) in June-December accounted for approximately 1.2% of total harvests of all species in terms of numbers of fish (approximately 47,000 fish of approximately 4 million total fish), and approximately 4.7% in terms of pounds of fish (approximately 432,000 lbs, whole weight, of approximately 9.3 million lbs total weight). For the entire year, SWG accounted for a larger proportion of total harvests, approximately 1.7% and 6.4% in terms of numbers of fish (approximately 131,000 fish of approximately 7.6 million total fish) and pounds of fish (approximately 1.1 million lbs, whole weight, of approximately 17.5 million lbs total weight), respectively.

These results are consistent with estimates for the entire South Atlantic where SWG accounted for approximately 0.2% of total fish landed per year across all South Atlantic states and modes combined (approximately 116,000 fish of approximately 46.8 million total fish) and approximately 2% of total pounds landed (approximately 1.1 million lbs, whole weight, of approximately 53.8 million lbs total weight). These ratios remained unchanged for the June-December months. For the charter sector, SWG was relatively more important in terms of numbers of fish landed, accounting for approximately 1.3% (approximately 24,000 fish of approximately 1.8 million total fish), but somewhat less important in terms of pounds landed, approximately 1.8% (approximately 200,000 lbs, whole weight, of approximately 11.1 million lbs total weight). SWG were the most important among all sectors for the private sector, accounting for approximately 2.5% in terms of pounds landed (approximately 834,000 lbs, whole weight, of approximately 33.1 million lbs total weight), yet still accounting for only 0.3% in terms of numbers of fish (approximately 86,000 fish of approximately 25.1 million total fish). It should be noted that recordings of bait fish species, which also tend to be small fish and, thus, have low average weights, are likely more common for the charter and private angler sectors than for headboats, thus inflating the number of fish recorded for these sectors relative to headboat harvests, while potentially depressing average weight totals.

Despite the caveats to the estimates, all these results support a determination that gag harvests year-round and SWG harvests from June-December off Monroe County are relatively minor in terms of numbers of fish harvested, accounting for less than 3% of total fish harvested for the headboat sector and likely less than 2% for the shore, charter, and private sectors, but somewhat more important in terms of pounds compared, accounting for approximately 12% of headboat harvests, but likely less than 5% for the shore, charter, and private sectors. As a result of the expected lack of importance of these species relative to the harvest of other species, any economic losses associated with the prohibition of the harvest of these species would be expected to be minimal. Although some individual anglers fishing off Monroe County may target gag and other SWG species, these species are, in general, likely component species of general bottom fishing activities, with snappers the more common expected harvest, such that few trip cancellations, changes in fishing behavior and expenditures would be expected, and any reduction in recreational value would be expected to be minor. Thus, this alternative may be expected to result in minimal adverse economic effects on the recreational sector.

4.1.5.3 Social Effects of Management Alternatives

Impacts from this suite of proposed alternatives will vary depending on sector/fishery, the specific alternative, and whether one looks at the short or long-term impacts.

In general, by ending overfishing and keeping gag at a sustainable status, long-term benefits are expected to accrue to all participants in the fishery, commercial, recreational, and the general public. Alternatives differ in how they would allow the stock to arrive at a long-term sustainable status. As a result, each of these alternatives differs in the degree and type of negative short- and long-term impacts imposed on each fishing and non-fishing sector. Below is a more detailed analysis of the negative and positive short-term impacts of the proposed alternatives. Long-term benefits are discussed throughout the analysis but as there are sparse data to analyze long-term effects of management measures on communities, future conditions of communities cannot be predicted with confidence.

4.1.5.3.1 *Commercial Fishery*

While **Alternative 1 No Action** would pose the least short-term negative impacts, the stock assessment indicates the stock cannot sustain the current rate of fishing mortality over time and still provide maximum sustainable yield. If stock status worsened in the future and more restrictive management measures were needed, adverse impacts to the commercial fishing sector and associated communities would be substantial.

Preferred Alternative 2 would establish a spawning season closure January through April for both the commercial and recreational sectors. This would remove a perceived inequity with the current regulations that allow continued recreational fishing during the spawning season closure. Short-term social impacts would be negative but long-term benefits would accrue from protecting gag during the spawning season.

Alternative 3a would establish a 1,000 pound trip limit, May 1 fishing year start date, and March and April closure for all shallow water groupers. Short-term social impacts would be more positive than the preferred but could result in longer closures with associated negative social impacts. The long-term social impacts would not be as positive as the preferred alternative due to the lack of protection of gag during the spawning season.

Alternative 3b would establish a 1,000 pound trip limit, January 1 fishing year start date, and February, March, and April closure for all shallow water groupers. Short-term social impacts would be more positive than the preferred but could result in longer closures with associated negative social impacts. The long-term social impacts would not be as positive as the preferred alternative due to the lack of protection of gag during the spawning season.

Preferred Alternatives 4 would establish a directed commercial quota and could result in disproportionate impacts by region, that is, catch from one region could prevent fishermen in the other region from obtaining their "fair" share. Short-term social impacts would be negative but long-term benefits would accrue from preventing overfishing of gag thereby leading to higher, more sustainable catches.

Alterative 5 would divide the directed commercial quota into two regions. This alternative would reduce the concern that one region's catch would prevent the other region from catching their fair share. This will be viewed as being more equitable than **Alternative 4** alone.

Alternative 6 would establish a separate set of regulations for Monroe County, however, both the short-term and long-term social impacts would be more negative than the preferred.

4.1.5.3.2 *Recreational Fishery*

While **Alternative 1 No Action** would pose the least short-term negative impacts, the stock assessment indicates the stock cannot sustain the current rate of fishing mortality over time and still provide maximum sustainable yield. If stock status worsened in the future and more restrictive management measures were needed, adverse impacts to the recreational fishing sector and associated communities would be substantial.

Preferred Alternative 2 would establish a spawning season closure January through April for both the recreational and commercial sectors. This would remove a perceived inequity with the current regulations that allow continued recreational fishing during the spawning season closure. However, some in the recreational sector will not be supportive of this change due to the loss of fishing opportunity during this time period. Short-term social impacts would be negative but long-term benefits would accrue from protecting gag during the spawning season.

Alternative 6 would establish a separate set of regulations for Monroe County, however, both the short-term and long-term social impacts would be more negative than the preferred.

Preferred Alternative 7a would reduce the aggregate bag limit from 5 to 3, reduce the gag or black grouper bag limit from 2 to 1, and exclude captain and crew on for hire vessels. Short-term social impacts would be negative but long-term benefits would accrue from eliminating overfishing. **Alternative 7b** would retain the existing bag limits but add the month of December to the spawning season closure for the recreational sector. Short-term social impacts would not be as negative for those who prefer the existing bag limit; long-term benefits would accrue from protecting gag during the spawning season.

4.1.5.3.3 *General Non-Fishing Public*

For the general non-fishing public of the U.S., all the alternatives to status quo offer long-term benefits related to ending overfishing and improving stock status. These alternatives benefit those in the U.S. who derive satisfaction from knowing the marine environment is managed sustainably and is thriving. The U.S. consumer may benefit from potential increased consumption of locally caught fish as the stock recovers.

There is the potential of long-term negative impacts to the general non-fishing public who enjoy coming to the coast to experience a "fishing community," eat locally caught seafood, and enjoy the heritage tourism benefits of many coastal communities. If the infrastructure for commercial fishing in the South Atlantic continues to wane, and the proposed management measures hasten that decline, communities will lose this attraction for their tourist trade, and visitors may have a diminished coastal tourism experience. However, these communities can only be expected to exist and prosper if healthy resources and fisheries also exist. Therefore, ending overfishing of the gag resource, as a component of the marine ecosystem, is essential to the existence and sustenance of these communities.

4.1.5.4 Administrative Effects of Management Alternatives

Maintaining the status-quo under **Alternative 1** could potentially have the greatest administrative effect on NOAA Fisheries Service and the Council. If more restrictive management measures are not put in place, overfishing would continue and the risk of this stock being designated as a stock that is overfished would increase. Managing a stock that is overfished has the potential to burden the administrative environment. Since designation of an overfished condition triggers a requirement to develop and implement a rebuilding plan. The greater the likelihood of being declared overfished, the greater the administrative burden.

Preferred Alternative 2 could create a low-level administrative burden, because fishing for and possession of several species in addition to gag would be prohibited from January through April annually. This would require a coordination of enforcement efforts, and the formulation and issuance of new management guidance to fishery participants in the commercial and recreational sectors.

Alternatives 3a and 3b would require standard outreach to the commercial fishing community and coordination with NOAA Fisheries Service office of Law Enforcement. Outreach materials would take the form of fishery bulletins and possible updates to NOAA Fisheries Service Southeast Region's web site. Current regulations would need to be modified to change the fishing year start date to the May 1 fishing year start date under **Alternative 3a.** Regulations would also need to be modified to reflect the extended spawning season closure (under **Alternative 3b**) to include the month of February in addition to the current seasonal closure months of March and April during which there would be a prohibition on fishing for and/or possession of gag and the other shallow water snapper grouper species. Furthermore, ongoing monitoring of the new annual commercial quota would be required (if **Alternative 4 Preferred** under this action is implemented) as it relates to the proposed 1,000 lb gutted weight trip limit. Under this alternative, if the annual quota is met before the beginning of the proposed seasonal closure, the fishery would be closed at that time rather than waiting for the seasonal closure to be in effect. Such a closure would be considered routine and would incur a minor impact on the administrative environment due to staff time required to process paperwork to imitate the closure.

Alternative 3a or **3b** discussed above, could be combined with **Alternative 5**, which would split the proposed directed commercial quota under **Alternative 4 (Preferred)** amongst a northern and southern region. If this combination of alternatives were to be implemented the resulting adverse effect on the administrative environment could fall within a range from moderate to minor dependent upon fishing activity in each region each fishing year. If one region's quota is met before the fixed seasonal closure begins (under **Alternatives 3a** or **3b**) in any given year, the fishery would be closed for that specific region. If the quota is met in each region at different times, but before each seasonal closure begins, the administrative burden, in the form of processing paperwork for the quota closures, would double. If neither region's quota is met before a seasonal closure begins, the administrative burden would be less since fishery participants would only receive notification of the seasonal closure, and not of any additional quota-related closure preceding it.

Currently there is no quota monitoring mechanism in place for gag. In order to monitor the quota throughout the year, each dealer would be required to report the amount of gag purchased on a predetermined basis using a reporting form provided by NOAA Fisheries Service. Reports may be submitted via paper or electronic reporting methods. The dealer reporting requirement portion of the alternative requires compliance with current Paperwork Reduction Act requirements, and therefore adds to the administrative burden of its implementation.

Alternative 6 would require significant coordination between NOAA Fisheries Service Office of Sustainable Fisheries, the Office of Law Enforcement, as well as the Permits Office. In order to enforce provisions related to the creation of a "Southern Region" bounded to the north by the Miami Dade/Monroe County line, some form of permit or new fishing authorization instrument may be necessary to formally designate those fishermen allowed to fish north of the Miami Dade/Monroe County line and those allowed to fish south of it. Otherwise, it can be expected that a large number of commercial and/or recreational fishermen located north of the Miami-Dade/Monroe County line would travel to points south of that line in order to fish for shallow water snapper grouper species during the spawning season closure north of the Miami-Dade/Monroe County line. If no special permit were issued for the Southern Region, it would stand to reason that anyone located north of the established boundary would be able to travel south of the boundary and legally fish for species otherwise prohibited in the area north of the proposed boundary during the months of March and April. Such an effort shift could spurn an unsustainable level of fishing for the Southern Region, which may require future management measures be implemented, further adding to the administrative burden.

The creation of a new or renamed permit, as may be needed under this alternative, is a major undertaking by the Permits Office and would require extensive coordination amongst several divisions within NOAA Fisheries. If such a permit was required, it would have to be determined who would qualify for a permit specific to the area south of the Miami Dade/Monroe County line. Then those fishermen would need to be notified of the impending change, along with those fishermen who fish north of the proposed boundary. Next, there would need to be a temporary freeze on permit renewal and transfers in the snapper grouper fishery in order to establish the true universe of vessels that qualify for the Southern Region permit. After each qualifying vessel has been identified, a one-time mailing of the new or replacement permit would be conducted by the Permits Office. After a predetermined “effective date”, the old permit would no longer be valid when fishing within the Southern Region. It is expected that if **Alternative 6** were implemented and such a permit was established, significant short-term adverse effects would be borne primarily by the Permits Office, and somewhat less significant adverse administrative effects would be borne by the Office of Sustainable Fisheries and the Office of Law Enforcement. However, the administrative burden and cost would be incurred over a very short duration (about three months), enforcement of the boundary and associated take provisions would be ongoing and last the duration of regulations implementing this action.

If this alternative were combined with any other alternative being considered under this action it can be inferred that adverse effects on the administrative environment would likely increase. Administrative impacts from any other alternative could be added to the impacts described under **Alternative 6**.

Establishment of a directed commercial quota a specified in **Preferred Alternative 4** is not likely to increase the administrative burden on NOAA Fisheries Service or the Council, since a commercial quota monitoring system is currently in place.

Under **Alternative 5**, the administrative burden on NOAA Fisheries Service would increase substantially. Rather than monitoring the quota/allocation of one commercial and one recreational sector of the fishery, as is specified in **Preferred Alternative 4**, the agency would be responsible for monitoring two regional commercial quotas, and the recreational allocation for possible overages. This would require a coordination of enforcement efforts, and the formulation and issuance of new management guidance to fishery participants in the commercial and recreational sectors. It would also require development and implementation of a more sophisticated catch level monitoring system in the South Atlantic Region.

Preferred Alternative 7a would require no additional administrative action, whereas **Alternative 7b** would require a coordination of enforcement efforts, and the formulation and issuance of new management guidance to fishery participants in the commercial and recreational sectors.

The combination of **Preferred Alternative 2** and **Alternative 7b**, would induce the same type of administrative burden, and most likely to the same or lesser degree than combining **Alternatives 5** and **Preferred Alternative 7a**. **Alternatives 5** and **7b** together would create the greatest administrative burden, while the combination of **Alternative 3** and **Preferred Alternative 7a** would generate a minimal administrative burden. The administrative environment would be effected on an intermediate level under a combination of **Preferred Alternatives 2** and **7a**, **Alternative 5** and **Preferred Alternative 7a**, or **Preferred Alternative 4** and **Preferred 7b**.

4.1.5.5 Council Conclusions

The Council has proposed actions that will provide the necessary reduction in fishing mortality to end overfishing. The Council recognizes these actions have serious negative social and economic impacts on affected fishermen, dealers, and consumers. However, the Council must take these actions to comply with the Magnuson-Stevens Act. These actions are based on the best available data from the SEDAR assessment, and the assessment has been reviewed and approved by the Council's Scientific and Statistical Committee (SSC).

The Council concluded their proposed actions provide the necessary biological protection while minimizing the social and economic impacts to the maximum extent allowed under the law.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and recommended changes to the spawning closure and commercial trip limit for gag and to the management program for Monroe County. The Council considered these requests but concluded the most biologically conservative measure would be to protect the spawning season with a full closure from January through April.

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the January through April spawning closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

The Council concluded their proposed management measures best meet the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.2 *Vermilion Snapper*

4.2.1 Background

An update to the vermilion snapper Southeast Data Assessment and Review (SEDAR) stock assessment indicates the stock is undergoing overfishing (SEDAR Update #3 2007). Overfishing is defined as a fishing mortality rate (F) exceeding the maximum fishing mortality threshold (MFMT), which the Council has specified as F_{MSY}. Current $F_{2006}/F_{MSY} = 0.729/0.355 = 2.05$.

The Council's SSC did not have confidence in the biomass reference points from the SEDAR assessment because of uncertainty about the stock/recruitment relationship; therefore, it is unknown if vermilion snapper is overfished. A new age-based benchmark assessment will be completed in late 2008, which will update the status determination criteria for vermilion snapper.

The SSC did, however, have confidence in the fishing mortality rate estimates and indicated a 61% reduction in overall harvest (commercial and recreational sectors) would be needed to reduce fishing mortality to the yield associated with F_{OY}. This is equivalent to a total allowable catch level of 566,179 lbs gutted weight (628,459 lbs whole weight) (Table 4-48). Based on the Council's preferred allocation alternative, this would correspond to harvest reductions of 58% in the commercial sector and 69% in the recreational sector (Table 4-48).

Table 4-48. Commercial and recreational portions of catch (pounds gutted weight) associated with allocations suggested by Council thus far.

Vermilion Snapper		**Allocation Alternative 2. 68%C/32%R**	
	Total	**Commercial**	**Recreational**
Year	**Allowable Catch (TAC)** (gutted weight)	**Proportion** (gutted weight)	**Proportion** (gutted weight)
2008	566,179	385,002	181,177

Review of Previous Stock Assessments

The first stock assessment for vermilion snapper was conducted in 1990 (PDT 1990) using data from 1972 through 1988/89. Spawning Stock Ratio (SSR) (considered to be the same as Spawning Potential Ratio (SPR)) was calculated separately for recreational and commercial fisheries (Table 4-49).

Table 4-49. Spawning Stock Ratio (SSR) values for vermilion snapper.
Source: PDT 1990.

RECREATIONAL	COMMERCIAL
Carolinas = 19%	Carolinas = 20 - 28%
Florida = 26 - 19%	Florida = 17 - 27%
SSR with 10 inch Recreational Minimum Size Limit:	SSR with 12 inch Commercial Minimum Size Limit:
30%	25%

A series of stock assessments provided estimates of SSR based on catch curves (NMFS 1991; Huntsman *et al.* 1992; Huntsman *et al.* 1993) (Table 4-50). Virtual Population Analyses conducted by Zhao and McGovern (1995) and Manooch *et al.* (1998) provided SPR values (Manooch *et al.* 1998) (Table 4-50). Potts and Brennan (2001) provided SPR values based on catch curve analyses.

Table 4-50. Spawning Stock Ratio (SSR) values provided by NMFS 1991; Huntsman *et al.* 1992; Huntsman *et al.* 1993; Zhao and McGovern 1995; and Potts and Brennan 2001.

Assessment Year	Catch Data From	Overall SSR	SSR with Minimum Sizes
1991	1988	23%	28%
1992	1990	20%	27%
1993	1991	16%	27%
1995	1993	25%	?
1998	1997	21-27%	>30%
2001	1999	21%	13” for 30%

Regulations, which may have affected the catch of vermilion snapper are shown in Table 4-51 and Figure 4-5.

Table 4-51. Regulations for vermilion snapper.

Regulation	Effective Date	Plan or Amendment
4" trawl mesh size to achieve a 12" TL minimum size	8/31/83	Original FMP (SAFMC 1983)
Prohibit trawls	1/12/89	Amendment 1 (SAFMC 1988)
Prohibit fish traps, entanglement nets, & longlines within 50 fathoms; bag limit of 10 vermilion per person per day; 10" TL recreational minimum size limit & 12" TL commercial minimum size limit	1/1/92	Amendment 4 (SAFMC 1991)
Oculina Experimental Closed Area	6/27/94	Amendment 6 (SAFMC 1993)
Limited entry program: transferable permits and 225-lb non-transferable permits	12/98	Amendment 8 (SAFMC 1997)
Recreational size limit increased to 11" TL; Vessels with longlines may only possess deepwater species	2/24/99	Amendment 9 (SAFMC 1998c)
Commercial quota set at 1.1 million lbs gutted weight; recreational size limit increased to 12" TL.	10/23/06	Amendment 13C (SAFMC 2006)

Commercial harvest was less than 1,000,000 lbs gutted weight during 1992-1999 then increased to about 1,500,000 lbs gutted weight in 2001; commercial landings decreased to about 760,000 lbs gutted weight in 2003 (Figure 4-5). In 2004, landings were about 1.1 million lbs whole weight but decreased during 2005. Based on data from NMFS Landings (ALS), the NMFS headboat survey, and Marine Recreational Fisheries Statistics Survey (MRFSS), 68% of the harvest during 1986-2005 was by commercial fishermen and 32% by recreational fishermen (Figure 4-5).

The mean length of vermilion snapper caught by commercial, recreational, and headboat fishermen has generally increased since 1984 (Figure 4-6). The mean size of vermilion snapper is largest for commercially caught fish and smallest for vermilion snapper taken by headboat fishermen. Noticeable increases in the mean size occurred when minimum sizes of 10" total length recreational and 12" total length commercial were implemented in 1992 (Figure 4-6).

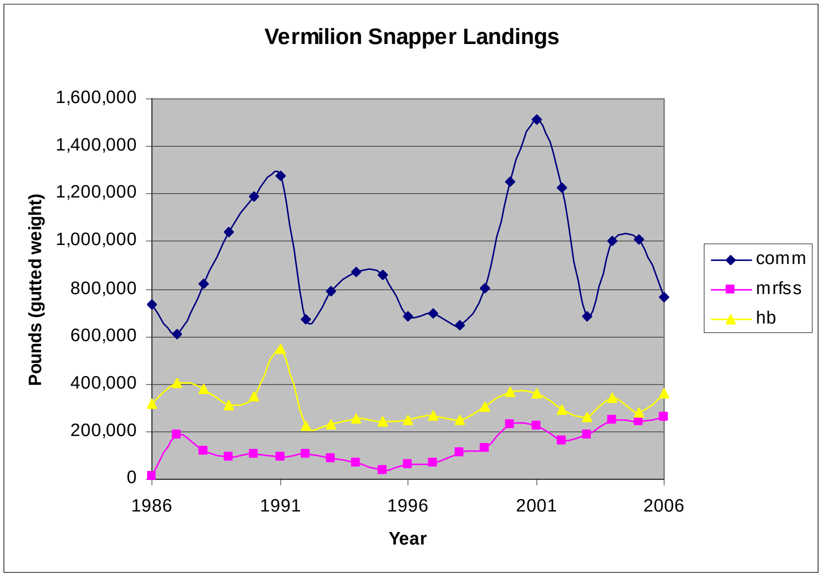


Figure 4-5. Annual landings (lbs gutted weight) of vermilion snapper.
SOURCE: Commercial landings are from the NMFS Accumulative Landings System (ALS), Headboat data are from NMFS-Beaufort, and MRFSS data are from the MRFSS web site.

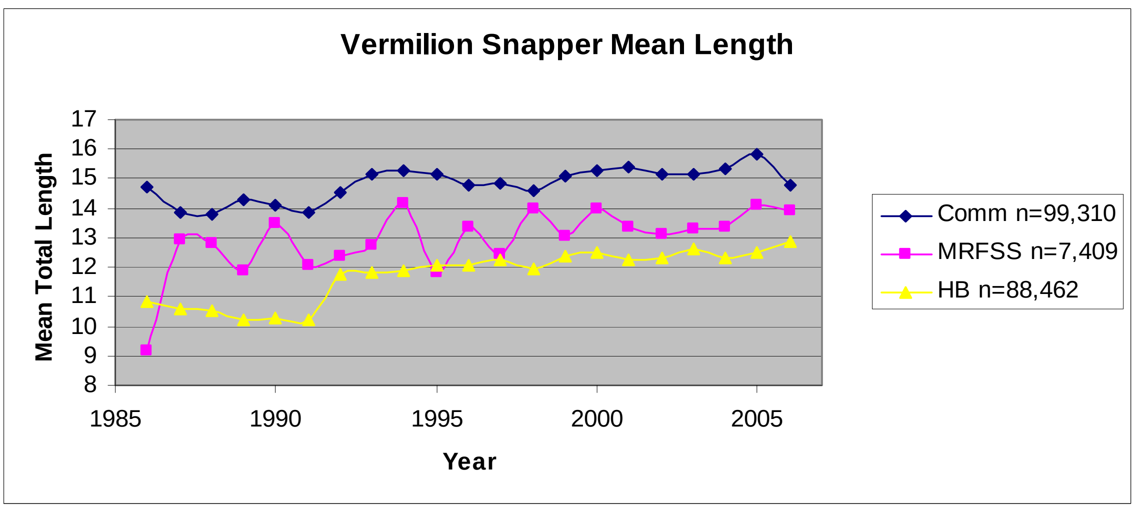


Figure 4-6. Mean lengths (inches, total length) of vermilion snapper taken by commercial, headboat, and recreational (MRFSS) fishermen during 1984-2006.

Note: Additional data are provided in **Appendix F**.

4.2.2 Management Reference Point Alternatives

Maximum Sustainable Yield (MSY) for Vermilion Snapper
Alternatives are shown because the current definition for MSY is being replaced with a formula approved by the Council (Table 4-52a). In the future, this will not be an action item unless the Council decides to change how MSY is calculated; the actual value will be updated from the most recent SEDAR assessment.

Optimum Yield (OY) for Vermilion
Alternatives are shown because the current definition for OY is being replaced with a formula approved by the Council (Table 4-52a). In the future, this will not be an action item unless the Council decides to change the way OY is calculated; the actual value will be updated from the most recent SEDAR assessment.

<u>Discussion</u>
Alternatives are being considered by the Council because the current definition for MSY is being replaced (Table 4-52a). In the future, this will not be an action item unless the Council decides to change how the MSY is calculated; the value will be updated from the most recent SEDAR assessment.

The Council has chosen **Preferred Alternative 2** as the preferred where MSY is specified. The Council is aware of the concerns the SSC had with uncertainty and that the SSC did not support the use of this estimate. An assessment is currently being planned and completion is expected late in 2008. The SSC has confidence in the fishing mortality rate (F) estimates from the SEDAR Assessment Update, but the SSC does not feel the biomass estimates are reliable due to uncertainty about the spawner/recruit relationship.

The value specified for MSY at equilibrium has not been endorsed by the SSC. OY values for 65% and 85% F_{MAX} (**Alternatives 2a and 2c**) were determined using the Baranov equation just as the SSC did to calculate the yield at 75% of F_{MAX}. These MSY and OY values will be updated after the new assessment is completed in late 2008. The Council has Chosen **Preferred Alternative 2a as the preferred where OY is specified.**

The Council's **Preferred Alternative 2** would redefine the MSY of the vermilion stock to equal the value recommended by the most recent SEDAR assessment. Currently this value is based on SEDAR Update #3 (2007). However, the value would be replaced by the estimate of MSY from the new benchmark assessment for vermilion snapper that is underway.

Preferred Alternative 2 would improve the scientific basis for managing vermilion snapper because it is a biomass estimate based on the best available science. Designation of MSY may make it more likely management actions can be taken to reduce fishing pressure on a stock experiencing unsustainable fishing mortality or is overfished. Therefore, stocks with reference points based on SEDAR assessments are expected to provide the strongest positive environmental effects.

Table 4-52a. MSY and OY alternatives for vermilion snapper.

Alternatives	Equation	F_{MSY} & F_{OY} Values	MSY & OY Values
Alternative 1 (no action)	MSY equals the yield produced by $F_{MSY.}$ $F_{30\%SPR}$ is used as the F_{MSY} proxy for all stocks. OY equals the yield produced by F_{OY}. $F_{40\%SPR}$ is used as the F_{OY} proxy.	$\mathbf{F_{MSY}}$ = 0.35* $\mathbf{F_{OY}}$ = 0.25*	Not specified Not specified
Alternative 2 (preferred)	MSY equals the yield produced by $F_{MSY.}$ MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by $F_{OY.}$ If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. The overfished status of vermilion snapper is unknown.	$\mathbf{F_{MSY}}$ = 0.355** See subalts. below	2,699,957 lbs whole weight (2.432.394 lbs gutted weight)
Alternative 2a		OY=(65%)(F_{MSY})	547,887 lbs whole weight** (493,592 lbs gutted weight)
Alternative 2b (preferred)		OY=(75%)(F_{MSY})	628,459 lbs whole weight** (566,179 lbs gutted weight)
Alternative 2c		OY=(85%)(F_{MSY})	692,916 lbs whole weight** (624,249 lbs gutted weight)

*Source: Powers 1999 **Source: Recommendation from SEFSC based on the results from SEDAR Update #3 (2007). OY values represent the current yield at F_{OY} and do not represent OY at equilibrium. F_{MAX} used as a proxy for F_{MSY}. *** The Council's SSC did not endorse the estimate of MSY from the vermilion snapper SEDAR Update #3 (2007). This value would represent the MSY at equilibrium.

OY Alternative 1 would retain the OY definition established in the Snapper Grouper FMP Amendment 11 (SAFMC 1998d); however, the value for OY was not specified. Not designating an OY value or designating one not based upon the best available science (**OY Alternative 1**) would have adverse, indirect effects on the vermilion snapper stock. The SPR based definition identifies a fixed fishing mortality rate, which would reduce the spawning biomass per recruit to 45% of the unfished level. Powers (1999) estimated $F_{45\%SPR}$ as 0.25.

The more conservative the estimate of OY, the larger the sustainable biomass. The biomass of the population would be least when the rate of fishing mortality is equal to F_{MSY} and would be greatest when the fishing mortality rate was equivalent to 65% of F_{MSY}. Therefore, a larger sustainable biomass associated with a fishing mortality rate at 65% of F_{MSY} would be good for the stock, but could have negative social and economic effects, in the short term, because longer and/or harder short-term reductions in harvest would be needed to achieve larger sustainable biomass.

Like **Alternative 1**, **Alternatives 2a-2c** would specify fixed exploitation rates. However, the rates defined by **Alternatives 2a-2c** relate directly to what is expected to produce MSY (F_{MSY}), consistent with the definition of OY provided in the Magnuson-Stevens Act and as discussed in the National Standard Guidelines at 50 CFR 600.310(b). These alternatives would indirectly benefit the biological and ecological environment by providing a more precise estimation of OY based upon the recent stock assessment.

Alternatives 2a-2c are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Alternative 2a** represents the most precautionary management program of those considered for each unit. This alternative defines OY to equal the average yield associated with fishing at just 65% of F_{MSY}. This OY definition would provide the largest buffer between MSY and OY relative to the other alternatives and, consequently, the greatest assurance that management measures designed to achieve OY would be effective in sustaining gag over the long term.

The Council's **Preferred Alternative 2b** defines OY as the average yield associated with fishing at 75% of F_{MSY}. This definition reduces slightly the safety margin between MSY and OY relative to **Alternative 2a**. Restrepo *et al.* (1998) state "that fishing at 75% of F_{MSY} would result in equilibrium yields at 94% of MSY or higher, and equilibrium biomass levels between 125% and 131% of B_{MSY} – a relatively small sacrifice in yield for a relatively large gain in biomass." A simple deterministic model described in Mace (1994) to describe to evaluate the effects of fishing at 75% of F_{MSY} indicates that the ratios are consistent across a broad set of life history characteristics ranging from species such as snowy grouper with low natural mortality rates to more productive species like vermilion snapper and black sea bass. Restrepo *et al.* (1998) determined the ratio between the yield fishing at 75% of F_{MSY} relative to fishing at 75% of F_{MSY} relative to MSY would range from 0.949 and 0.983. Restrepo *et al.* (1998) also indicate fishing at this rate under equilibrium conditions is expected to reduce the risk of overfishing by 20-30%. Therefore, the biological and ecological effects of this definition for vermilion snapper are still expected to be positive.

Alternative 2c defines OY to equal the average yield associated with fishing at 85% of F_{MSY}. This is the least conservative of those OY alternatives considered because it would further reduce the precautionary buffer between OY and MSY. Therefore, this definition would provide the least amount of indirect benefits to the biological and ecological environment of all the alternatives, and could make it more difficult to sustain vermilion snapper over the long-term.

The Council has specified the Minimum Stock Size Threshold (MSST) as the biomass using the formula MSST = (1-M)*SSB_{MSY}. This formula is recommended in the Technical Guidance Document developed by NMFS (Restrepo *et al.* 1998) and represents 1 minus the natural mortality multiplied by the spawning stock biomass at maximum sustainable yield. **This value is unknown at this time given the high level of uncertainty with the biomass values (Table 52b).** A new age-based stock assessment will be available in late 2008 and that should provide an estimate of the MSST. The new value of MSST will be specified by the new age-based SEDAR assessment expected to be completed in late 2008.

Table 4-52b. Criteria used to determine the overfished and overfishing status of vermilion snapper.
Source: SEDAR Update #3 (2007).

DETERMINATION	SSB_{CURR}	MSST	F_{CURR} (Average of 2004-2006)	MFMT	STATUS
OVERFISHED?	Unknown	Unknown			Unknown (B_{CURR}/MSST = Unknown)
OVERFISHING?			0.729*	0.355**	Overfishing (F_{CURR}/MFMT = 2.05)

*F_{CURR} represents the geometric mean of the fishing mortality during 2004-2006.
** F_{MAX} is used as a proxy for F_{MSY} as recommended by the SSC for the SEDAR Assessment Update #3 (2007).

4.2.2.1 Biological Effects of Management Reference Point Alternatives

Alternatives are shown because the current definitions for MSY and OY are being replaced. In the future, these will not be action items unless the Council decides to change how the MSY and OY are calculated; the values will be updated from the most recent SEDAR assessment.

The Council has chosen **Alternative 2** as the **preferred** where MSY is specified. The Council is aware of the concerns the SSC had with uncertainty and that the SSC did not support the use of this estimate. An assessment will be completed in late 2008. The SSC is confident with the F estimates from the SEDAR Assessment Update #3 (2007) but not biomass estimates.

The Council selected yield at 75%F_{MSY} as the preferred OY alternative for snowy grouper, black sea bass, and red porgy in Amendment 15A. Equilibrium OY is uncertain for vermilion snapper. Until a new assessment is completed, the interim OY is the yield at 75%F_{MAX} (**Preferred Alternative 2b**) as suggested by the SSC. **OY Alternatives 2a**

and 2c represent the yield at 65% and 85% of F_{MSY}, respectively. The values were estimated using the Baranov equation and will also serve as placeholders until the new benchmark assessment is completed.

National Environmental Policy Act (NEPA) 40 CFR §1508.8 (a) defines direct effects "which are caused by the action and occur at the same time and place". NEPA 40 CFR §1508.8 (b) defines indirect effects "which are caused by the action and are later in time or farther removed by distance." According to the NEPA definitions of direct and indirect effects, defining MSY and OY for vermilion snapper will not directly affect the biological or ecological environment, including ESA-listed protected species, because these parameters are not used in determining immediate harvest objectives. MSY and OY are reference points used by fishery managers to assess fishery performance over the long term. As a result, redefined management reference points could require regulatory changes in the future as managers monitor the long-term performance in reference to the new reference points. Therefore, these parameter definitions will indirectly affect subject stocks and the ecosystem of which they are a part, by influencing decisions about how to maximize and optimize the long-term yield of fisheries under equilibrium conditions and triggering action when stock biomass decreases below a threshold level.

MSY Alternative 1 would retain SPR based MSY definitions as a proxy for MSY established for the vermilion snapper stock in Snapper Grouper Amendment 11 (SAFMC 1998d). This SPR-based definition specifies a fixed fishing mortality rate, which would reduce the spawning biomass per recruit to 30% of the unfished level.

MSY provides fishery managers a specific reference point against which to evaluate the sustainability of catches over the long term. MSY is often treated as a limit that should not be exceeded. Not designating a MSY value or designating one not based upon the best available science **(Alternative 1)** could have adverse, indirect effects on the vermilion snapper stock in the south Atlantic.

MSY in **Alternative 1** is defined as the yield produced by F_{MSY}, where $F_{30\%SPR}$ is used as the F_{MSY} proxy. The F_{MSY} based on the SPR proxy associated with the MSY definition in the no action **Alternative 1** (F = 0.35) is very similar to the estimate of F_{MAX} = 0.355 that serves as a proxy for F_{MSY} from SEDAR Assessment Update #3 (2007).

The Council's **Preferred MSY Alternative 2** would redefine the MSY of vermilion snapper to equal the value recommended by the most recent SEDAR stock assessment. Neither value would be expected to result in overexploitation of the stock but the new definition is more precise because it is based on the best available scientific information. **Preferred Alternative 2** would indirectly benefit the biological and ecological environment. Specifying MSY provides fishery managers a specific reference point against which to evaluate the sustainability of catches over the long term. Designation of MSY may make it more likely management actions can be taken to reduce fishing pressure on a stock experiencing unsustainable fishing mortality or a stock that is overfished. Therefore, stocks with reference points based on SEDAR assessments are expected to provide the strongest positive indirect environmental effects.

OY Alternative 1 would retain the OY definition established in the Snapper Grouper FMP Amendment 11 (SAFMC 1998d; however, the value for OY was not specified. Not designating an OY value or designating one that is not based upon the best available science (OY **Alternative 1**) would have adverse, indirect effects on the vermilion snapper stock. This SPR-based definition specifies a fixed fishing mortality rate, which would reduce the spawning biomass per recruit to 40% of the unfished level. Powers (1999) estimated $F_{40\%SPR}$ as 0.25. As **Preferred Alternative 2** is based on a recent assessment, it would provide a better estimate of the OY than **Alternative 1**.

The more conservative the estimate of OY, the larger the sustainable biomass. The biomass of the population would be least when the rate of fishing mortality is equal to F_{MSY} and would be greatest when the fishing mortality rate was equivalent to 65% of F_{MSY}. Therefore, a larger sustainable biomass associated with a fishing mortality rate at 65% of F_{MSY} would be good for the stock, but bad for the fishery, in the short term, because longer and/or harder short-term reductions in harvest would be needed to achieve larger sustainable biomass.

Like **Alternative 1**, **Preferred Alternative 2b and Alternatives 2a and 2c** would specify fixed fishing mortality rates. However, the rates defined relate directly to what is expected to produce MSY (F_{MSY}), consistent with the definition of OY provided at 50 CFR 600.310(b). These alternatives would indirectly benefit the biological and ecological environment by providing a more precise estimation of OY based upon the recent stock assessment.

Preferred Alternative 2b and Alternatives 2a and 2c are distinguished from one another by the level of risk (and associated tradeoffs) each would assume. **Alternative 2a** represents the most precautionary management program of those considered for each unit. This alternative defines OY to equal the average yield associated with fishing at 65% of F_{MSY}. This OY definition would provide the largest buffer between MSY and OY relative to the other alternatives and, consequently, the greatest assurance that management measures designed to achieve OY would be effective in sustaining vermilion snapper over the long term.

The Council's **Preferred Alternative 2b** defines OY to equal the average yield associated with fishing at 75% of F_{MSY}. This definition reduces slightly the safety margin between MSY and OY relative to **Alternative 2a**. Restrepo *et al.* (1998) state "that fishing at 75% of F_{MSY} would result in equilibrium yields at 94% of MSY or higher, and equilibrium biomass levels between 125% and 131% of B_{MSY} – a relatively small sacrifice in yield for a relatively large gain in biomass." A simple deterministic model described in Mace (1994) to evaluate the effects between the yield of fishing at 75% of F_{MSY} relative to fishing at F_{MSY} indicates that the ratios are consistent across a broad set of life history characteristics ranging from species such as snowy grouper with low natural mortality rates to more productive species like vermilion snapper and black sea bass. Restrepo *et al.* (1998) determined the ratio of the yield of fishing at 75% of F_{MSY} relative to F_{MSY} would range from 0.949 and 0.983. Restrepo *et al.* (1998) also indicate fishing at this rate under equilibrium conditions is expected to reduce the risk of overfishing by 20-30%. Vermilion snapper are vulnerable to overfishing because they are moderately long-lived (max age = 14 years), achieve sizes as great as 24" TL, and form schools. Therefore, the biological and ecological effects of this definition for vermilion snapper are still expected to be positive.

Alternative 2c defines OY to equal the average yield associated with fishing at 85% of F_{MSY}. This is the least conservative of the OY alternatives considered because it would further reduce the precautionary buffer between OY and MSY. Therefore, this definition would provide the least amount of benefits to the biological and ecological environment of all the alternatives, and could make it more difficult to sustain vermilion snapper over the long-term.

4.2.2.2 Economic Effects of Management Reference Point Alternatives

As in the case with gag, defining the MSY and OY for vermilion snapper does not alter the current harvest or use of the resource. Specification of these measures merely establishes benchmarks for fishery and resource evaluation from which additional management actions for the species would be based, should comparison of the fishery and resource with the benchmarks indicate that management adjustments are necessary. The impacts of these management adjustments will be evaluated in the appropriate sections of this amendment. As benchmarks, these parameters would not limit how, when, where, or with what frequency participants in the fishery engage the resource. This includes participants who directly utilize the resource (principally, commercial vessels, for-hire operations, and recreational anglers), as well as participants associated with peripheral and support industries.

Since there would be no direct effects on resource harvest or use, there would be no direct effects on fishery participants, associated industries, or communities. Direct effects only accrue to actions that alter harvest or other use of the resource. Specifying MSY and OY, however, establishes the platform for future management, specifically from the perspective of bounding allowable harvest levels. In this sense, MSY and OY may be considered to have indirect effects on fishery participants.

Combined recreational and commercial harvests of vermilion snapper averaged approximately 1.6 million pounds gutted weight from 2001 to 2006 (see Table 4-54). Considering that **Preferred Alternative 2** provides the only estimate of MSY, it affords greater probability for long-term protection of the stock and consequently higher probability for the long-term viability of both commercial and recreational fisheries. In addition, the high MSY level relative to current harvests indicates that even if restrictive measures were to be imposed their short-run costs would likely be outweighed by future benefits.

OY is the long-term goal of fisheries management, and as such it sets the level of potential economic benefits fishery participants can derive from the fishery. OY levels specified in this amendment are mainly biological measures that can be translated to harvest levels. Given harvest levels at specified OY, the corresponding level of economic benefits derivable therefrom highly depends on the management system adopted for the fishery. A controlled access system, for example an IFQ, in the commercial fishery is apt to generate more economic benefits than an open access system given the same OY and harvest level. In general, harvest levels would be driven up to the allowable maximum under an open access system as fishermen compete for a larger share of allowable harvest. On the other hand, there is some possibility that harvest levels under a controlled access system would fall below the allowable maximum if the fishing industry deems it unprofitable to go for a higher harvest level. Thus, there is greater chance that a high OY level may not be sustainable under an open access system. The key issue in this discussion is that OY be set at a more sustainable level and that a given OY and corresponding harvest level may be more sustainable under a controlled access system than under an open access system.

In poundage terms, the various OY alternatives would be 493,592 pounds gutted weight for **Alternative 2a**, 566,179 pounds gutted weight for **Preferred Alternative 2b**, and 624,249 pounds gutted weight for **Alternative 2c**. Given current landings of vermilion snapper, all OY alternatives would provide for highly restrictive harvest levels, with **Alternative 2a** being relatively more restrictive than **Preferred Alternative 2a** and **Alternative 2c**. From the standpoint of commercial and recreational fishing operations, any of the alternatives would likely bring about large reductions in their net benefits derivable from the vermilion fishery. In order to compensate for this relatively large short-run losses, long-term gains especially if they occur farther into the future would have to be very high. Given the preferred MSY level and potential upward drift in yield at OY as overfishing is ended, such large long-term gains may be deemed to be within reasonable realms of probability.

4.2.2.3 Social Effects of Management Reference Point Alternatives

Defining the MSY, OY, or MSST would not cause direct social impacts because it would not place specific controls on the amount or manner in which the resources are harvested. These parameters simply provide management targets and thresholds needed to assess the status and performance of the fishery. All current direct, indirect, consumptive, and non-consumptive uses of the resources will be unaffected. Evaluation of the resource relative to the benchmarks, however, may trigger harvest and/or effort controls, which would directly affect the individuals, social networks, and associated industries related to the fishery, inducing short-term adverse economic impacts until less restrictive management is allowable.

Designation of these benchmarks, therefore, establishes the foundation for subsequent regulatory change. Regulatory change may cause some of the following direct and indirect 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; 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.

A major indirect effect of fisheries management on the fishing community and related sectors is 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 the community. The fact that "the science" can cause relatively large reductions in harvests is particularly disconcerting to many fishermen and concerned stakeholders. The potential for unemployment and financial uncertainty looms large in their envisioned future. An attitude of defeat and resignation among fishermen has been noted in the snapper grouper fishery, and it is not known to what extent mental health may be affected by proposed regulatory change. This "lack of enthusiasm" for fishery management, however defined, coupled with confusion about scientific premises and concepts, has direct and indirect effects on other elements in the fishery, such as enforcement efforts and compliance with current and future regulations. This can lead to inefficient use of resources, ineffectual regulations, and failure to meet management targets, which may precipitate additional restrictions.

Data deficiencies and the complexity of the task make it difficult to determine the biological reference points with certainty. The selection of a particular benchmark has potential implications on resource users depending upon its accuracy relative to the true value. Selection of the wrong alternative, while protecting the resource, may subject the human environment to overly restrictive regulations, increasing the risk to the economic viability of participants in the fishery and associated industries. Alternatively, the erroneous choice of a less conservative alternative when more conservatism is warranted could result in short-term increased economic benefits to fishery participants, but lead to reduced stock sustainability, ultimately leading to more severe social and economic disruptions than would occur under more conservative management. In general, however, the higher the MSY and OY, the greater the allowable, long-term sustainable yield for the fishery and, hence, the greater the long-term social benefits of a sustainable and healthy resource.

Since none of the alternative MSY and OY specifications imply harvest reductions, each implies the potential for increased social benefits once overfishing is ended and the biomass increases. Among the MSY alternatives, MSY is not directly specified in **Alternative 1**. **Preferred Alternative 2** is based on the new value from SEDAR Update #3 (2007) and MSY equals 2.7 million pounds whole weight. This is based on the most recent information, is more accurately reflective of harvest patterns in the fishery and, thus, is expected provide the social benefits of a stable and sustainable fishery.

Among the OY alternatives, OY is not specified in **Alternative 1**. **Alternative 2c** would allow the largest harvests and provide the greatest long-term social benefits, if the specified difference between OY and MSY is sufficient to capture the environmental variability of the resource. **Preferred Alternative 2b**, however, may provide a better hedge against harvest overages, thereby supporting more stable harvests and social benefits. **Alternative 2a** would be more restrictive on the fishery and, if unnecessarily conservative, it would generate the least long-term social benefit.

MSST is unknown at this time.

4.2.2.4 Administrative Effects of Management Reference Point Alternatives

The potential administrative effects of these alternatives differ in that the scenarios defined by each vary in terms of the implied restrictions required to constrain the fisheries to the respective benchmarks. Of the two MSY alternatives, only **Preferred MSY Alternative 2** identifies a specific harvest level.

In theory, the larger the allowable harvest, the less restrictive and administratively burdensome subsequent management is needed to be. From this perspective **MSY** and **OY Alternative 1** would allow the largest harvest, and therefore less restriction. However, the more conservative the estimate of OY, the larger the sustainable biomass, which translates into a lower administrative burden. **Alternative 2a** reflects the highest level of restriction, based on 65% of F_{MSY}, and **Alternative 2c** reflects the lowest level of restriction, based on 85% of F_{MSY}. The **Preferred OY Alternative 2b** would establish an intermediate safety margin, based on 75% of F_{MSY}, relative to **Alternatives 2a and 2c**. However, it would reduce the possible administrative burden of justifying the potentially excessively conservative management position embodied by **Alternative 2a**, and correcting the problems induced by the potential management programs that could lead to overfishing under **OY Alternative 2c**.

The vermilion snapper MSST is unknown at this point but an estimate will be forthcoming after the 2008 age-based stock assessment has been completed.

4.2.2.5 Council Conclusions

The Council has proposed formulas for specifying the Maximum Sustainable Yield (MSY) and Optimum Yield (OY). The actual values are to come from SEDAR assessments, and in the future this will not be an action item. The value will simply be updated based on the most recent SEDAR stock assessment.

The formula to calculate the Minimum Stock Size Threshold (MSST) was previously specified by the Council. This is not an action item; the value will be updated from the most recent SEDAR stock assessment.

The Council has proposed MSY and MFMT values based on the best available data from the most recent SEDAR Assessments. The Council's Scientific and Statistical Committee (SSC) has approved the assessment.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternatives should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative. The AP has recommended the Council specify the least restrictive action to end overfishing using the new age-based SEDAR stock assessment.

The Council concluded their proposed Optimum Yield (OY) of 75% of the fishing mortality rate that will produce MSY (F_{MSY}) best meet the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.2.3 Vermilion Total Allowable Catch

Vermilion snapper is experiencing overfishing but the overfished status is unknown. The Council's SSC recommended a restriction in harvest to F_{OY} equal to the yield associated with 75% of F_{MSY}. The would correspond to a Total Allowable Catch (TAC) of 566,179 pounds gutted weight for all sectors (Table 4-53).

The Council evaluated one alternative, other than the no action alternative, based on their preferred alternative for OY as 75% of F_{MSY}. Other alternatives were considered for OY, which in turn would have resulted in other values for TAC. Therefore additional TAC values were linked to the OY decision so actually more than this one value for TAC was under consideration. The preferred alternative is based on the yield at 75%F_{MSY}, which was the Council's preferred alternative for OY. The Council also considered OY alternatives for 65%F_{MSY} and 85%F_{MSY}, which could correspond to TACs above and below those specified in the preferred alternative.

Table 4-53. Vermilion snapper total allowable catch (TAC).

Alternatives	TAC (pounds whole weight)
Alternative 1 (no action)	Do not specify a total allowable catch (TAC).
Alternative 2 (preferred)	Set the total allowable catch (TAC) = 566,179 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.
*Source: SSC.	

4.2.3.1 Biological Effects

Preferred Alternative 2 would establish a TAC based on the yield at F_{OY} rather than the yield at F_{MSY}. Setting a TAC at the yield at F_{OY} would increase the probability that overfishing would not occur and ensure that the stock did not become overfished.

SEDAR Assessment Update #3 (2007) and the benchmark assessment conducted in 2003 (SEDAR 2-SAR2 2003) indicated vermilion snapper was experiencing overfishing. The benchmark assessment concluded that the high degree of uncertainty in recruitment and spawning stock biomass estimates meant that reliable biomass based benchmarks could not be developed from the assessment, and this was found to be the case for the update assessment as well.

The ratio of fishing mortality in 2006 to F_{MAX} was 2.05, compared to 1.71 in the benchmark assessment, suggesting that overfishing continues and at a higher rate. Projections were used to evaluate the potential of the stock to be rebuilt, but could only be conducted for constant F scenarios. Four projections were considered: $F=F_{MAX}$; $F=85\%F_{MAX}$; $F=75\%F_{MAX}$; and $F=65F_{MAX}$; the results of each were very similar. The Council's SSC recommended the Council restrict harvest to the F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a total allowable catch (TAC) of 566,179 pounds gutted weight for all sectors (Table 4-53).

The vermilion snapper stock in the Atlantic is undergoing **overfishing** as of 2006 (last year of data in the stock assessment update). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For vermilion snapper the most recent estimate of the fishing mortality rate is from 2006 and was = 0.729. The Council is using the fishing mortality rate that produces the greatest yield per fish (F_{MAX} = 0.355) as the maximum fishing mortality threshold. F_{MAX} is being used as a proxy for F_{MSY} (F_{MSY} = Fishing mortality rate that would produce maximum sustainable yield) because the SSC did not have confidence in the calculated biomass reference points. The SSC does have confidence in the fishing mortality rate estimates from the SEDAR assessment. Comparing these two numbers:

- F_{2006}/MFMT = 0.729/0.355 = 2.05

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

Whether the vermilion snapper stock in the Atlantic is currently **overfished** is unknown because the SSC does not have confidence in the biomass reference points from the SEDAR assessment. Recognizing the need for a new benchmark assessment, NMFS and the state of South Carolina began sampling available vermilion snapper otoliths to enable an age-based assessment. The new benchmark assessment will be completed in late 2008. A new TAC based on the yield at F_{OY} from the new benchmark assessment would replace the value specified in Table 4-53.

Setting TAC to the yield at F_{OY} rather than F_{MSY} would ensure overfishing ends and that stock did not become overfished. With **Preferred Alternative 2**, a reduction in fishing mortality and subsequent increase in biomass would be expected to restore the natural population structure of the stock and benefit the ecosystem in which vermilion snapper occur.

4.2.3.2 Economic Effects

The setting of TACs is akin to setting management reference points in the sense that it sets the bounds for stipulation of management measures to control harvest to the specified TAC. In this sense, it does not have direct economic impacts, but being a notch closer to the actual management measures than management reference points, its indirect impacts are more predictable in terms of direction and relative magnitude than those of management reference points.

Total Allowable Catch (TAC) levels are provided in this amendment to end overfishing of vermilion snapper**.** **Alternative 1**, which does not provide a catch level, may be ruled out since it does not address the current overfishing condition of vermilion snapper. **Preferred Alternative 2** sets the catch level at 566,179 pounds gutted weight, and this is expected to end overfishing of vermilion snapper.

As specified in **Preferred Alternative 2**, the TAC for vermilion snapper is set at a level 64% lower than the 2001-2006 average vermilion harvest. It may thus be expected that stringent management measures would have to be implemented. The resulting short-run economic impacts of these stringent management measures on fishing participants may be expected to be substantially negative for the vermilion snapper fishery as a whole. Long-term economic impacts would have to be substantially more positive to outweigh short-run adverse impacts.

The actual harvest reduction to the commercial and recreational sectors would depend on some other measures in this amendment, such as the commercial/recreational allocation, quota, quota closures, bag limits, size limits, and seasonal closures. The economic impacts of these other measures are discussed in pertinent sections of this amendment. It may only be stated now that harvest reductions could result in more than proportionate reductions in economic benefits.

4.2.3.3 Social Effects

The setting of TAC is almost similar to the setting of management reference points in the sense that it mainly has indirect social impacts, because it would not place specific controls on the amount or manner in which the resource is harvested. However, unlike management reference points, a TAC provides specific harvest levels that would set narrowly defined effort control measures, which would directly affect the individuals, social networks, and associated industries related to the fishery.

Alternative 1 does not provide for TAC setting. Although this would result in maintaining short-run social interactions and structures, it could have more disruptive social implications if the vermilion snapper stock experience more overfishing since by then more strict management measures would have to be implemented.

Preferred Alternative 2 sets a TAC for vermilion snapper at a level 64% below current harvest levels in the fishery. More stringent measures in terms of harvest and effort controls may be expected from this alternative, with possibly large concomitant disruption in the businesses and lives of fishing participants and associated industries and communities. Such disruption may be deemed short-run in nature, but if the duration of this disruption becomes lengthy, fishing related businesses in the commercial and recreational sectors could cease to operate. For current fishing participants to benefit from the more constrained vermilion snapper fishery, long-term benefits would not only have to be substantial but they also would have to accrue over a relatively short time.

The more specific social implications of the TAC for vermilion snapper are discussed in particular sections defining actual management measures.

4.2.3.4 Administrative Effects

Alternative 1 would not establish a TAC for vermillion snapper. In the short-term there would be no administrative impacts under this alternative; however, in the long-term, if a TAC is not specified, the likelihood that overfishing would continue is very high. If overfishing were allowed to persist, additional management measures would be required in order to comply with the ending of overfishing provisions found in the Reauthorized Magnuson-Stevens Act, which in turn would create a significant administrative burden. Under **Preferred Alternative 2** a TAC would be established that ends overfishing. A minimal administrative burden would be incurred under this alternative and would take the form of the development of outreach materials and continued monitoring of fishery compliance with regulations associated with this action.

4.2.3.5 Council Conclusions

The Council has proposed a Total Allowable Catch (TAC) based on the best available data from the most recent SEDAR Assessments. The Council's Scientific and Statistical Committee (SSC) has approved the assessment and recommended that the Council restrict harvest to this level. The Council concluded their proposed TAC is sufficiently conservative to prevent overfishing in the future.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative. The AP has recommended the Council specify the least restrictive action to end overfishing using the new age-based SEDAR stock assessment.

The Council concluded their proposed TAC best meet the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.2.4 Interim Vermilion Snapper Allocation Alternatives

Alternative 1 (no action). Do not define interim allocations for vermilion snapper.

Alternative 2 (preferred). Define interim allocations for vermilion snapper based upon landings from the NMFS landings (ALS), NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 68% commercial and 32% recreational. This alternative would establish a commercial quota of 385,002 pounds gutted weight (427,352 pounds whole weight) and a recreational allocation of 181,177 pounds gutted weight (201,107 pounds whole weight). [See Table 4-54a.]

Table 4-54a. Vermilion snapper commercial quotas and recreational allocations (pounds gutted weight).

Vermilion Snapper		Allocation Alternative 1. 64%C/36%R		Allocation Alternative 2. (Preferred) 68%C/32%R	
	Annual	Commercial	Recreational	Commercial	Recreational
Year	TAC* (gutted weight)	Quota** (gutted weight)	Allocation** (gutted weight)	Quota (gutted weight)	Allocation (gutted weight)
2009 Onwards	566,179	362,355	203,824	385,002	181,177

*The harvest based on 75% of F_{MAX} is being used to determine TAC. This number may be modified based on the SSC's deliberations in June 2008.
**Alternative 1 would not specify a commercial or recreational allocation for vermilion snapper.

Allocation Alternatives 1 and 2 are compared to the average 2004-2006 landings in Table 4-54b to determine the percentage reduction to each sector (Table 4-55).

Table 4-54b. Historical vermilion snapper landings (gutted weight).

Vermilion Snapper Landings (pounds gutted weight)				Total	Total
Year	Commercial	Headboat	MRFSS	Recreational	Landings
2001	1,515,535	362,718	222,690	585,408	2,100,943
2002	1,228,928	294,094	159,450	453,544	1,682,472
2003	686,586	258,957	187,733	446,690	1,133,276
2004	1,001,297	342,138	247,219	589,357	1,590,654
2005	1,009,300	281,059	244,385	525,444	1,534,744
2006	765,216	362,476	262,328	624,804	1,390,021
Avg 04-06	925,271	328,558	251,311	579,868	1,505,139
Note: 2001 thru 2005 from SEDAR Update #3 (2007).					

Source: ALS, MRFSS Web site; Headboat survey. Data do not include dead discards and MRFSS data are A+B1; weight not converted from numbers.

Table 4-55. Percentage reductions by sector across the alternative vermilion snapper allocations.

Alternative	Commercial Reduction	Recreational Reduction
1	61%	65%
2 (**Preferred**)	58%	69%

4.2.4.1 Biological Effects of Allocation Alternatives

Alternative 1 would not specify a commercial or recreational allocation for vermilion snapper. If an allocation were not specified then it would not be possible to identify the allowable catch in the recreational sector; however, the commercial quota could be specified as the status quo assuming 64% of the landings are from the commercial sector.

In September 2007 the Advisory Panel recommended **Preferred Alternative 2**. The Council examined the complete time series and noticed there was little difference in the percentage commercial and recreational when any time series was examined. The Council concluded the longest time series (**Preferred Alternative 2**) was the best approach. In addition, the Council discussed whether an additional alternative was necessary but given the similar distribution over the years of data, the Council concluded two alternatives were appropriate for this action.

Using the landings data (in pounds gutted weight) and the allocations for the two time periods shown results in the commercial quotas and recreational allocations shown in Table 4-54a.

Alternative 1 would perpetuate the existing level of risk to protected species. The overall impact of **Preferred Alternative 2** on protected species are uncertain. Sea turtle abundance in the South Atlantic changes seasonally and the impact of fishing effort shifts, if any, resulting from these alternatives is difficult to predict. Current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

4.2.4.2 Economic Effects of Allocation Alternatives

4.2.4.2.1 *General Discussion*

There is only one alternative allocation ratio to the no action alternative. In general, allocation alternatives for vermilion snapper would determine the distribution of harvest reductions to the commercial and recreational sector due to the proposed catch level to address overfishing of vermilion snapper. **Preferred Alternative 2** was generated through an examination of sector harvests for 1986-2005 rather than an attempt to identify the allocation that maximized net benefits, or in the present case minimized net losses, because application of the maximum benefit analysis is not possible at this time with available data.

4.2.4.2.2 *Commercial Sector*

Assuming that the commercial allocation would be implemented by quota and quota closures, **Preferred Alternative 2** is expected to reduce commercial net operating revenues by 61.1% or about $2.8 million for vessel trips landing at least one pound of vermilion snapper (Table 4-56). Vertical line vessel trips would bear most of the revenue losses in terms of both percentage and absolute values, mainly because these vessel trips landed most of vermilion snapper. These particular vessel trips could experience net revenue losses of about $2.7 million, which is about 96.8% of total net operating revenue losses to the commercial sector. The relatively low levels of net operating revenue reductions for other vessel trips correlate directly with landings and net operating revenues from those vessel trips. Longline vessel trips would virtually remain unaffected by the allocation measure, because of the extremely low landings of vermilion snapper by these vessel trips.

Net revenue losses would be relatively much less when considering vessel trips landing at least one pound of any snapper grouper species. For these vessel trips, net operating revenue losses would be approximately $1.6 million, or 15.4% of the relevant baseline figure. The distribution of economic impacts across gear types would be relatively similar to that for trips landing at least one pound of vermilion snapper, with vertical line vessel trips bearing most of the net operating revenue reductions.

Table 4-56. Reductions in commercial vessels' net operating revenues from a vermilion snapper allocation alternative, in thousand 2005 dollars, by gear type.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
Vessel trips landing at least one pound of vermilion snapper								
Baseline	112	4,478	4	9	18	24	0	4,646
Alt. 2 (Pref)	**-69**	**-2,749**	**0**	**-3**	**-11**	**-9**	**0**	**-2,840**
Vessel trips landing at least one pound of any snapper grouper species								
Baseline	634	8,131	544	388	305	347	3	10,351
Alt. 2 (Pref)	**-5**	**-1,586**	**0**	**-1**	**1**	**-2**	**0**	**-1,592**

The baseline figures in Table 4-57 indicate that net operating revenues of commercial vessel trips fall as one moves from North Carolina down to the Florida Keys. This distribution of net operating revenues matches perfectly with the distribution of vermilion snapper landings. South Carolina has the highest net operating revenues, followed by North Carolina, Georgia/Northeast Florida, and the rest of areas in Florida. Reductions in net operating revenues follow a similar distribution across the various areas. The three northern areas would account for approximately 98.2% of total net operating revenue reductions. South Carolina would incur the largest reduction in net operating revenues of $1.14 million, followed by North Carolina with $1.04 million, and then by Georgia/Northeast Florida with $0.62 million. The rest of the areas would incur combined net operating revenue losses of $0.51 million.

Net operating revenue reductions would again be relatively less when considering trips landing at least one pound of any snapper grouper species. Losses would be approximately $0.61 million for North Carolina, $0.53 million for South Carolina, and $0.43 million for Georgia/Northeast Florida (Table 4-57). Net operating revenue reductions would be relatively low in other areas. Notice now that North Carolina would incur more losses than South Carolina. This would partly imply that North Carolina has more trips than South Carolina that would be affected by regulations in the vermilion snapper fishery.

In percentage terms, the distribution of baseline net operating revenues for trips landing at least one pound of vermilion snapper is as follows: 33.6% for North Carolina, 40.2% for South Carolina, 24.2% for Georgia/Northeast Florida, and 2.1% for the other areas. Now, the percent distribution of net operating revenue reductions for trips landing at least one pound of vermilion snapper would be as follows: 36.4% for North Carolina, 40% for South Carolina, 21.8% for Georgia/Northeast Florida, and 1.8% for the other areas. These percentages indicate that North Carolina would incur more than proportionate reductions in net operating revenues, South Carolina would experience about proportionate reductions in net operating revenues, and Georgia/Northeast Florida and other areas would face less than proportionate reductions in net operating revenues.

Table 4-57. Reductions in commercial vessels' net operating revenues from a vermilion snapper allocation alternative, in thousand 2005 dollars, by area.

Model	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
Vessel trips landing at least one pound of vermilion snapper							
Baseline	1,560	1,867	1,123	71	26	0	4,646
Alt. 2 (Pref)	**-1,035**	**-1,135**	**-619**	**-39**	**-12**	**0**	**-2,840**
Vessel trips landing at least one pound of any snapper grouper species							
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
Alt. 2 (Pref)	**-609**	**-533**	**-427**	**-16**	**-6**	**0**	**-1,592**

4.2.4.2.3 *Recreational Sector*

Assuming that the recreational harvest of vermilion snapper would be limited to the sector's allocation, **Preferred Alternative 2** may be expected to result in recreational benefit losses of about $1.25 million (Table 4-58). Approximately $1.17 million, or 93.5% of all losses, would be in terms of reductions in consumer surplus. Most of the losses in consumer surplus ($0.72 million) would come from headboat anglers. Losses in consumer surplus to private mode anglers would be about half of those of headboat anglers ($0.36 million). One major reason for the relative magnitudes of consumer surplus losses is the dominance of headboat anglers in harvesting vermilion snapper. Private mode anglers harvested about half as many vermilion snapper as harvested by headboat anglers.

Losses in producer surplus would be approximately $81 thousand, and this would be about evenly distributed between headboats ($43 thousand) and charterboats ($38 thousand). The low level of producer surplus losses would be partly due to relatively few target trips for vermilion snapper by the for-hire sector.

Table 4-58. Reductions in producer and consumer surplus from an allocation alternative for vermilion snapper, in thousand 2005 dollars, by fishing mode.

	Charterboats		Headboats		Private	
	Prod. Surp.	Cons. Surp.	Prod. Surp.	Cons. Surp.	Cons. Surp.	Total Effects
Baseline	537	286	173	1,526	1,055	3,577
Alt. 2 (Pref)	**38**	**90**	**43**	**721**	**362**	**1,254**

South Carolina would bear the largest reduction in total economic values of $431 thousand (34.4%), followed by Florida at $334 thousand (26.6%), North Carolina at $279 thousand (22.2%), and Georgia at $210 thousand (16.7%) (Table 4-59). These reductions relate directly to the proportional share of vermilion snapper harvests and therefore consumer/producer surplus of the respective states. A significantly greater portion of total losses in each state would be in the form of consumer surplus.

Table 4-59. Reductions in producer and consumer surplus from an allocation alternative for vermilion snapper, in thousand 2005 dollars, by fishing area.

	Florida		Georgia		South Carolina		North Carolina		Total Effects
	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	
Baseline	564	965	11	331	55	793	81	778	3,577
Alt. 2	54	280	3	207	13	418	11	268	1,254

4.2.4.3 Social Effects of Allocation Alternatives

As discussed in Section 4.2.4.2, the Council's vermilion snapper allocation alternative relative to the status quo would result in economic losses to both the commercial and recreational sectors. Appropriate changes in social benefits would be expected to similarly result. No alternative allocation has been identified that would benefit one sector while not harming the other sector.

In addition to the expected adverse economic effects on the commercial sector, any allocation would be accompanied with effects that cannot be quantified. If these unquantifiable effects are compounded as the magnitude of the allocation increases, substantially increased adverse social impacts could accrue to the commercial sector as a result of **Preferred Alternative 2** relative to the other alternative. Allocation away from historical distributions is a particularly divisive issue in fisheries, regardless of the amount of quantitative justification the allocation may appear to have. This is particularly true when incomes and livelihoods become affected. While appropriate data on business failure/exit do not exist, anecdotal information point to the increasing difficulty commercial fishermen have remaining in fisheries in general due to increased fuel costs, stagnant or declining ex-vessel prices, decreasing dock space and numbers of fish houses, fewer or more restrictive species options, and generally more restrictive management measures. Similar pressures exist for for-hire business operators. However, all of the allocation alternatives, while mitigating the effects of some of these pressures on the recreational sector, would exacerbate these pressures on the commercial sector. While none of the allocation alternatives to the status quo would be neutral to the commercial sector, lower adverse social impacts to the commercial sector and associated industries and communities would be expected to accrue to those alternatives that result in the lowest allocation away from the commercial sector.

4.2.4.4 Administrative Effects of Allocation Alternatives

Alternative 1 would maintain the status quo with no commercial or recreational allocations specified for vermilion snapper, and therefore would not have an effect on the administrative environment. **Preferred Alternatives 2** would allocate 68% of the TAC to the commercial sector and 32% to the recreational sector. The preferred alternative would increase the administrative burden on NOAA Fisheries Service, as landings would need to be monitored in relation to the commercial and recreational portion of the allocation for overages and commercial quota purposes. **Preferred Alternative 2** would require the establishment of a more sophisticated quota/allocation monitoring system.

4.2.4.5 Council Conclusions

The Council has proposed an interim allocation based on average landings from the years 1986-2005 because this reflects proportions taken over the longest time series available by the commercial and recreational sectors. Also, the Snapper Grouper Advisory Panel recommended this alternative. The Council concluded their proposed allocation is fair and equitable based on the information available.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative.

The Council concluded their proposed allocation best meet the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.2.5 Management Alternatives

Alternative 1. No action. **Current Regulations:**

(i) Current vermilion snapper commercial regulations = 12 inch TL size limit; commercial quota = 1,100,000 pounds gutted weight (1,221,000 pounds whole weight); vessels with longlines may only possess deepwater species; and limited entry program with 2 for 1 provision.

(ii) Current vermilion snapper recreational regulations = 12 inch TL size limit and 10 vermilion snapper bag limit.

Alternative 2 (Preferred). Directed Commercial Vermilion Snapper Quota. Establish a directed commercial vermilion snapper quota based on an interim allocation of 68% commercial and 32% recreational (Table 4-60). After the commercial quota is met, all purchase and sale is prohibited and harvest and/or possession is limited to the bag limit.

Table 4-60. Commercial vermilion snapper quota taking into consideration estimate of PQBM.

	Pounds Gutted Weight
Commercial quota	385,002
PQBM	57,000
Directed quota	**328,002**

Alternative 3. Divide the directed commercial vermilion snapper quota into seasons.

Alternative 3a (Preferred). Allocate the directed commercial vermilion snapper quota 50% to the period January 1st through June 30th and 50% to the period July 1st through December 31st (Table 4-61). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 4-61. Commercial vermilion snapper quotas for January-June (50%) and July-December (50%) taking into consideration estimate of PQBM.

	Pounds Gutted Weight
Commercial quota	385,002
Jan-June 50%	192,501
PQBM	24,000
Directed quota Jan-June	**168,501**
July-Dec 50%	192,501
PQBM	37,000
Directed quota July-Dec	**155,501**

Alternative 3b. Allocate the directed commercial vermilion snapper quota 40% to the period January 1st through June 30th and 60% to the period July 1st through December 31st (Table 62). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 4-62. Commercial vermilion snapper quotas for January-June (40%) and July-December (60%) taking into consideration estimate of PQBM.

	Pounds Gutted Weight
Commercial quota	385,002
Jan-June 40%	154,001
PQBM	27,000
Directed quota Jan-June	**127,001**
July-Dec 60%	231,001
PQBM	35,000
Directed quota July-Dec	**196,001**

Alternative 3c. Allocate the directed commercial vermilion snapper quota 50% to the period January 1st through August 31th and 50% to the period September 1st through December 31st (Table 63a). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward

Table 4-63a. Commercial vermilion snapper quotas for January-August (50%) and September-December (50%) taking into consideration estimate of PQBM.

	Pounds Gutted Weight
Commercial quota	385,002
Jan-Aug 50%	192,501
PQBM	43,000
Directed quota Jan-Aug	**149,501**
Sept-Dec 50%	192,501
PQBM	21,000
Directed quota Sept-Dec	**171,501**

Alternative 4. Manage the commercial vermilion snapper quota with a fishing year beginning May 1 and a 1,000 pound trip limit (gutted weight). [See Table 4-63b.]

Table 4-63b. Commercial quota (pounds gutted weight) for vermilion snapper.

Commercial quota	Pounds Gutted Weight 385,002
PQBM with trip limit	10,500
PQBM after quota	40,000
Directed quota	**334,502**

Alternative 5. Adjust recreational vermilion snapper bag/size limits and establish a recreational vermilion snapper closed season; no fishing for and/or possession of vermilion snapper would be allowed during the closed season; and captain crew on for-hire vessels would not be able to retain vermilion snapper.

Alternative 5a. Increase the recreational size limit to 14" TL and reduce the bag limit to 3 vermilion snapper (Total Reduction = 71%).

Alternative 5b. Increase the recreational size limit to 13" TL and reduce the bag limit to 1 vermilion snapper (Total Reduction = 73%).

Alternative 5c. Increase the recreational size limit to 13" TL and reduce the bag limit to 6 vermilion snapper (53% reduction) and close September & October (16% reduction) (Total Reduction = 61%).

Alternative 5d (Preferred). Reduce the bag limit from 10 to 4 vermilion snapper (45% reduction) and a season closure (no fishing for and/or possession) of October through May 15th (38% reduction) (Total reduction = 66%). Size limit remains at 12" TL.

Post Quota Bycatch Mortality (PQBM) calculations in the tables above assume after the trip limit is met or after the quota is met there is no directed catch and incidental catch is due to targeting co-occurring species. After the quota is met, it is assumed that 20% of the trips would not be made and fishermen can avoid 20% of vermilion snapper.

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the vermilion snapper closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

4.2.5.1 Biological Effects of Management Alternatives

The benchmark SEDAR assessment (SEDAR 2-SAR2 2003) and the updated SEDAR assessment (SEDAR Update #3 2007) are based on lengths. There is uncertainty about the biomass-based conclusions from these assessments, and the SSC has recommended the Council not use the biomass-based values because of uncertainty about the spawner/recruit relationship. The SSC has confidence in the fishing mortality rate values and recommends the Council use those values to reduce harvest and end overfishing. The Council is basing stock status and management decision on the fishing mortality rate values and not the biomass-based values from the SEDAR Update #3 (2007).

During the scoping process, many individuals commented that what they are seeing on the water does not agree with assessment results. Some individuals believe the vermilion snapper population is in good shape. NOAA Fisheries Service completed aging of otolith samples for vermilion snapper in early 2008, and the SEDAR process will be used to complete a new age-based benchmark assessment by late 2008.

However, under current law, the Council must move forward based on the information they have in hand (SEDAR Update #3 2007). Section 4.4 allows the Regional Administrator to impose less restrictive measures as specified by the Council if the new assessment indicates a lower level of reduction or no reduction in harvest is necessary.

The Snapper Grouper Advisory Panel recommended that, until the Council gets an updated stock assessment with biomass values, the Council take no action except to develop the allocation action. They noted the regulations from Amendment 13C have not been in place long enough to have much of an effect.

Alternative 1. No Action

Alternative 1 would retain the current regulations used to manage catches of vermilion snapper, perpetuating the existing level of risk to protected species. In general, regulations include a limited access system, a 1.1 million pound gutted weight commercial quota, a 12” total length (TL) commercial and recreational minimum size limit, and a 10 fish bag limit. In addition, the *Oculina* HAPC is closed to all bottom fishing off the coast of Florida (an area where vermilion snapper are known to occur). Limited access systems are designed to limit the type and amount of effort applied to a fishery. Minimum size limits are generally used to maximize the yield of each fish recruited to the fishery and to protect a portion of a stock from fishing mortality. The idea behind maximizing yield is to identify the size that best balances the benefits of harvesting fish at larger, more commercially valuable sizes against losses due to natural mortality. Protecting immature and newly mature fish from fishing mortality provides them increased opportunities to reproduce and replace themselves before they are captured. If the size limit chosen is larger than the size at first reproduction for the species in question, then a sufficient pool of spawners could be retained even if fishing pressure is heavy.

The Science Center conducted an analysis to determine the size limit that maximizes the yield of each fish recruited to the fishery. The analysis indicated that changes in the recreational minimum size limit offer very little changes in yield-per-recruit at F_{MAX}, 65% F_{MAX}, 75% F_{MAX}, and 85% F_{MAX}. Bigger gains in yield-per-recruit are best achieved through changes in fishing mortality. The authors indicated that the results are not surprising, especially given that this analysis is only manipulating the recreational sector of fishing, which in recent years only accounts for ~30% of the total fishery landings (Figure 4-7; **Appendix G**).

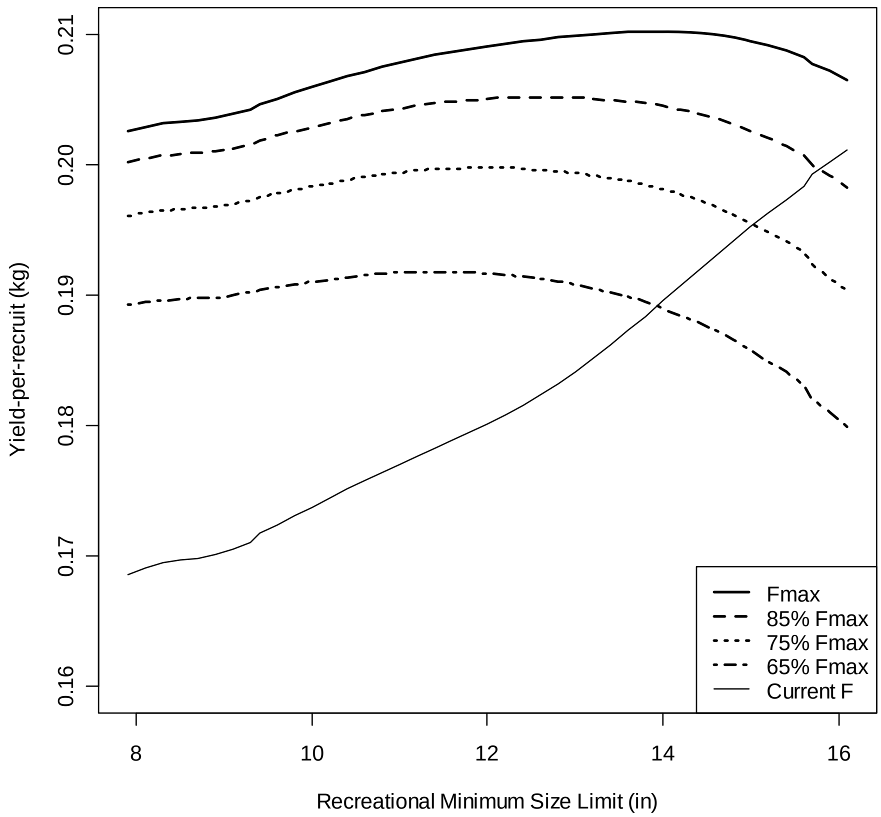


Figure 4-7. Plot of yield-per-recruit (kg) as a function of recreational size limit (inches TL) for various fishing mortality rates (F).

These types of measures are generally expected to benefit the environment in the short term and long term by limiting the extent to which a stock is targeted. However, the extent to which such benefits are realized depends on the appropriateness of a measure when applied to a specific stock, as well as if and to what extent fishing effort changes or shifts in response to the select management measure. Minimum size limits can have detrimental effects on fish stocks because they do not protect the older year classes. Recruitment problems can occur in a fishery that has fewer age classes than an unfished population. For example, a population might live for ten years, but minimum sizes might allow for the harvesting of all fish older than four years of age. Recruitment failure could occur if there were several consecutive years of poor recruitment due to environmental conditions. The older age classes might not be present to guard against recruitment failure as they would under natural conditions. This truncation of average size is often undesirable from an economic perspective, because larger fish are sought after by recreational fishermen and because commercial markets often favor fish of a certain size.

Additionally, minimum size limits encourage the harvest of older, larger fish that have the greatest reproductive potential. For example, fecundity has an exponential relationship with size. One 60.5 cm (23.8 inches) female red snapper can produce the same number of eggs as 212 females at 42 cm (PDT 1990). Therefore, the size of the spawner, not just the overall number of spawners, is important when considering the reproductive potential of a population, and removal of all the large spawners can be catastrophic even if some smaller spawners remain. If the size limit is set below the minimum size for reproduction, heavy fishing pressure may lead to reproductive failure, as the size limit does not protect fish of spawning size.

Discard mortality also can limit the amount by which fishing effort and mortality is reduced by limited access systems, trip limits, and minimum size limits, if fishermen catch and discard vermilion snapper when targeting co-occurring species. Additionally, the environmental benefits of a closed area management strategy can be reduced or negated if not integrated with some form of control on fishing mortality and effort outside the closed area.

Amendment 13C (SAFMC 2006) increased the size limit of vermilion snapper taken by recreational fishermen from 11 inches TL to 12 inches TL. There was some concern from the Council and the public that an increased size limit could increase the magnitude of discards if a large portion of vermilion snapper taken by recreational fishermen are less than 12 inches TL. Examination of Waves 1-5 during 2007 relative to 2006 reveal an increase in the number of discards during Waves 3, 4, and 5 when most of the vermilion snapper are caught (Table 4-64).

Table 4-64. Harvested (A+B1) and discards (B2) catch of vermilion snapper for Waves 1-5 during 2006 and 2007.

	2006		
	A+B1	B2	%B2s
Wave 1	8,610	47	0.54%
Wave 2	32,271	53,517	62.38%
Wave 3	47,847	8,482	15.06%
Wave 4	107,442	15,258	12.44%
Wave 5	35,274	21,610	37.99%
Total	231,444	98,914	29.94%
	2007		
	A+B1	B2	%B2s
Wave 1	23,819	7,627	24.25%
Wave 2	33,187	13,543	28.98%
Wave 3	75,918	80,154	51.36%
Wave 4	103,079	99,631	49.15%
Wave 5	43,096	66,212	60.57%
Total	279,099	267,167	48.91%

The effect of increasing the minimum size on the magnitude of discards is more pronounced when annual MRFSS data (Figure 4-8). No increase in the number of discards was observed in 1991 when a 10 inch TL size limit was imposed for vermilion snapper. However, a large spike in the number of discarded vermilion snapper occurred in 1999 when the minimum size limit was increased to 11 inches TL. The number of discards decreased after 2000 as fish grew into the new size limit. Another very large increase in the number of discarded fish occurred in 2007 after the recreational minimum size limit was increased to 12 inches TL through actions taken in Amendment 13C (SAFMC 2006).

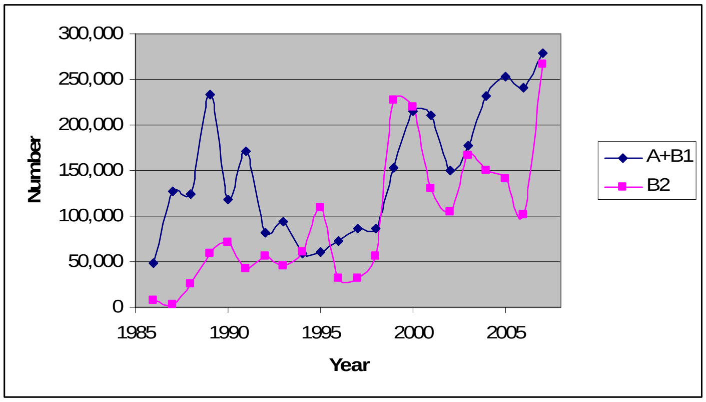


Figure 4-8. Annual number of vermilion snapper harvested (A+B1) and discarded (B2) during 1986 – 2007.
Notes: Data for 2007 do not include Wave 6 (November – December) numbers.

Alternative 1, which retains the status quo management strategy, would be expected to adversely impact the vermilion snapper stock, if results from the vermilion snapper assessment update are correct. To determine the actual environmental effects of the no action management alternative on vermilion snapper, one must first examine current trends in harvest levels, stock biomass levels, and life history characteristics, then predict the direction of future trends under status quo management. The recent SEDAR assessment update determined the vermilion snapper stock in the South Atlantic is undergoing overfishing (SEDAR Update #3 2007). The Council's Scientific and Statistical Committee (SSC), in June 2007, recommended the Council not adopt the biomass and yield benchmarks used to determine whether the stock is overfished, as they were deemed unreliable for management purposes due to uncertainty about the spawner/recruit relationship.

Commercial landings of vermilion snapper rose from 743,000 to 954,000 lbs gutted weight during 1992 to 1995 (Figure 4-5). Landings declined to 718,000 lbs gutted weight followed by a large increase to 1,682,000 lbs gutted weight in 2001. A large decline in landings to 760,000 lbs gutted weight occurred in 2003 followed by an increase to about 1,000,000 lbs gutted weight in 2004-2005. Landings decreased further in 2006. The CPUE of vermilion snapper taken with MARMAP trapping gear showed similar trends to commercial landings with an increase during 1994-1996 from 5.8 to 6.2 fish caught per hour followed by a decrease to 2.2 fish caught per hour in 1999 (SEDAR Update #3 2007). CPUE increased to 4.7 fish caught per hour in 2001 with a sharp decrease in 2003 to 0.35 fish per trap hour, the lowest value recorded since 1988. Low CPUE in 2003, as well as low commercial catches, was probably due to a prolonged cold water upwelling event. A slight increase in CPUE occurred in 2004 and 2005-2006 values were similar to 2004. Headboat CPUE increased during 1992-2002, decreased in 2003 and then increased again during 2004-2006 (SEDAR Update #3 2007).

Zhao *et al*. (1997) and Zhao and McGovern (1997) report during the middle 1990s, the vermilion snapper stock was exhibiting many of the symptoms of an overexploited population, including a decrease in size at age, possibly caused by fishing pressure. Since these studies were conducted, the Council established a program to limit initial eligibility for the snapper grouper fishery and raised the vermilion snapper recreational size limit to 11" total length in 1999, increased the recreational size limit to 12" total length in 2006, and imposed a 1.1 million pound gutted weight commercial quota in 2006. Additionally, the Council recently extended indefinitely the *Oculina* closed area. Although the biological benefits of this area cannot be quantified at this time, evidence indicates there has been an increase in abundance of many species within the area since it was closed (Koenig 2001). Koenig *et al.* (2002) documented the presence of vermilion snapper in the *Oculina* closed area.

These management measures may have reduced fishing mortality (F) during the late 1990s as the SEDAR stock assessment noted a substantial decline in fishing mortality during 1997 and 1998; however, F increased during 1999-2001. The SEDAR Assessment Update #3 (2007) indicates overfishing is still occurring. Such trends are expected to continue if status quo commercial management regulations are maintained, and could have a significant adverse effect on the stocks if allowed to continue indefinitely. The adverse effects of decreasing size and age trends on stock biomass and reproduction, population structure, and the marine ecosystem are described Amendment 13C (SAFMC 2006). However, it must be noted a new benchmark assessment is being conducted for vermilion snapper with a completion date expected in late 2008. Results of the new age-based benchmark assessment could be different from either the SEDAR 2-SAR (2003) benchmark assessment or the SEDAR Assessment Update #3 (2007), both of which were length-based assessments.

All the alternatives to status quo management evaluated for vermilion snapper are intended to reduce fishing mortality. As a result, they are expected to directly and significantly benefit the biological environment by assisting in restoring stock status and population demographics to more natural conditions. The indirect effects of these alternatives on the ecological environment are less certain. Improving the status of the vermilion snapper stock would likely promote more natural ecological functions. However, competitor, predator, and prey relationships in marine ecosystems are complex and poorly understood.

The snapper grouper ecosystem includes many species, which occupy the same habitat at the same time. For example, vermilion snapper co-occur with tomtate, scup, red porgy, white grunt, black sea bass, red grouper, scamp, gag, and others. Therefore, snapper grouper species are likely to be caught when regulated since they will be incidentally caught when fishermen target other co-occurring species. Continued overexploitation of any snapper grouper species may disrupt the natural community structure of the reef ecosystems that support these species. Predators exploited species could be expected to decrease in abundance in response to a decline of an exploited species. Alternatively, predators would target other species as prey items. Conversely, the abundance of those prey and competitor species of the overexploited species that are not targeted in fisheries (e.g., scup and tomtate) could increase in response to a decline in the abundance of vermilion snapper.

<u>Alternative 2. Commercial Vermilion Snapper Quota</u>
Preferred Alternative 2 would implement a commercial quota of 385,002 lbs gutted weight, which would then be reduced for PQBM. The directed commercial vermilion snapper quota would be 328,002 pounds gutted weight. The actual magnitude of PQBM would depend on other management measures used to reduce fishing mortality and assumptions concerning the ability of fishermen to avoid vermilion snapper after a quota is met. The SSC and Council approved the methodology for PQBM analyses at their December 2007 meeting. However, they recommended the Snapper Grouper Advisory Panel review the methodology to provide an estimate of the number of trips that might not be taken to target snapper grouper species during a closure for vermilion snapper or gag and provide an estimate of the ability of fishermen to avoid vermilion snapper or gag by modifying fishing techniques. The Council and the Council's AP recommended that estimates for PQBM assume that fishing trips, which previously caught vermilion snapper, would be reduced by 20% after a quota is met and fishermen can avoid 20% of the vermilion snapper by using different techniques.

Adjusting the quota for PQBM would take into consideration the dead discards that could occur after a quota is met and end overfishing. Ending overfishing of vermilion snapper is expected to increase stock biomass and promote a more natural population structure by helping to reverse any trends in decreasing mean length and size/age at sexual maturity that could occur. These effects would benefit the vermilion snapper stock and associated species by protecting the stock against recruitment overfishing and reducing its vulnerability to adverse environmental conditions.

Based on data from 1999-2005, this quota would be achieved sometime between May and September, at which time the fishery for vermilion snapper would be closed. As a result, the quota could encourage derby conditions, where fishermen compete with each other to catch as many fish as possible before the quota is taken and the fishery is closed for the remainder of the fishing year. Derby fisheries can unnecessarily increase discards by providing participants less flexibility in deciding when, where, and how to fish. Vermilion snapper are also taken on trips that target gag, scamp, red grouper, snowy grouper, greater amberjack, and almaco jack. Due to incidental catch of vermilion snapper, the quota might not provide the needed reduction in harvest if dead discards after the quota is met are not accounted for. However, it is likely that fishermen can change fishing methods to decrease the change of hooking vermilion snapper and can avoid "hot spots" where vermilion snapper occur.

The impacts of **Preferred Alternative 2** on protected resources are uncertain. If adjusting the quota for PQBM encourages derby fishing, the risk of adverse affects to protected species from interactions with fishery is likely to increase while the fishery remains open. However, closure of the fishery after the proposed quota has been met would likely lower the risk of adverse affects from interactions. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

Alternative 3. Divide the commercial vermilion snapper quota seasonally
Preferred Alternative 3a and Alternatives 3b and 3c would specify how the quota specified in **Preferred Alterative 2** would be allocated throughout the year. As in **Preferred Alternative 2**, **Preferred Alternative 3a and Alternatives 3b and 3c** would adjust the quota for PQBM. However, the magnitude of PQBM would not be the same for the two time periods. PQBM is based on historic landings and takes into consideration an estimation of dead discards that could occur when fishermen target co-occurring species. Since the magnitude of vermilion snapper has historically been greater during fall than during the early part of the year, the estimate of PQBM is greater for the second seasonal quota under **Preferred Alternative 3a and Alternative 3b**.

Preferred Alternative 3a would allocate 50% of the directed commercial quota to January 1st through June 30th and 50% to the period July 1st through December 31st (Table 4-65). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 4-65. Commercial quotas for January-June (50%) and July-December (50%) taking into consideration estimate of PQBM.

Commercial quota	385,002
Jan-June 50%	192,501
PQBM	24,000
Directed quota Jan-June	**168,501**
July-Dec 50%	192,501
PQBM	37,000
Directed quota July-Dec	**155,501**

Note: Different values of PQBM could be used in the future. PQBM is rounded to the nearest 1,000 lbs. Weight is in lbs gutted weight.

Based on data from 1999-2005, the 168,501 pound gutted weight quota would be met in March or April and the 155,501 pound gutted weight quota would be achieved sometime between July and September, at which time the fishery for vermilion snapper would be closed.

Alternative 3b would allocate 40% of the directed commercial quota to January 1st through June 30th and 60% to period July 1st through December 31st (Table 4-66). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 4-66. Commercial quotas for January-June (40%) and July-December (60%) taking into consideration estimate of PQBM.

Commercial quota	385,002
Jan-June 40%	154,001
PQBM	27,000
Directed quota Jan-June	**127,001**
July-Dec 60%	231,001
PQBM	35,000
Directed quota July-Dec	**196,001**

Note: Different values of PQBM could be used in the future. PQBM is rounded to the nearest 1,000 pounds. Weight is in pounds gutted weight.

Based on data from 1999-2005, the 127,001 pound gutted weight quota would be met in March and the 196,001 pound gutted weight quota would be achieved sometime between July and September, at which time the fishery for vermilion snapper would be closed.

Alternative 3c would allocate 50% the directed commercial quota to January 1st through August 31th and 50% to September 1st through December 31st (Table 4-67). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Table 4-67. Commercial quotas for January-August (50%) and September-December (50%) taking into consideration estimate of PQBM.

Commercial quota	385,002
Jan-Aug 50%	192,501
PQBM	43,000
Directed quota Jan-Aug	**149,501**
Sept-Dec 50%	192,501
PQBM	21,000
Directed quota Sept-Dec	**171,501**

Note: Different values of PQBM could be used in the future. PQBM is rounded to the nearest 1,000 pounds. Weight is in pounds gutted weight.

Based on data from 1999-2005, the 149,501 pound gutted weight quota would be met in March and the 171,501 pound gutted weight quota would be achieved sometime between September and November, at which time the fishery for vermilion snapper would be closed. Since the first seasonal quota would be met as early as March and vermilion snapper would likely be closed from April through the end of August, PQBM under **Alternative 3c** would be greater for the first seasonal quota than the second.

Dividing the small quota into two time periods would result in the fishery being open for a very short period of time. Therefore, **Preferred Alternative 3a and Alternatives 3b and 3c** could encourage derby conditions to a greater extent than **Preferred Alternative 2**. Although **Preferred Alternative 2** does not divide the quota seasonally, it is small and southern areas with better weather during winter could have an advantage in catching vermilion snapper early in the fishing year. Therefore, the Council felt that alternatives that divide the quota into two time periods would allow for a greater opportunity among all areas to catch vermilion snapper. Furthermore, dividing the quota into two seasons would allow fishermen to target vermilion snapper in late summer when historical catches of vermilion snapper have been the best.

The biological effects of **Preferred Alternative 3a and Alternatives 3b and 3c** are very similar. The Council selected **Preferred Alternative 3a** alternative because it has the largest quota and the least amount of PQBM. **Preferred Alternative 3a** would allow the season to extend longer during the January-June period than would **Alternative 3b** and would be less likely to cause a derby fishery during a period of bad weather to fill the first quota in the spring. Further, the Council felt **Alternative 3c** would result in the vermilion snapper fishery being closed from March through August and would begin the second season in September during the peak in hurricane season.

Ending overfishing of vermilion snapper is expected to increase stock biomass and promote a more natural population structure by helping to reverse any trends in decreasing mean length and size/age at sexual maturity that could occur. These effects would benefit the vermilion snapper stock and associated species by protecting the stock against recruitment overfishing and reducing its vulnerability to adverse environmental conditions.

As with **Preferred Alternative 2**, the impacts of **Preferred Alternative 3a and Alternatives 3b and 3c** on protected resources are uncertain. If the proposed quotas do encourage derby fishing, the risk of adverse affects to protected species from interactions with the fishery is likely to increase while the fishery remains open. However, closure of the fishery after the proposed quotas are met would likely lower the risk of adverse affects from interactions. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

Alternative 4. Manage the commercial vermilion snapper quota with a fishing year beginning May 1 and a 1,000 pound trip limit (gutted weight)

The Snapper Grouper AP recommended vermilion snapper **Alternative 4** be combined with the May 1 start date and 1,000 lb gutted weight trip limit for the vermilion snapper commercial fishery. Many snapper grouper fishermen target gag and vermilion snapper on the same trip and in the same area. Analysis of logbook data indicates gag is the most common species taken on trips where at least one pound whole weight of vermilion snapper was caught (Table 4-68). With a May 1 start date for the vermilion snapper fishing year and a 1,000 lb gutted weight trip limit, it is expected a 334,502 lb gutted weight quota (Table 4-69) would be met sometime between August and December. Thus, with the current level of effort, gag and vermilion snapper would likely be closed during January through April if the fishing year for both species started on May 1.

A May 1 start date for vermilion snapper and gag could reduce bycatch of both species and benefit gag during its January-April spawning season when it forms aggregations and is particularly vulnerable to capture. In addition, it is anticipated effort would decrease for other snapper grouper species since vermilion snapper and gag are among the top fish targeted by snapper grouper fishermen. Thus, many co-occurring snapper grouper species could benefit from a May 1 start date for both vermilion snapper and gag.

Table 4-68. Species taken on trips when at least 1 pound whole weight of vermilion snapper were taken.

COMMON	Sum	%	Cum
SNAPPER,VERMILION	3,005,272	32.52%	32.52%
GROUPER,GAG	1,031,230	11.16%	43.67%
SCAMP	779,083	8.43%	52.10%
TRIGGERFISH,GRAY	595,067	6.44%	58.54%
AMBERJACK,GREATER	553,829	5.99%	64.53%
GROUPER,RED	490,283	5.30%	69.84%
JACK,ALMACO	407,937	4.41%	74.25%
SNAPPER,RED	326,173	3.53%	77.78%
SEA BASSE,ATLANTIC,BLACK,UNC	231,433	2.50%	80.29%

A May 1 start date would also provide more equitable access among regions to a limited amount of vermilion snapper quota. Weather during winter months can prevent fishermen from northern areas of the South Atlantic from engaging in fishing activities, while fishers to the south generally enjoy greater weather during January through April and can participate in a greater proportion of trips.

Along with the May 1 start date for vermilion snapper, the AP also recommended the Council consider a 1,000 pound gutted weight trip limit. The AP's intent of the 1,000 pound gutted weight trip limit is to extend the duration of the fishing year and reduce the chance of a market disruption from an early closure of the fishery. Logbook data indicate approximately 12% of the trips exceeded 1,000 pounds gutted weight of vermilion snapper; therefore a 1,000 pound gutted weight trip limit would be expected to extend the fishing season to some degree. Trip limits have the potential to increase discards if fishermen continue to pursue co-occurring species after achieving the trip limit; however, the quota takes into consideration the increase in dead discards that could be expected to occur with the 1,000 lb gutted weight trip limit (Table 4-69).

Based on data from 2001-2005, the 334,502 lb gutted weight vermilion snapper quota would be achieved sometime between August and December, at which time the fishery would be closed. As a result, the quota could encourage derby conditions, where fishermen compete with each other to catch as many fish as possible before the quota is taken and the fishery is closed for the remainder of the fishing year. Derby fisheries can unnecessarily increase discards by providing participants less flexibility in deciding when, where, and how to fish. Since vermilion snapper are also taken on trips that target gag, scamp, red grouper, and other species some incidental catch could occur after the quota is met. Therefore, the quota might not provide the needed reduction in harvest if dead discards after the quota is met are not accounted for. However, it is likely that fishermen can change fishing methods to decrease the change of hooking vermilion snapper and can avoid "hot spots" where vermilion snapper occur. Furthermore, the directed quota specified in Table 4-60 takes into consideration dead discards that could occur after the quota is met. In addition, a synoptic closure of shallow water grouper species could reduce bycatch and mortality of vermilion snapper.

Table 4-69. Commercial quota (pounds gutted weight) for vermilion snapper. Assumes after trip limit is met or after quota met there is no directed catch and incidental catch due to targeting co-occurring species. After quota met, assumed 20% of trips would not be made and fishermen can avoid 20% of vermilion snapper.

Commercial quota	385,002
PQBM with trip limit	10,500
PQBM after quota	40,000
Directed quota	**334,502**

Alternative 5 – Combined vermilion snapper bag/size limit and recreational seasonal closure

Alternative 5. Adjust recreational bag/size limit and establish a recreational closed season; no fishing for and/or possession of vermilion snapper would be allowed during the closed season; and captain crew on for-hire vessels would not be able to retain vermilion snapper.

Alternative 5a. Increase the recreational size limit to 14" TL and reduce the bag limit to 3 vermilion snapper (Total Reduction = 71%; Table 4-72).

Alternative 5b. Increase the recreational size limit to 13" TL and reduce the bag limit to 1 vermilion snapper (Total Reduction = 73%; Table 4-71).

Alternative 5c. Increase the recreational size limit to 13" TL and reduce the bag limit to 6 vermilion snapper (53% reduction) and close September & October (16% reduction) (Total Reduction = 61%; Table 4-70).

Alternative 5d (Preferred). Reduce the bag limit from 10 to 4 vermilion snapper (45% reduction) and a season closure (no fishing for and/or possession) of October through May 15th (38% reduction) (Total reduction = 66%; Table 4-70).

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the vermilion snapper closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

Table 4-70. Reduction from size limit, bag limit, and seasonal closure.

closure	Open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	65.99%	66.87%	68.37%	69.82%	71.54%	73.44%	75.82%	78.63%	82.31%
sept-april	May-Aug	57.69%	58.78%	60.65%	62.46%	64.59%	66.95%	69.92%	73.42%	77.99%
oct-april	May-Sept	52.06%	53.29%	55.41%	57.46%	59.88%	62.55%	65.91%	69.88%	75.06%
oct-may 15	May 16 – Sept	56.21%	57.34%	59.27%	61.14%	63.35%	65.79%	68.86%	72.49%	77.22%
nov-april	May-Oct	46.14%	47.53%	49.90%	52.21%	54.93%	57.93%	61.70%	66.16%	71.98%
nov-mar	April-Oct	40.86%	42.39%	45.00%	47.53%	50.51%	53.81%	57.96%	62.85%	69.24%
dec-mar	April-Nov	38.11%	39.70%	42.43%	45.08%	48.21%	51.66%	55.99%	61.11%	67.80%
dec-feb	Mar-Nov	34.77%	36.45%	39.33%	42.12%	45.41%	49.05%	53.62%	59.02%	66.06%
jan-feb	Mar-Dec	33.30%	35.02%	37.96%	40.82%	44.18%	47.90%	52.58%	58.09%	65.30%
jan-mar	Apr-Dec	36.64%	38.27%	41.07%	43.78%	46.98%	50.51%	54.95%	60.19%	67.04%
jan-apr	May-Dec	41.91%	43.41%	45.97%	48.46%	51.39%	54.63%	58.70%	63.50%	69.78%
sept-oct	nov-aug	40.97%	42.49%	45.09%	47.62%	50.60%	53.89%	58.03%	62.91%	69.29%
no closure	All year	29.41%	31.23%	34.35%	37.37%	40.93%	44.87%	49.81%	55.65%	63.28%

Note: Assumes 25% release mortality, non-compliance with size limit, and excludes captain and crew. **Vermilion Snapper 12" TL size limit**; 88% effectiveness of seasonal closure.

Table 4-71. Reduction from size limit, bag limit, and seasonal closure.

closure	Open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	74.51%	75.16%	75.16%	77.38%	78.67%	80.09%	81.87%	83.98%	86.74%
sept-april	May-Aug	68.28%	69.10%	69.10%	71.86%	73.46%	75.23%	77.45%	80.07%	83.50%
oct-april	May-Sept	64.06%	64.99%	64.99%	68.11%	69.93%	71.93%	74.45%	77.42%	81.30%
oct-may 15	May 16 – Sept	67.17%	68.02%	68.02%	70.87%	72.53%	74.36%	76.66%	79.38%	82.92%
nov-april	May-Oct	59.62%	60.67%	68.02%	64.18%	66.21%	68.46%	71.29%	74.63%	79.00%
nov-mar	April-Oct	55.67%	56.82%	56.82%	60.67%	62.91%	65.38%	68.48%	72.15%	76.94%
dec-mar	April-Nov	53.61%	54.80%	54.80%	58.84%	61.18%	63.76%	67.01%	70.85%	75.86%
dec-feb	Mar-Nov	51.10%	52.36%	52.36%	56.61%	59.08%	61.81%	65.23%	69.28%	74.56%
jan-feb	Mar-Dec	50.00%	51.29%	51.29%	55.64%	58.16%	60.95%	64.45%	68.59%	73.99%
jan-mar	Apr-Dec	52.50%	53.73%	53.73%	57.86%	60.25%	62.90%	66.23%	70.16%	75.29%
jan-apr	May-Dec	56.46%	57.58%	57.58%	61.36%	63.56%	65.99%	69.04%	72.64%	77.35%
sept-oct	nov-aug	55.75%	56.89%	56.89%	60.74%	62.97%	65.44%	68.54%	72.20%	76.98%
no closure	All year	47.09%	48.45%	48.45%	53.05%	55.72%	58.67%	62.38%	66.76%	72.47%

Note: Assumes 25% release mortality, non-compliance with size limit, and excludes captain and crew. **Vermilion Snapper 13" TL size limit**; 88% effectiveness of seasonal closure.

Table 4-72. Reduction from size limit, bag limit, and seasonal closure.

closure	Open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	80.09%	80.60%	80.60%	82.33%	83.34%	84.45%	85.84%	87.49%	89.64%
sept-april	May-Aug	75.23%	75.87%	75.87%	78.02%	79.27%	80.65%	82.39%	84.44%	87.11%
oct-april	May-Sept	71.93%	72.65%	72.65%	75.09%	76.51%	78.08%	80.04%	82.36%	85.40%
oct-may 15	May 16 – Sept	74.36%	75.02%	75.02%	77.25%	78.54%	79.97%	81.77%	83.89%	86.66%
nov-april	May-Oct	68.47%	69.28%	69.28%	72.02%	73.61%	75.37%	77.58%	80.19%	83.60%
nov-mar	April-Oct	65.38%	66.27%	66.27%	69.28%	71.03%	72.96%	75.39%	78.25%	81.99%
dec-mar	April-Nov	63.77%	64.70%	64.70%	67.85%	69.68%	71.70%	74.24%	77.23%	81.15%
dec-feb	Mar-Nov	61.81%	62.79%	62.79%	66.11%	68.04%	70.17%	72.85%	76.01%	80.13%
jan-feb	Mar-Dec	60.95%	61.96%	61.96%	65.35%	67.32%	69.50%	72.24%	75.47%	79.68%
jan-mar	Apr-Dec	62.90%	63.86%	63.86%	67.09%	68.96%	71.03%	73.63%	76.69%	80.70%
jan-apr	May-Dec	65.99%	66.87%	66.87%	69.83%	71.54%	73.44%	75.82%	78.63%	82.31%
sept-oct	nov-aug	65.44%	66.33%	66.33%	69.33%	71.08%	73.00%	75.43%	78.29%	82.02%
no closure	All year	58.68%	59.74%	59.74%	63.33%	65.42%	67.72%	70.62%	74.04%	78.50%

Note: Assumes 25% release mortality, non-compliance with size limit, and excludes captain and crew. **Vermilion Snapper 14" TL size limit**; 88% effectiveness of seasonal closure.

Alternative 5a would increase the recreational size limit to 14 inches TL in combination with a reduction in the bag limit, whereas **Alternative 5b** would increase the size limit to 13 inches TL in combination with a reduced bag limit. **Alternative 5c** would also increase the minimum size limit along with an adjustment to the bag limit and an establishment of a recreational seasonal closure. These three alternatives would prohibit captain and crew on for-hire vessels from retaining a bag limit. An increase in the minimum size limit under **Alternatives 5a, 5b, and 5c** would be expected to increase the number of regulatory discards. The number of discarded vermilion snapper spiked when the recreational size limit was increased to 11 inches TL in 1999 and again in 2007, when the recreational size limit was increased to 12 inches TL. Since recreational fishermen fish in shallower water and bring fish to the surface at a slower rate than commercial fishermen, survival of vermilion snapper released by recreational fishermen is expected to be higher than those caught by commercial fishermen (25% versus 40%). However, given the very low recapture rates of vermilion snapper reported by McGovern and Meister (1999) and Burns *et al*. (2002), it is possible the release mortality rate of 25% might be an underestimate, further diminishing the effectiveness of **Alternative 5a** in reducing fishing mortality. Therefore, actions that increase the minimum size in **Alternatives 5a, 5b, and 5c** could continue trends observed in the mid-1990s, including a smaller size at age, smaller size at maturity, a change in the genetic integrity of the stock, and possible shifts in community structure. However, some reduction in fishing mortality and biological benefits are expected from an increase in the minimum size.

Alternatives 5a, 5b, and 5c and Preferred Alternative 5d would adjust the bag limit in combination with other management measures. Bag limits have some desirable characteristics as management tools. They are commonly used management measures, which are readily understood by fishermen. Violations of bag limits are readily apparent by simply counting the number of fish that are retained, which aids in enforcement of fishery regulations. The rationale for bag limits is that they reduce the amount of harvest and are often used in conjunction with size limits to achieve a desired reduction.

There are a number of shortcomings with bag limits. Once bag limits are reached, some fishermen may continue to fish, keeping larger fish and throwing smaller, dead fish back. The snapper grouper fishery represents many species occupying the same location at the same time. Fishermen could continue to target other co-occurring species and throw back fish that have bag limits, many of which will die. It would be expected that fishermen would still tend to target the largest, most desirable species. Therefore, there still could be a problem with removing the larger, faster growing fish, reducing genetic variability, and reducing the variability in the age structure of the population that ensures against recruitment failure.

Alternative 5c and Preferred Alternative 5d would include management measures to establish a recreational seasonal closure in combination with other measures. **Alternative 5c** would increase the minimum size limit, adjust the recreational bag limit, and establish a recreational season closure. **Preferred Alternative 5d** would adjust the bag limit in combination with a recreational closure.

The length of the closed season may influence its effectiveness in reducing fishing mortality of vermilion snapper due to effort shifting weeks before and after the closure. For example, a February 15-March 15 closure on red grouper, gag, and black grouper was implemented in the Gulf of Mexico in 2001. Although a reduction in catch of 8% for red grouper and 10% for gag/black grouper was predicted based on landings in previous years, relative catch was only 2% less during the first year the closure was effective (GMFMC 2004). A longer closed season, as proposed in **Preferred Alternative 5d**, may be more effective in reducing harvest, as it would be more difficult for fishermen to shift all their effort. However, some displacement of effort is still likely to occur, making it difficult to estimate impacts of seasonal closures (GMFMC 2004).

Furthermore, it is unlikely fishing mortality could be completely eliminated on vermilion snapper during a closure since vermilion snapper would be caught when fishermen target co-occurring species. This is taken into consideration when estimating the effectiveness of a seasonal closure.

To determine the effectiveness of a recreational seasonal closure seven steps were taken. First, MRFSS and headboat data were examined to determine the most commonly taken species on trips with vermilion snapper. Second, trips were identified that caught species commonly taken with vermilion snapper. Third, landings of vermilion snapper on trips identified in step 2 that targeted co-occurring species were determined. This would be considered to be incidental catch of vermilion snapper. Fourth, dead discards of vermilion snapper incidental catch was determined by applying a release mortality rate of 25% (SEDAR Update #3 2007). Fifth, a reduction in trips that might not be taken during a seasonal closure was estimated. Six, ability to avoid vermilion snapper by changing fishing methodology or avoiding locations where the species occurs was considered.

Seventh, effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings.

Alternatives 5a, 5b, and 5c and Preferred Alternative 5d would not allow captain and crew on for-hire vessels to retain vermilion snapper. Reductions in landings resulting from restrictions on captain and crew retention limits are difficult to quantify because surveys used to collect recreational fishing data do not provide information on the number of captains or crew on the vessel, or whether or not the captain and crew contribute to the catch. Therefore, assumptions must be made that captain and crew are retaining vermilion snapper on for-hire vessels. The Snapper Grouper Advisory Panel supports this action. These reductions take into consideration a 25% release mortality rate (SEDAR Update #3 2007). It is estimated that eliminating captain and crew from retaining vermilion snapper will provide slight reductions in the harvest of vermilion snapper. These reductions could help reduce bycatch and prevent captain and crew from supplementing their client's catch once their client's daily bag limits have been met. Reductions in landings resulting from a zero captain and crew bag limit in combination with management alternatives considered in **Alternative 5** will directly benefit the biological environment by helping to reduce vermilion snapper directed fishery landings.

These alternatives would end overfishing for the recreational sector if estimates of release mortality rates are correct. However, if release mortality rates are higher than 25%, as suggested by the very low tag recapture rates (McGovern and Meister 1999; Burns *et al*. 2002), then the desired effects might not be achieved. Therefore, trends observed in the mid-1990s could occur, including a smaller size at age, smaller size at maturity, a change in the genetic integrity of the stock, and possible shifts in community structure.

Alternative 1 would perpetuate the existing level of risk to protected species. **Alternatives 2-5** and their sub-alternatives ultimately seek to alter fishing effort. Therefore, the impacts of these alternatives on protected species are uncertain and will depend on the extent to which these measures reduce fishing effort. If these measures do reduce fishing effort, the likelihood of adverse impacts from the fishery occurring to protected species may be reduced. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

4.2.5.2 Economic Effects of Management Regulations Alternatives

4.2.5.2.1 *General Discussion*

The alternatives in this section have varying applicability by sector. **Preferred Alternative 2, Alternative 3,** and **Alternative 4** would only apply to the commercial sector, whereas **Alternative 5** would only apply to the recreational sector.

Management alternatives for vermilion snapper are generally designed to keep each sector within its respective allocation of total allowable catch (TAC) levels. If successful, they are expected to generate benefits in the future that would outweigh their short-run costs. The following discussions deal only with the economic costs of management measures in the short-run. No attempt is made to compare them with the expected future benefits.

Preferred Alternative 2 would impose a single overall quota on the commercial sector. Even under the current controlled access management system of the fishery, a derby can still occur especially with low and strictly binding quota levels such as the ones contemplated in this amendment. One major consequence of a derby condition is the increase in cost and possible reduction in ex-vessel price when gag are landed within a short period.

Alternative 3 would divide the commercial quota into sub-quotas for various seasons within a year. **Preferred Alternative 3a** would allocate 50% of the directed commercial quota to the first six months of the year and 50% to the remaining six months. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward. **Alternative 3b** would allocate 40% of the directed commercial quota to the first six months of the year and 60% to the remaining six months. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward. **Alternative 3c** would allocate 50% of the directed commercial quota to the first eight months of the year and 50% to the remaining four months. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward. This subdivision of the commercial quota would not solve the potential derby problem that may occur in the fishery, although it probably could mitigate the results forthcoming from a single quota. A relatively similar partitioning of the commercial quota was implemented in the Gulf of Mexico red snapper fishery before adoption of the IFQ program for that fishery. Results from the seasonal partitioning of the red snapper quota indicated the quota partitioning did not eliminate the derby but it did provide some benefits in terms of slightly better ex-vessel price and safer fishing condition from a lengthened fishing season.

Alternative 4 would not allocate the commercial quota to different seasons, but would attempt to reduce derby pressure by imposing a 1,000-lb trip limit and starting the fishing year on May 1.

Alternative 5 would provide for a combination of larger size limit and lower bag limit for two sub-alternatives (**Alternatives 5a and 5b**), a combination of larger size limit, lower bag limit and seasonal closure for one sub-alternative (**Alternative 5c**), and a combination of lower bag limit and seasonal closure for one alternative (**Preferred Alternative 5d**). The bag limit reduction and size limit increase would not necessarily result in trip cancellation; however, they would reduce the quality of fishing experience. Thus, they would likely reduce consumer surplus more than producer surplus. The prohibition on the captain and crew from possessing a bag limit would impinge on producer surplus. The seasonal closure may be expected to reduce both producer and consumer surplus partly due to some trip cancellations.

4.2.5.2.2 *Commercial Sector*

Simulation runs for **Alternatives 1-3** are presented in Table 4-73 by gear type and Table 4-74 by area, while the appropriate information for **Alternative 4** is presented in Tables 4-75 and 4-76. The model run for **Preferred Alternative 2** is identical to that for the allocation alternative discussed earlier, because the allocation alternative was modeled assuming a single quota.

Model results indicate that any of the partitioning of the quota by season would result in slightly higher reductions in net operating revenues whether considering only trips landing at least one pound of vermilion snapper or trips landing at least one pound of any snapper grouper species. The varying effects of the alternatives are not very apparent when considering trips landing at least one pound of any snapper grouper species. For these trips, the total economic effects of the various alternatives would be relatively close to one another, ranging from $1.59 million for **Preferred Alternative 2** to $1.65 million for **Alternative 3b** (Table 4-73). In fact, the total economic effects of the various seasonal quota alternatives would even be much closer to one another, ranging from $1.64 million for **Preferred Alternative 3a** to $1.65 for **Alternative 3b**. On the other hand, the differential effects of the various alternatives would become more apparent when considering trips landing at least one pound of vermilion snapper. The immediately succeeding discussion focuses on trips landing at least one pound of vermilion snapper.

A single quota (**Preferred Alternative 2**) would reduce net operating revenues by $2.84 million (61.1%) whereas the seasonal partitioning of the quota would result in reductions ranging from $2.96 million (63.7%) for **Alternative 3b** to $3.16 million (68%) for **Alternative 3c** (Table 4-73). The total economic effects of **Preferred Alternative 3a** would be $2.97 million (63.8%), which is very close to those of **Alternative 3b**. Note that **Alternative 3a** would allocate 50% of the quota to the January-June season and 50% to the remaining months. **Alternative 3c**, on the other hand, would divide the fishing year into the January-August season and September-December season, with 50% of the quota allocated to each season. One possible implication of the results is that delaying the opening of the second season with equal allocation with the first season would tend to constrain the activities of some vessels such that potential "losses" in the first season could not be made up in the second season. Another result worth noting is the very close similarity in the overall outcome of **Alternative 3b** to that of **Preferred Alternative 3a**. Note that both alternatives divide the fishing year into the January-June season and July-December season. The only difference between the two alternatives is that for **Alternative 3b**, 40% of the quota would be allotted to the first season and 60% to the second season. This could possibly imply that under **Alternative 3b**, potential "losses" in the first season could be recouped so long as the second season is kept longer (relative to that under **Alternative 3c**). From the results found in Table 4-73, it would appear that an equal division of the fishing year into two seasons, with possibly equal quota allocation to each season, would provide better fishing conditions than an unequal division of the fishing year.

In terms of absolute magnitudes, the vertical line vessel trips would incur the largest reduction under any of the quota alternatives including the single quota alternative for both trips landing at least one pound of vermilion snapper and trips landing at least one pound of any snapper grouper species. Such reductions would be higher under any of the seasonal quota alternative, particularly under **Alternative 3c**, than under a single quota. Relative to the baseline, each quota alternative would reduce the net operating revenues of vertical line vessel trips, for vessels landing at least one pound of vermilion snapper, by over 60%. The effects on vertical line vessel trips are rather expected considering the dominance of this gear type in trips harvesting vermilion snapper.

The ranking of alternatives is not straightforward because of the differing results between trips landing at least one pound of vermilion snapper and trips landing at least one pound of any snapper grouper species. Regardless of the type of trips, however, it would appear that a single quota (**Preferred Alternative 2**) might be ranked higher than any of the seasonal quota alternatives. For trips landing at least one pound of vermilion snapper, the alternatives for season quotas may be ranked in descending order as follows: **Alternative 3b**, **Preferred Alternative 3a**, and **Alternative 3c**. We may add that the effects of **Alternative 3b** are minimally different from those of **Preferred Alternative 3a**. For trips landing at least one pound of any snapper grouper species, the ranking of seasonal quota alternatives in descending order is **Preferred Alternative 3a**, **Alternative 3c**, and **Alternative 3b**.

Table 4-73. Reductions in commercial vessels' net operating revenues from various alternatives on vermilion snapper overall quota and seasonal quotas, in thousand 2005 dollars, by gear type.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
Vessel trips landing at least one pound of vermilion snapper								
Baseline	112	4,478	4	9	18	24	0	4,646
Overall quota								
Alt. 2 (Pref)	**-69**	**-2,749**	**0**	**-3**	**-11**	**-9**	**0**	**-2,840**
Seasonal quotas								
Alt. 3a (Pref)	**-70**	**-2,867**	**-3**	**-4**	**-8**	**-14**	**0**	**-2,966**
Alt. 3b	-68	-2,863	-4	-4	-8	-15	0	-2,962
Alt. 3c	-73	-3,053	-3	-7	-9	-14	0	-3,159
Vessel trips landing at least one pound of any snapper grouper species								
Baseline	634	8,131	544	388	305	347	3	10,351
Overall quota								
Alt. 2 (Pref)	**-5**	**-1,586**	**0**	**-1**	**1**	**-2**	**0**	**-1,592**
Seasonal quotas								
Alt. 3a (Pref)	**-5**	**-1,631**	**0**	**-1**	**1**	**-3**	**0**	**-1,638**
Alt. 3b	-5	-1,642	0	-1	1	-3	0	-1,650
Alt. 3c	-5	-1,638	0	0	1	-2	0	-1,643

From the standpoint of distributional effects by area, North Carolina and South Carolina would experience the largest losses in terms of both absolute and percentage values (Table 4-74) under any of the quota alternatives. The seasonal quota alternatives would only worsen the situation for South Carolina but not necessarily for North Carolina. In fact, North Carolina would experience slightly lower losses under **Preferred Alternative 3a and Alternative 3b** but not under **Alternative 3c**. This could imply that North Carolina is more susceptible to seasonalities in fishing for vermilion snapper than other area. The Georgia/Northeast Florida area would also experience relatively large losses in terms of both absolute and percentage values in all quota alternatives. The situation for this area would be worse under any of the seasonal quota alternative than under a single quota. All other areas would be slightly worse off under any of the seasonal quotas than under a single quota.

The expected economic effects of Alternative **4** on the commercial sector are provided in Tables 4-75 and 4-76. Since the changes are single-year, they would be expected to re-occur in subsequent years, as modified by adaptive fishing behavior. Changes in net operating revenues were summarized separately by geographic area (Table 4-75) and by gear type across all areas (Table 4-76). Because the vertical line sector dominates harvests in the commercial SG fishery, only the geographic area results will be summarized in the following discussion. The geographic area designations indicate where the fish are projected to be landed.

Alternative 4, which would establish a May 1 start to the fishing year and a 1,000-lb (gutted weight) trip limit, was modeled assuming a regional TAC of 385,002 pounds (gutted weight) and a 1,000-lb trip limit (gutted weight). Under these conditions, **Alternative 4** is expected to result in an annual reduction in net operating revenues from the status quo of approximately $2.56 million for trips projected to harvest at least one pound of vermilion snapper and approximately $1.66 million for trips projected to harvest at least one pound of SG (Table 4-75). The fact that the reduction in annual net revenues is greater for trips projected to harvest at least one pound of vermilion snapper than for trips projected to harvest at least one pound of SG may seem puzzling. Similar to the analyses of the alternative gag management measures, these results reflect the expected performance of trips that are projected to harvest at least one pound of the focus species.

The vermilion snapper measures are projected to result in a greater reduction in trips projected to harvest at least one pound of vermilion snapper than the reduction in trips projected to harvest at least one pound of SG. For the analysis of trips projected to harvest at least one pound of vermilion snapper, the economic contributions (associated with all harvested species) of a trip projected to lose all vermilion snapper would be completely deducted from the baseline for vermilion snapper trips (since no vermilion snapper harvest would occur, the trip would no longer be included in trips that harvested vermilion snapper). However, the harvest of other SG, despite losing vermilion snapper harvests and revenues, may allow a trip to continue to be profitable and, thus, continue to be counted in the results for SG trips.

Table 4-74. Reductions in commercial vessels' net operating revenues from various alternatives on vermilion snapper overall quota and seasonal quotas, in thousand 2005 dollars, by area.

Model	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
Vessel trips landing at least one pound of vermilion snapper							
Baseline	1,560	1,867	1,123	71	26		4,646
Overall quota							
Alt. 2 (Pref)	**-1,035**	**-1,135**	**-619**	**-39**	**-12**	**0**	**-2,840**
Seasonal quotas							
Alt. 3a (Pref)	**-1,018**	**-1,206**	**-686**	**-41**	**-15**	**0**	**-2,966**
Alt. 3b	-987	-1,213	-706	-44	-13	0	-2,962
Alt. 3c	-1,135	-1,271	-699	-40	-16	0	-3,159
Vessel trips landing at least one pound of any snapper grouper species							
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
Overall quota							
Alt. 2 (Pref)	**-609**	**-533**	**-427**	**-16**	**-6**	**0**	**-1,592**
Seasonal quotas							
Alt. 3a (Pref)	**-593**	**-578**	**-446**	**-15**	**-5**	**0**	**-1,638**
Alt. 3b	-571	-597	-462	-15	-5	0	-1,650
Alt. 3c	-617	-561	-445	-13	-7	0	-1,643

The largest reductions in absolute dollars as a result of **Alternative 4** are projected to occur in South Carolina, $1.03 million and $631,000, and Georgia-Northeast Florida, $772,000 and $549,000 for vermilion snapper trips and SG trips, respectively. In terms of percentage reductions, Georgia-Northeast Florida is expected to experience the largest reductions in annual net operating revenues for both vermilion snapper and SG trips, 69% and 41%, respectively, with Central-South Florida expected to experience the second largest reduction for vermilion snapper trips, 63%, and South Carolina the second largest reduction for SG trips, 29%.

Table 4-75. Reductions in commercial vessels' net operating revenues due to vermilion snapper management alternatives, in thousand 2005 dollars, by area.

Model	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
385,002 lbs gutted weight TAC, 1,000-lb trip limit, May 1 start to fishing year							
Vessel trips landing at least one pound of vermilion snapper							
Baseline	1,560	1,867	1,123	71	26	0	4,646
Alt. 4	-702	-1,028	-772	-45	-11	0	-2,556
Vessel trips landing at least one pound of any snapper grouper species							
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
Alt. 4	-463	-631	-549	-13	-4	0	-1,661

Table 4-76. Reductions in commercial vessels' net operating revenues due to vermilion snapper management alternatives, in thousand 2005 dollars, by gear type.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
385,002 lbs gutted weight TAC, 1,000-lb trip limit, May 1 start to fishing year								
Vessel trips landing at least one pound of vermilion snapper								
Baseline	112	4,478	4	9	18	24	0	4,646
Alt. 4	-63	-2,458	-1	-6	-11	-19	0	-2,556
Vessel trips landing at least one pound of any snapper grouper species								
Baseline	634	8,131	544	388	305	347	3	10,351
Alt. 4	-5	-1,654	0	-1	2	-3	0	-1,661

4.2.5.2.3 *Recreational Sector*

Unlike the commercial sector, the recreational sector would not be subject to quotas and quota closures. In this respect, the management measures consisting of bag and size limits (**Alternatives 5a and 5b**), size/bag limit and seasonal closure (**Alternative 5c**), and bag limit and seasonal closure (**Preferred Alternative 5d**) are assumed to achieve their expected harvest reductions. With this assumption, the economic impacts of the various alternatives for the recreational sector were estimated without regard to the allocation ratio.

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the vermilion snapper closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

The overall economic impacts of **Alternatives 5a and 5b** would not significantly differ from each other, but these impacts would be higher than those for **Alternative 5c** and **Preferred Alternative 5d** (Table 4-77). Total economic impacts would be about $1.3 million for **Alternatives 5a and 5b**. Total economic impacts for **Alternative 5c** would be about $1.1 million and for **Preferred Alternative 5d**, $1.2 million. In terms of total economic impacts, the alternatives may be ranked in descending order as follows: **Alternative 5c**, **Preferred Alternative 5d**, **Alternative 5a**, and **Alternative 5b**. Although it may be expected for a seasonal closure to result in larger surplus reductions than size and bag limits, it would appear that a two-month closure would not totally overcome the losses from a lower size limit and higher bag limit such that an alternative like **Alternative 5c** would not result in larger surplus reductions than an alternative with relatively lower bag limit and higher size limit such as **Alternative 5a** or **Alternative 5b**. However, a much longer closure, such as in **Alternative 5d**, could readily result in larger losses.

In all four alternatives, reductions in consumer surplus would be substantially higher than reductions in producer surplus. In fact, losses in producer surplus would only be about 6 to 7% of those in consumer surplus for all alternatives. Two factors contributed to this result. First, producer surplus losses would come from two sources (charterboats and headboats), whereas there would three sources of consumer surplus losses, namely, charterboats, headboats, and private mode. Second, even considering only charterboats and headboats, consumer surplus losses would still be more than producer surplus losses.

Under all alternatives, headboats would lose more than charterboats in producer surplus, primarily because there are more headboat trips than charterboat trips targeting/catching vermilion snapper. Among anglers, those fishing from headboats would experience much larger losses in consumer surplus than those fishing from charter or private mode for all alternatives. A major reason for this is that headboat anglers caught more vermilion than private mode anglers.

Headboat losses in producer surplus would follow a pattern similar to that for overall losses. That is, headboats would lose least under **Alternative 5c** and largest under **Alternative 5b**. Similar patterns would hold for charterboat producer surplus and angler consumer surplus.

Table 4-77. Reductions in producer and consumer surplus from various alternatives on vermilion snapper bag limits, size limits, and seasonal closure, in thousand 2005 dollars, by fishing mode.

	Charterboats		**Headboats**		**Private**	
	Prod. Surp.	Cons. Surp.	Prod. Surp.	Cons. Surp.	Cons. Surp.	**Total Effects**
Baseline	537	286	173	1,526	1,055	3,577
Alt. 5a	38	92	43	742	372	1,288
Alt. 5b	38	95	43	763	383	1,322
Alt. 5c	33	79	38	638	320	1,109
Alt. 5d (Pref)	**36**	**86**	**41**	**690**	**346**	**1,200**

In terms of area distribution, South Carolina would incur the largest total losses, followed by Florida, North Florida, and Georgia (Table 4-78). This distribution of losses mimics the distribution of baseline producer/consumer surplus by state. Similar distributional impacts by area would hold for consumer but not for producer surplus. Florida would lose more producer surplus than other areas, followed by South Carolina, North Carolina, and then Georgia.

The magnitude of each state's producer and consumer surplus losses across the various alternatives would follow a pattern similar to that for overall reductions. That is, each state's producer and consumer surplus losses would be least under **Alternative 5c** and largest under **Alternative 5b**. In addition, each state would lose substantially more consumer surplus than producer surplus in all alternatives. This is merely reflective of the relative magnitude of total producer and consumer surplus.

To determine the proportional economic impacts on the various states, we can compare the distribution of baseline producer/consumer surplus with that of the alternatives. The state by state distribution of baseline total producer and consumer surplus is as follows: 43% for Florida, 10% for Georgia, 24% for South Carolina, and 24% for North Carolina. On the other hand, percent distribution of reductions in producers and consumer surplus would be 27% for Florida, 17% for Georgia, 34% for South Carolina, and 22% for North Carolina. We may add that the percent distribution of economic impacts would be the same for all alternatives because the same proportion was used to allocate economic impacts to the various states. These two distributions indicate that both South Carolina and Georgia would experience more than proportionate reductions in producer and consumer surplus and both Florida and North Carolina, less than proportionate reductions in producer and consumer surplus.

Table 4-78. Reductions in producer and consumer surplus from various alternatives on vermilion snapper bag and size limits, in thousand 2005 dollars, by area. .

	Florida		**Georgia**		**South Carolina**		**North Carolina**		**Total**
	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	**Effects**
Baseline	564	965	11	331	55	793	81	778	3,577
Alt. 5a	54	289	3	213	13	430	11	276	1,288
Alt. 5b	54	297	3	219	13	442	11	284	1,322
Alt. 5c	48	248	2	183	12	369	10	237	1,109
Alt. 5d	52	268	3	198	13	400	10	257	1,200

4.2.5.3 Social Effects of Management Regulations Alternatives

Impacts from this suite of proposed alternatives will vary depending on sector/fishery, the specific alternative, and whether one looks at the short- or long-term impacts.

In general, by ending overfishing and keeping vermilion snapper at a sustainable status, long-term benefits are expected to accrue to all participants in the fishery, commercial, recreational, and the general public. Alternatives differ in how they would allow the stock to arrive at a long-term sustainable status. As a result, each of these alternatives differs in the degree and type of negative short- and long-term impacts imposed on each fishing and non-fishing sector. Below is a more detailed analysis of the negative and positive short-term impacts of the proposed alternatives. Long-term benefits are discussed throughout the analysis but as there are sparse data to analyze long-term effects of management measures on communities, future conditions of communities cannot be predicted with confidence.

4.2.5.3.1 *Commercial Fishery*

While the **No Action Alternative 1** would pose the least short-term negative impacts, the stock assessment indicates the stock cannot sustain the current rate of fishing mortality over time and still provide maximum sustainable yield. If stock status worsened in the future and more restrictive management measures were needed, adverse impacts to the commercial fishing sector and associated communities would be substantial.

Preferred Alternative 2 sets a commercial quota and is not tempered by a trip limit to slow development of a derby fishery, which not only poses a safety hazard (less boat maintenance, continuing to fish in bad weather, more stress, and less sleep lead to more accidents) for fishermen, but deteriorates any sense of community between fishermen as they must compete tirelessly against each other to get their historical catch.

Alternatives 3a, 3b, and 3c would divide the commercial quota by season and would address some of the negative social impacts of a derby fishery.

Alternative 4 sets a commercial quota and a May 1 fishing year and would address some of the negative social impacts of a derby fishery.

4.2.5.3.2 *Recreational Fishery*

Alternative 1 is the "No Action" alternative, and negative impacts could occur if a reduction in effort is needed and nothing is done. This might mean that the fishery could be fished to a level that might not allow it to recover or would require more restrictive management measures in the future. The length of recovery might drive some people out of the fishery (or it might be a driving force in eliminating certain for-hire trips), but might even have greater implications for the commercial sector.

Alternative 5 may have a significant, adverse impact on longer headboat trips, especially in North Carolina. Because longer trips are often frequented by return clients, as well as "hardcore" fishers. For these people the trip may be more expensive and taxing on the body, but the reward is often a bigger stringer of prized fish for the table. In North Carolina, many of the trips associated with vermilion snapper catches are longer in nature and require longer steam time to offshore locations. If the bag limit is reduced to 4 (**Preferred Alternative 5d**), then it is possible that these trips may be in jeopardy of being lost due to fishers' perceptions that it is no longer worth their time or money to go fishing for this species.

4.2.5.3.3 *General Non-Fishing Public*

For the general non-fishing public of the U.S., all the alternatives to status quo offer long-term benefits related to ending overfishing and improving stock status. These alternatives benefit those in the U.S. who derive satisfaction from knowing the marine environment is managed sustainably and is thriving. The U.S. consumer may benefit from potential increased consumption of locally caught fish as the stock recovers.

There is the potential of long-term negative impacts to the general non-fishing public who enjoy coming to the coast to experience a "fishing community," eat locally caught seafood, and enjoy the heritage tourism benefits of many coastal communities. If the infrastructure for commercial fishing in the South Atlantic continues to wane, and the proposed management measures hasten that decline, communities will lose this attraction for their tourist trade, and visitors may have a diminished coastal tourism experience. However, these communities can only be expected to exist and prosper if healthy resources and fisheries also exist. Therefore, ending overfishing of vermilion snapper, as a component of the marine ecosystem, is essential to the existence and sustenance of these communities.

4.2.5.4 Administrative Effects of Management Regulations Alternatives

Alternative 1 (No Action) would not change the administrative environment from its current state. **Preferred Alternative 2**, which would establish a directed commercial quota, would minimally affect the current administrative environment, since there is already a commercial quota monitoring system in place for vermilion snapper and would be utilized to monitor any newly established directed commercial quota.

Alternative 3 would divide the directed commercial quota into seasons (specified under each of the sub-alternatives.) Of the six alternatives and sub-alternatives considered for management of vermilion snapper, sub-alternatives under **Alternative 3** would impose the most significant, direct administrative burden. Since the specified quotas are very small, it is likely the fishery would remain open for a very short period of time. If the quota is close to being met or exceeded twice each year, fishery managers will have to prepare and issue fishery closure notices twice as often as they currently do, and twice as many notices would have to be prepared announcing the re-opening of the fishery with any carry-over from the first part of the year. Additionally, enforcement personnel would be burdened with an increase in potential fishery closures, which they would have to monitor.

Alternative 4 would incur similar administrative effects as **Preferred Alternative 3a** under Management Alternatives for gag, and as is the case with gag, would only be germane if a directed quota alternative is implemented. **Alternative 4** would require standard outreach to the commercial fishing community and coordination with NOAA Fisheries Service office of Law Enforcement. Outreach materials would take the form of fishery bulletins and possible updates to NOAA Fisheries Service Southeast Region's web site. Current regulations would need to be modified to change the fishing year start date to the May 1 fishing year start date. Furthermore, ongoing monitoring of the new annual commercial quota would be required (if **Preferred Alternative 2** under this action is implemented) as it relates to the proposed 1,000 pound gutted weight trip limit. Under this alternative, once the annual commercial quota is met, fishing for and/or possession of vermilion snapper by a commercial vessel would be prohibited. Such a closure would be considered routine and would incur a minor impact on the administrative environment due to staff time required to process paperwork to imitate the closure. No significant administrative impacts would be expected under these management alternatives since a quota monitoring system is currently in place, and outreach and coordination efforts would create a minimal administrative burden.

All of the sub-alternatives under **Alternative 5**, which include adjustments to recreational bag/size limits and establishing a recreational closed season, would be expected to create an administrative burden of the same type and to the same degree. Enforcement personnel would be required to enforce a recreational closed season in addition to all other pre-existing or adjusted management measures. NOAA Fisheries Service and the Council would be responsible for notifying the recreational sector of the closed season, and developing new outreach materials outlining any bag/size limit adjustments. Relative to other alternatives being considered under this action, **Alternative 5** would be expected to directly affect the administrative environment on an intermediate level.

4.2.5.5 Council Conclusions

The Council has proposed actions that will provide the necessary reduction in fishing mortality to end overfishing of vermilion snapper. The Council recognizes these actions have serious negative social and economic impacts on affected fishermen, dealers, and consumers. However, the Council must take these actions to comply with the Reauthorized Magnuson-Stevens Act. These actions are based on the best available data from the SEDAR assessment, and the assessment has been reviewed and approved by the Council's Scientific and Statistical Committee (SSC). The final vermilion snapper regulations will be based on the new, age-based SEDAR assessment scheduled to be completed late in 2008. The Council concluded their proposed actions provide the necessary biological protection while minimizing the social and economic impacts to the maximum extent allowed under the law.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative. The AP recommended the least restrictive action to end overfishing using the new age-based SEDAR assessment results.

To make the spawning season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the vermilion snapper closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

The Council concluded their proposed management measures best meet the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.3 *Reduce Bycatch of Snapper Grouper Species*

Alternative 1. No Action. Do not require use of venting tools, dehooking devices, and circle hooks to reduce bycatch.

Alternative 2. Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools and (b) use of non-offset, non-stainless steel circle hooks when using natural baits to fish for snapper grouper species in one of the following South Atlantic EEZ fisheries:

Alternative 2a. Commercial snapper grouper fishery.
Alternative 2b. Recreational snapper grouper fishery.
Alternative 2c. Both commercial and recreational snapper grouper fisheries.

Alternative 3 (Preferred). Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and dehooking tools.

The Council's intent is that the venting tool only be used as required. For example, if the swim bladder is inflated or the fish was caught in deep water, then the venting tool should be used.

Regulations recently implemented in the Gulf of Mexico under Gulf Reef Fish/Shrimp Amendment 14/27 are as follows:

(m) Required gear in the Gulf reef fish fishery. For a person on board a vessel to fish for Gulf reef fish in the Gulf EEZ, the vessel must possess on board and such person must use the gear as specified in paragraphs (m)(1) through (m)(3) of this section.

(1) Non-stainless steel circle hooks. Non-stainless steel circle hooks are required when fishing with natural baits.

(2) Dehooking device. At least one dehooking device is required and must be used to remove hooks embedded in Gulf reef fish with minimum damage. The hook removal device must be constructed to allow the hook to be secured and the barb shielded without re-engaging during the removal process. The dehooking end must be blunt, and all edges rounded. The device must be of a size appropriate to secure the range of hook sizes and styles used in the Gulf reef fish fishery.

(3) Venting tool. At least one venting tool is required and must be used to deflate the swim bladders of Gulf reef fish to release the fish with minimum damage. This tool must be a sharpened, hollow instrument, such as a hypodermic syringe with the plunger removed, or a 16-gauge needle fixed to a hollow wooden dowel. A tool such as a knife or an ice pick may not be used. The venting tool must be inserted into the fish at a 45-degree angle approximately 1 to 2 inches (2.54 to 5.08 cm) from the base of the pectoral fin. The tool must be inserted just deep enough to release the gases, so that the fish may be released with minimum damage.

4.3.1 Biological Effects of Measures to Reduce Bycatch

Alternative 2 would require the use of circle hooks, venting tools, and dehooking devices, which would reduce discard and bycatch mortality in the snapper grouper fishery. Burns *et al.* (2004) reported use of J hooks was the leading cause of red snapper mortality when the effects of hook versus depth related trauma. However, a tagging study conducted by Burns *et al.* (2004) resulted in slightly more red snapper captures from fish initially caught on J hooks suggesting circle hooks might not provide increased survival over J hooks. Tagging was done by members of the public using non-offset circle hooks provided by the researchers. Burns *et al.* (2004) suggested some fishers may have used their own circle hooks or offset circle hooks by hand thereby reducing the survival rate that might have been provided by circle hooks designed for the study.

Cooke and Suski (2004) found mortality rates were lower for circle hooks than J-style hooks. Hooking depth, anatomical hooking location, amount of bleeding, and ease of hook removal were identified as major contributors to mortality. In many cases, circle hooks were found in the maxilla (jaw) and were less likely to be swallowed. Additionally, circle hooks were found less likely to result in bleeding than J-hooks, which tend to deep hook fish at a higher frequency (Cooke and Suski 2004). Removal of deeply ingested hooks often results in mortality (Warner 1979; Muoneke and Childress 1994), with vital organs being damaged from penetration into the pericardium or body cavity (Diggles and Ernst 1997). Kaimmer and Trumble (1997) found circle hooks caught the jaw of Pacific halibut in more than 95% of the observations, while J-hooks caught the jaw about 80% of the time.

Bacheler and Buckel (2004) determined the proportion of grouper and smaller grunt and porgy species that bled varied across hooking locations, with more fish bleeding from gut and gill hooking than jaw hooking. Circle hooks were more likely to hook the species they studied in the jaw, and jaw hooked fish were much less likely to bleed (Bacheler and Buckel (2004). Burns *et al.* (2002) found more red snapper caught with rod-and-reel gear died from hook mortality than all other causes combined, including depth, stress, and handling. Acute J-hook mortalities occurred when the hook penetrated or slit the esophagus, heart, or liver.

Bacheler and Buckel (2004) evaluated the ability of various hook types and sizes to reduce catches of sublegal grouper and non-target species in Onslow Bay, North Carolina. Catch rates for undersized grouper, non-target individuals, and sharks varied across hook treatments, while catch rates for large grouper did not. Bacheler and Buckel (2004) concluded that changes made to hook sizes or type within the ranges used in their study would have very little effect on the catch and size of grouper.

While hook type and size did not affect catches of grouper species, Bacheler and Buckel (2004) found catch rates of other species such as white grunt and red porgy were much higher for the small J hooks than for the large J hook or the circle hook. These results suggest there are limitations to gape size for smaller grunt and porgy species. In the

Portugal longline fishery, Erzini *et al.* (1998) found the smallest J hooks sparids than larger hooks (size 13 and 11).

Bacheler and Buckel (2004) found circle hooks significantly reduced gut hooking in all grouper species (e.g., gag, red grouper, and scamp) as well as smaller grunt and porgy species. Large J hooks were also determined to reduce gut hooking in smaller grunt and porgy species. Circle hooks have been found to reduce gut hooking in bluegill, rainbow trout, and striped marlin, juvenile bluefin tuna, striped bass sailfish, yellowfin tuna, and Pacific halibut (Domeier *et al.* 2003; Falterman and Graves 2002; Lukacovic and Uphoff 2002; Jenkins 2003; Prince *et al.* 2002; Skomal *et al.* 2002; Trumble *et al.* 2002).

If circle hooks increase catch rates as suggested by Henwood *et al.* (2006), a negative effect on the biological environment is possible. Because the recreational sector is managed with size limits, bag limits, and closed seasons, it is more susceptible to increased catch rates. If recreational anglers catch the bag limit more frequently and land larger fish, landings could increase beyond current levels. However, if catch rates increase the number of legal size fish landed and reduce discard mortality, a net benefit would be expected. Therefore, exclusion of smaller individuals or an increase in survival of regulatory discards would be considered to be a positive biological effect.

Similarly, if circle hooks decrease catch-per-unit-effort (CPUE), then a net benefit to the stock could occur. In addition, circle hooks could reduce regulatory discards, thereby providing additional benefits. Modifying gear to reduce bycatch and bycatch mortality could also have beneficial effects on the biological and ecological environment of non-targeted species. Some incidentally caught species in the directed gag and vermilion snapper fishery include red grouper, scamp, red snapper, and greater amberjack that have similar mouth morphology, which is an important factor in the effectiveness of circle hook use (Cooke and Suski 2004). As a result, hooking mortality on these species could be reduced. Discard mortality rates of snapper grouper stocks that are either overfished or are undergoing overfishing could decrease with the use of circle hooks. Therefore, the mandatory use of circle hooks specified in **Alternative 2** has the potential to reduce fishing mortality and help stressed snapper grouper species return to a healthy sustainable level.

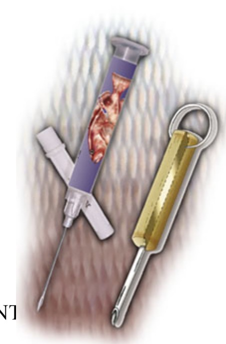
Nevertheless, studies on the effects of circle hooks and J hooks on retention and survival is limited to a handful of snapper grouper species. Due to limited data, it is not possible to quantify the reduction in mortality that could be provided by using circle hooks. Not all species in the snapper grouper complex have the same mouth morphology and it is possible that circle hooks could negatively affect survival. Alternatively, use of circle hooks could substantially reduce harvest of some species, and would have positive biological benefits but negative social and economic impacts on fishermen dependent upon the species.

Alternative 2 and **Preferred Alternative 3** would require the use of venting tools and dehooking devices. The Council's intent is that the venting tool only be used as required. For example, if the swim bladder is inflated or the fish was caught in deep water, then the venting tool should be used. **Preferred Alternative 3** differs from **Alternative 2** in that it would not require circle hooks as a method to reduce bycatch. At their June 2008 meeting, the Scientific and Statistical Committee (SSC) passed a motion requesting the circle hook requirement be removed from the amendment because of poor documentation of the benefits relative to species in Snapper Grouper Amendment 16 and the snapper grouper fishery management unit. The SSC felt reductions in harvest and bycatch mortality would need to be quantified for each of the 73 species in the snapper grouper fishery management unit, and the economic effects for all species in the unit would need to be analyzed. The effects of circle hooks have been examined for only a few snapper grouper species. Therefore, it was suggested by members of the SSC that this particular management measure be considered in a stand-alone amendment. The Snapper Grouper AP also requested this action be removed from Snapper Grouper Amendment 16 because they felt a requirement for circle hooks could reduce the ability to catch yellowtail snapper, a species that is neither overfished or experiencing overfishing. The SSC and Snapper Grouper AP felt requiring the use of venting tools and dehooking devices would likely have positive impacts on reducing mortality of discarded snapper grouper species. The Council's intent is that the venting tool only be used as required. For example, if the swim bladder is inflated or the fish was caught in deep water, then the venting tool should be used.

Venting, when properly executed, is believed to increase survival of released fish. The use of venting tools may also reduce predation on reef fish species by allowing rapid return to depth making them less vulnerable to predators. Discarded fish stranded at the surface become prey for marine mammals, sea birds, and large predators such as amberjack, barracuda, and sharks (Burns *et al.* 2002).

Collins *et al.* (1999) determined that venting of black sea bass provided significant reductions in mortality and benefits of deflation increased with depth. Swim bladder deflation of vermilion snapper also had positive effects but to a lesser extent (Collins *et al.* 1999). The benefits of releasing air from the swim bladder of released fishes was supported by McGovern *et al.*(2005) who conducted a tagging study of gag and greater amberjack. McGovern *et al.* (2005) stated if swim bladders of gag had not been deflated prior to the release of fish, it is likely mortality would have been higher and tag recapture rates would have been lower. The recapture of a gag tagged in depths of 73 m (240 feet) further supports the benefits of swim bladder deflation and indicates at least a portion of degassed fish survive the trauma of capture even in deep water (McGovern *et al.* 2005). Preliminary data from a 15-year study conducted at Mote Marine Lab (GMFMC 2007) suggest venting increases survival in red snapper caught in deep water. In contrast, Render and Wilson (1996) reported swim bladder deflation was not an effective tool for enhancing survival of red snapper.

A venting tool can be any hollow, sharpened instrument that allows gases to escape. Ice picks and knives are not suitable because simply puncturing the fish is undesirable and can kill the fish. Venting tools can be purchased from vendors or constructed by fishermen. For example, Florida Sea Grant indicates a venting tool can be constructed



from a modified hypodermic needle or from a hollow, sharpened stainless steel cannula mounted on a hollow wooden dowel also works (Figure 4-9). The tool should be cleaned between uses and kept in a safe and accessible place. Chlorine bleach is a good disinfectant. After use, sharp points of venting tools should be capped with a cork or some other means to prevent personal injury. Instructions on use and construction of venting tools are provided by Florida Sea Grant and can be found on the Web (http://www.flseagrant.org/program_areas/fisheries/venting/).

Species with large swim bladders such as red grouper, black sea bass, and gag benefit from venting; however, these species do not always need to have air removed from the swim bladder. If a fish is bloated and cannot control its buoyancy or if the fish's stomach is protruding from the mouth, the fish should be vented. Venting is not necessary if the fish appears normal, not bloated, and is able to swim to depth on its own. A fish should be vented as quickly as possible with a minimum of handling. If the fish's stomach is everted out of the fish's mouth, it should not be punctured or pushed it back into the fish's body. Puncturing an everted stomach will cause injury. Removal of gasses from the swim bladder will allow the stomach to return to its normal position within a few hours. To remove air from the swim bladder, Florida Sea Grant recommends holding the fish gently but firmly on its side and inserting the venting tool at a 45-degree angle in a forward direction, approximately one to two inches back from the base of the pectoral fin. The tool is inserted only deep enough to release the gases (http://www.flseagrant.org/program_areas/fisheries/venting/).

Alternative 2 and **Preferred Alternative 3** would also require dehooking devices. Cooke and Suski (2004) identified ease of hook removal as a major contributor to mortality; therefore, the use of dehookers to remove hooks and lines would likely reduce serious injury and post-release mortality of sea turtles, marine mammals, targeted species, and other incidentally caught species.

A dehooking device is a tool intended to remove a hook embedded in a fish and allow a fish to be released with minimum damage. Dehookers would not have to be used if it is safer for the fish and the angler to cut the line rather than trying to remove a deeply imbedded hook. Ideally, a dehooking device would allow the hook to be secured and the barb shielded without re-engaging during removal. The dehooking device would be blunt with all edges rounded so as not to damage the fish. In addition the device would be able to secure the range of hook sizes and styles used in the snapper grouper fishery.

Examples of dehooking devices would include tools with a long shaft with an inverted V or other hook capturing device, bluntnosed pliers, alligator pliers, or dehooking forceps. While pliers and forceps can be used as a dehooking device, the use of dehooking tools that can grab the fishing line, slide down the line, and remove the hook quickly are encouraged because these tools require less handling of the fish and are better able to secure the hook during removal. Devices that could be used to remove hooks depending on the depth and location of hooking are illustrated in Figure 4-9).

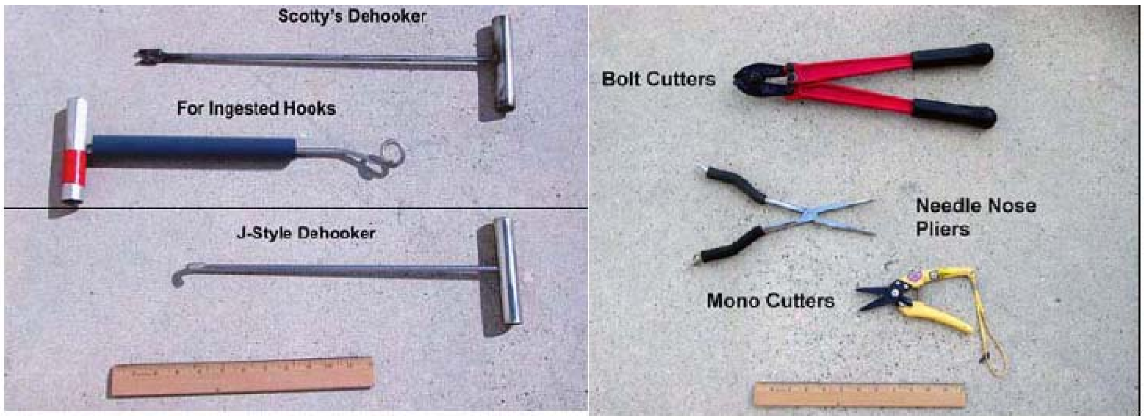


Figure 4-9. Examples of dehooking devices that could be used to remove fish hooks (GFMC 2007).

Dehooking devices can allow fishermen to remove hooks with greater ease and more quickly from snapper grouper species without removing the fish from the water. Leaving a fish in the water while removing the hook can reduce physiological stress. If a fish does need to be removed from the water, dehookers could still reduce handling time in removing hooks, thus increasing survival.

Alternatives 2a and 2b would require only the commercial or recreational sector to use circle hooks, venting tools, and dehooking devices, respectively; whereas, **Alternative 2c** would require both sectors to comply with these requirements. Similarly, **Preferred Alternative 3** would require venting tools and dehooking devices for both the commercial and recreational sectors but not circle hooks. Therefore, **Alternative 2c**, and to a lesser extent **Preferred Alternative 3**, would be the most effective for reducing bycatch mortality of snapper grouper species. Snapper Grouper Amendment 15B (SAFMC 2008b) is under Secretarial Review and would require all vessels with commercial and for-hire snapper grouper vessel permits carrying hook-and-line gear onboard, to have sea turtle release equipment, a long-handled dehooker for ingested hooks, and a long-handled dehooker for external hooks. These dehooking devices may be effective in removing hooks from some fish species.

Alternatives 2c and **Preferred Alternative 3** are likely to reduce the risk of adverse affects to protected species from interactions with the fishery. While dehooking gear for sea turtles and smalltooth sawfish is already required, and venting tools are not applicable to protected species, circle hook requirements could reduce the risk of interactions. Circle hooks are known to reduce the severity of impacts to sea turtles from incidental capture by reducing the likelihood of hook ingestion. Depending on the size of the animal, circle hooks may also reduce the frequency of incidental capture of sea turtles and smalltooth sawfish. Regardless, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

4.3.2 Economic Effects of Measures to Reduce Bycatch

Alternative 1, the no action alternative, would not require vessels to use additional bycatch reduction devices, such as venting tools, dehooking devices, and circle hooks. Therefore, there would not be any changes in net benefits from this alternative. However, as bycatch increase in magnitude over time, long-term benefits from existing and future management measures designed to rebuild the stock would be reduced.

The Council's intent is that the venting tool only be used as required. For example, if the swim bladder is inflated or the fish was caught in deep water, then the venting tool should be used.

Alternative 2 would require these devices only for the commercial sector (**Alternative 2a**), or only the recreational sector (**Alternative 2b**), or both sectors (**Alternative 2c**). The general benefits from **Alternative 2** would come in the form of enhancing the various measures in place for the recreational and/or commercial sectors by lowering incidental take of managed species. The general short-term effects, however, of requiring these devices aboard fishing vessels would be to increase fishing costs if these devices were not used at all by any vessels. Those vessels that already use these devices would not experience any increase in fishing costs. It may be noted, though, that by reducing bycatch, adoption of these devices would free up some crew effort that otherwise would be spent culling the vessel's catch of unwanted fish. Freed up labor hours could be devoted to other activities that could generate more catch or revenues. As discussed above, it is also possible that intended harvest could be reduced because of the circle hook requirement. Depending on the physical structure of a fish's mouth, and the way that they take bait, circle hooks may make it difficult to harvest desired species, reducing revenues to commercial fishermen and consumer surplus to recreational anglers, as well as potential losses in producer surplus to for-hire businesses if angler demand is adversely affected.

Of the total commercial snapper grouper harvests for the period 2001-2006, 79% were accounted for by vertical line fishermen, 8% by longline fishermen, 8% by sea bass pot fishermen, and 5% by fishermen using other gear types (NMFS logbook data). In the Gulf, many fishermen using vertical lines used circle hooks, and if the same were to hold true for the South Atlantic, then the economic effect of requiring circle hooks on commercial fishermen (**Alternative 2a** and **Alternative 2c**) would be relatively low. In addition, the use of circle hooks has gained popularity among Gulf for-hire operators and private anglers, and if this were also true among for-hire operators and private anglers in the South Atlantic, then the economic effects of requiring circle hooks on the recreational sector (**Alternative 2b** and **Alternative 2c**) would also be relatively low. Moreover, fishing equipment suppliers and large-scale retailers currently offer a wide variety of comparably priced hooks, including circle hooks.

Many state agencies and extension and research services, e.g., Florida Sea Grant, have conducted workshops or designed educational brochures detailing proper dehooking and venting procedures and indicating simple methods for altering commonly available instruments such as hypodermic needles to serve as venting tools. Needle-nose pliers can be used as dehooking devices. Ready-made dehooking devices and venting tools are available for purchase from various sources for less than $15 each. Hence, the economic impacts of requiring dehooking tools and venting devices on either the commercial or recreational sector would be relatively low.

In general then, the required bycatch devices under **Alternative 2** 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. **Alternative 2c**, which would require the use of circle hooks, dehooking tools, and venting devices in all harvest sectors would provide for the greatest possible benefits from bycatch reduction, but also result in the greatest unintended reduction in directed harvests of target species that cannot properly bite a circle hook (e.g., yellowtail snapper and mangrove snapper).

Preferred Alternative 3 would only require the use of venting and dehooking tools and, as a result, would avoid the loss of directed harvest of target species that cannot be caught with circle hooks. Thus, while total bycatch and bycatch mortality would not be reduced as much as under **Alternative 2**, the costs associated with lost revenues and reduced consumer surplus or producer surpluses would be avoided.

4.3.3 Social Effects of Measures to Reduce Bycatch

The Council's intent is that the venting tool only be used as required. For example, if the swim bladder is inflated or the fish was caught in deep water, then the venting tool should be used.

Preferred Alternative 3 offers ways to reduce the recreational bycatch mortality by requiring the use of venting and dehooking tools and non-offset, non-stainless steel circle hooks. These measures will impose some short-term negative social impacts but the long-term social impacts should be positive as the stock recovers.

4.3.4 Administrative Effects of Measures to Reduce Bycatch

Alternative 3 (Preferred) would create moderate adverse administrative effects since it would require extensive coordination between the Office of Sustainable Fisheries and the Office of Law Enforcement. Several forms of educational and outreach materials would need to be made available to fishery participants. Educational materials would outline proper use and technique when using the required tools, and would provide specifications for what constitutes an effective venting and/or dehooking tool. Other outreach materials such as Fishery Bulletins and the NOAA Fisheries Service web site would be used to notify fishery participants of the requirement for each vessel in the commercial or recreational sector of the snapper grouper fishery to use venting and dehooking tools on snapper grouper species. The education and outreach component of this provision would create a relatively short-term impact on the administrative environment; however, enforcement of its implementing regulations would be ongoing.

4.3.5 Council Conclusions

The Council has proposed actions that will reduce bycatch mortality and help to end overfishing. The Council recognizes these actions will be difficult to enforce. However, the Council is relying on fishermen to do what is right to help prevent unnecessary mortality. To the extent bycatch and discard mortality are reduced, available catches will be able to increase more quickly.

The Council's intent is that the venting tool only be used as required. For example, if the swim bladder is inflated or the fish was caught in deep water, then the venting tool should be used.

The Council concluded their proposed actions will provide some biological protection while minimizing the disruption to normal fishing operations.

The Council reviewed public comments at the June 2008 meeting and changed their preferred alternative to only require venting and dehooking and not circle hooks. Additional public comment was reviewed at the September 2008 meeting, and the Council determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings support the use of venting and dehooking tools.

The Council concluded requiring use of venting and dehooking tools best meets the objectives of the Snapper Grouper Fishery Management Plan as modified.

4.4 *Allow NMFS Regional Administrator (RA) to Make Adjustments to Vermilion Snapper Management Measures*

Alternative 1. No Action. Do not allow the NMFS Regional Administrator (RA) to make adjustments to the management measures based on outcome of new vermilion snapper benchmark assessment.

Alternative 2 (Preferred). Allow the NMFS Regional Administrator (RA) to make adjustments to the management measures as specified in Table 4-79 based on the outcome of new vermilion snapper SEDAR benchmark assessment.

Discussion

In order to meet the Magnuson-Stevens Act one-year requirement to prepare an amendment to end overfishing (the Council was notified about overfishing of vermilion snapper in June 2007), the Council has specified management measures based on the existing assessment (SEDAR Update #3 2007). The updated assessment was based on length data. The Council requested a new stock assessment based on ages rather than lengths. The new, age-based, benchmark assessment will be completed in late 2008, too late for the Council to include in Snapper Grouper Amendment 16. Therefore, the Council has specified a measure that allows the NMFS Regional Administrator (RA) to determine the actual vermilion snapper regulations that will be implemented in the final rule for Snapper Grouper Amendment 16 in response to the new benchmark assessment. The following two tables (Tables 4-79 and 4-80) provide the specific guidance to be used by the NMFS RA in determining the actual regulations.

The Scientific and Statistical Committee (SSC) will review the SEDAR Benchmark Assessment (available in late 2008) to determine whether it is based on the best available science. The SSC will then provide management advice regarding vermilion snapper to the Council at the December 2008 Council meeting, including the final TAC which will be used to determine the commercial quota.

The SEDAR Benchmark Assessment and SSC review will result in a new numerical estimate of OY that has been specified by the Council as the yield at 75%F_{MSY}. That is, the new value for OY replaces the current value which is 628,459 pounds whole weight (566,179 pounds gutted weight) shown in Table 4-52a. (Note: The values for 65% and 85% of F_{MSY} will also change based on the new F_{MSY} from the new age-based benchmark assessment/SSC review.) The Total Allowable Catch (TAC) (Table 4-53) would be respecified as the new value of yield at F_{OY}. The TAC would be allocated 68% to the commercial sector and 32% to the recreational sector and the new values will replace those found in Table 4-54a.

For the commercial sector, the new quota would be divided 50% to the period January 1st through June 30th and 50% to the period July 1st through December 31st. Then post quota bycatch mortality (PQBM) would be estimated and deducted, to provide new values for the directed commercial quotas shown in Table 4-61. Examples based on 10%

- 60% are shown in Table 4-80. However, the actual values will be calculated from the new commercial quota as described above.

For the recreational sector, the new recreational allocation that replaces the value in Table 4-54a would be compared to the average 2004-2006 recreational landings (Table 4-54b) to determine the percentage reduction needed and this value will replace the value specified in Table 4-55. The following two examples explain what would be implemented for the recreational sector in the final rule for Snapper Grouper Amendment 16:

Example 1. If the recreational percentage reduction required is 23% that is in the range (15.0%-24.9%) specified for Alternative 2B. in Table 4-79. Therefore, the recreational measures would remain at 12” TL minimum size limit, 10 fish bag limit, and no closure. Amendment 13C increased the size limit of vermilion snapper taken by recreational fishermen from 11 inches TL to 12 inches TL. Combined with the reduction provided by excluding the captain and crew from retaining vermilion snapper, the increased minimum size limit in Snapper Grouper Amendment 13C is estimated to provide a 27.5% reduction in harvest, assuming 25% of the fish released do not survive. Therefore, the RA would not make any changes to management measures beyond those imposed though Amendment 13C if the new, age-based SEDAR benchmark assessment indicated needed reductions were less than 30%.

Example 2. If the recreational percentage reduction required is 36% that is in the range (35.0%-44.9%) specified for Alternative 2D. in Table 4-79. Therefore, the recreational measures to be implemented in the final rule for Snapper Grouper Amendment 16 would remain at 12” TL minimum size limit but the bag limit would decrease from 10 to 9 vermilion snapper and there would be a recreational closure from November through March.

To make the recreational season closure as effective as possible, the Council also specified that for a person on board a vessel or for which a valid federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, the provisions of the vermilion snapper closure apply in the South Atlantic, regardless of where such fish are harvested, that is, in State or Federal waters.

Table 4-79. Commercial and recreational management measures to be employed by NMFS RA based on reduction harvest needed to achieve the yield at F_{OY}. Commercial quota to be divided into two seasons – January-June and July-December. Recreational measures would eliminate captain and crew from retaining the bag limit.

%REDUCTION	COMMERCIAL	RECREATONAL
Alternative 2A. 10% (5.0 – 14.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 10 FISH & NO CLOSURE**
Alternative 2B. 20% (15.0 – 24.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 10 FISH & NO CLOSURE**
Alternative 2C. 30% (25.0 – 34.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 9 FISH & NO CLOSURE**
Alternative 2D. 40% (35.0 – 44.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 9 FISH & NOV-MARCH CLOSURE**
Alternative 2E. 50% (45.0 – 54.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 5 FISH & NOV-MARCH CLOSURE**
Alternative 2F. 60% (55.0 – 64.9%)	**QUOTA ALLOCATED BY SEASON**	**12", 5 FISH & OCT – APRIL CLOSURE**

Table 4-80. Directed quota associated with reduction in harvest required from new vermilion snapper assessment.

Reduction	10%	20%	30%	40%	50%	58%*	60%
Commercial quota	**832,744**	**740,217**	**647,690**	**555,163**	**462,636**	**385,002**	**370,108**
Jan-June 50%	416,372	370,108	323,845	277,581	231,318	192,501	185,054
PQBM	6,000	9,000	11,000	16,000	19,000	24,000	24,000
Directed quota Jan-June	**410,372**	**361,108**	**312,845**	**261,581**	**212,318**	**168,501**	**161,054**
July-Dec 50%	416,372	370,108	323,845	277,581	231,318	192,501	185,054
PQBM	19,000	21,000	24,000	29,000	34,000	37,000	37,000
Directed quota July-Dec	**397,372**	**349,108**	**299,845**	**248,581**	**197,318**	**155,501**	**148,054**

Rebuilding projections from new assessment could have different values for quotas associated with required reduction. These values are estimates until new assessment becomes available. Reduction is based on average landings from 2004-2006 (925,271 lbs gutted weight).
* Values from Alternative 3a in Section 4.2.4.

4.4.1 Biological Effects of RA Measures

A new vermilion snapper benchmark assessment is ongoing, which will incorporate ages from over 9,000 fish. A data workshop was held in May 2008, an assessment workshop in August 2008, and a review workshop in October 2008. The Council's SSC will review the assessment at their November 30-December 3, 2008 meeting. If the outcome of the assessment is different than the 2007 vermilion snapper assessment update, **Preferred Alternative 2** would allow the RA to make adjustments to the management measures as specified in Tables 4-79 and 4-80. [Note: See the previous discussion for examples of how this would work.] This would be a onetime adjustment, which would be specified via rulemaking to implement this amendment. The Commercial quota in **Preferred Alternative 2** would be based on **Preferred Alternative 3a** in Section 4.2.5 where 50%

of the directed commercial quota would be allocated to January 1st through June 30th and 50% to the period July 1st through December 31st. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward to the next year.

Estimates of commercial quota and PQBM associated with various reductions in harvest needed to achieve the yield at F_{OY} are provided in Table 4-80. The actual values for TAC and an associated commercial quota specified by the benchmark assessment for a particular reduction in harvest will be different since the assessment could be using a different set of years and could make different assumptions. However, Table 4-80 provides values that should approximate the expected quota associated with achieving the yield at F_{OY}. The commercial quota will be determined from an assessment projection. The preferred commercial allocation (68%) will be applied to the Total Allowable Catch from the yield at 75% Fmsy specified in the projection. Thus, the new commercial quota will correspond to 68% of the TAC. This value would be split equally into two seasons (January-June) and July-December) and adjusted for PQBM.

Preferred Alternative 2 would implement two seasonal commercial quotas derived from the new vermilion snapper SEDAR assessment, which would then be reduced for PQBM. The SSC and Council approved the methodology for PQBM analyses at their December 2007 meeting. However, they recommended the Snapper Grouper AP review the methodology to provide an estimate of the number of trips that might not be taken to target snapper grouper species during a closure for vermilion snapper or gag and provide an estimate of the ability of fishermen to avoid vermilion snapper or gag by modifying fishing techniques. The Council and the Council's AP recommended that estimates for PQBM assume that fishing trips, which previously caught vermilion snapper, would be reduced by 20% after a quota is met and fishermen can avoid 20% of the vermilion snapper by using different techniques. The magnitude of PQBM will depend on the level of harvest reduction specified by the new SEDAR stock assessment and the length of any closed season.

The length of time the fishery remains open would depend on the magnitude of reduction in harvest needed. With a 10% reduction in the average 1999-2005 landings (see Table 8 in Appendix F), a quota for would likely be met during June during the January 1st through June 30th quota period and October for the July 1st through December 31st quota period. In contrast, with a 60% reduction in the average 1999-2005 landings (see Table 8 in Appendix F), a quota would likely be met during March during the January 1st through June 30th quota period and August for the July 1st through December 31st quota period. Larger reduction in harvest would be more likely to encourage derby conditions, where fishermen compete with each other to catch as many fish as possible before the quota is taken and the fishery is closed for the remainder of the fishing season.

Preferred Alternative 2 would also allow the RA to make adjustments to the bag limit and length of a seasonal closure to achieve the reduction in harvest needed to achieve the yield at F_{OY} specified by the new vermilion snapper benchmark assessment (Table 4-79). Amendment 13C increased the size limit of vermilion snapper taken by recreational fishermen from 11 inches TL to 12 inches TL. Combined with the reduction provided by excluding the captain and crew from retaining vermilion snapper, the increased minimum size limit in Snapper Grouper Amendment 13C is estimated to provide a 27.5% reduction in harvest, assuming 25% of the fish released do not survive. Therefore, the RA would not make any changes to management measures beyond those imposed though Amendment 13C if the new SEDAR benchmark assessment indicated needed reductions were less than 30%.

If the new benchmark assessment indicated reductions of 30 to 60% in harvest were needed to achieve the yield at F_{OY}, the RA would make adjustments in the bag limit and length of a seasonal closure. A reduction in the bag limit to 9 fish combined with excluding the captain and crew from retaining a bag limit would provide close to a 30% reduction in harvest when the effect of increasing the minimum size to 12 inches TL is considered. To achieve a 60% reduction in harvest, the bag limit would be reduced to 5 fish per person and an October to April seasonal closure would be imposed. None of the options would increase the minimum size limit.

The Council chose not to include an increase in the minimum size limit as an option because it would be expected to increase the number of regulatory discards as was observed when the recreational size limit was increased to 11 inches TL in 1999 and again in 2007, when the recreational size limit was increased to 12 inches TL. Instead, the Council chose to reduce harvest through a combination of bag limit adjustments and seasonal closures. Bag limits are commonly used management measures, which are readily understood by fishermen. Violations of bag limits are readily apparent by simply counting the number of fish that are retained, which aids in enforcement of fishery regulations. However, fishermen may continue to fish, keeping larger fish and throwing smaller dead fish back. In addition, fishermen may continue to catch vermilion snapper once the bag limit is reached when targeting co-occurring species.

The length of the closed season may influence its effectiveness in reducing fishing mortality on vermilion snapper due to shifting of effort to weeks before and after the closure. A longer closed season, as proposed in alternatives that require greater reductions in harvest, may be more effective, as it would be more difficult for fishermen to shift all their effort. However, some displacement of effort is still likely to occur, making it difficult to estimate impacts of seasonal closures (GMFMC 2004).

Ending overfishing of vermilion snapper is expected to increase stock biomass and promote a more natural population structure by helping to reverse any trends in decreasing mean length and size/age at sexual maturity that could occur. These effects would benefit the vermilion snapper stock and associated species by protecting the stock against recruitment overfishing and reducing its vulnerability to adverse environmental conditions.

Due to the range of options possible, the impacts of **Alternative 2** on protected resources are uncertain. However, current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an

ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

4.4.2 Economic Effects of RA Measures

4.4.2.1 General Discussion

The various measures in this section are designed to allow the RA to adjust the management measures based on the results of the forthcoming, new benchmark stock assessment. The management objective remains achieving the yield at Foy but management measures may need to be changed in order to achieve this objective. **Alternative 1**, the no action alternative, does not allow the RA to make adjustments based on the new stock assessment. **Preferred Alternative 2** would allow the RA to make the necessary adjustments based on the new stock assessment. The type of management changes considered under **Preferred Alternative 2** focus on quota changes for the commercial sector and bag limit and seasonal closures changes for the recreational sector. The general economic implications of these management measures have already been discussed in previous sections. The current discussion focuses on the specific level of reductions required to achieve the yield at Foy, assuming the period 2004-2006 as the baseline period for calculating the required harvest reductions. Percent reductions of 10% to 60% are considered. Noting that a 62% harvest reduction is the current preferred option based on the 2007 stock assessment, most of the options considered under **Preferred Alternative 2** would tend to alleviate this amendment's overall short-run negative impacts on both the commercial and recreational sectors.

4.4.2.2 Commercial Sector

Simulation runs for the various quota alternatives for the commercial sector are presented in Table 4-81 by gear type and Table 4-82 by area. The various quotas are implemented as two-tiered quotas, with 50% of overall quota allocated to the January-June season and the rest to the July-December season. The baseline numbers are identical to those in previous simulations presented in earlier sections of this amendment. In addition to determining the impacts on net operating revenues of trips with at least one pound of vermilion snapper and of trips with at least one pound of any snapper grouper species, simulations were also done with and without assumptions on quotas/closures for gag. The general expectation in the latter case is that if a quota and closures were also adopted for gag and other species, the effects of the various quotas for vermilion snapper would be higher than if there were no such quota/closures for gag and other species.

Simulation results in terms of vessel net operating revenues follow linearly the progression in harvest reductions, with the least effects from **Alternative 2A** with a 10% harvest reduction and largest effects from **Alternative 2F** with a 60% harvest reduction. This would be true whether or not there would be a gag quota and seasonal closure and regardless of whether trips were those landing at least one pound of vermilion snapper or those landing at least one pound of any snapper grouper species. Thus, the ranking of alternatives in descending order would be **Alternative 2A**, **Alternative 2B**, **Alternative 2C**, **Alternative 2D**, **Alternative 2E**, and **Alternative 2F**.

As already noted in earlier discussions, the percent reductions in harvest would not be identical to the percent reductions in net operating revenues. As can be readily computed from results presented in Tables 4-81 and 4-82, the percent reductions in net operating revenues would be higher than their corresponding reductions in harvest for vessel trips landing at least one pound of vermilion snapper. On the other hand, percent reductions in net operating revenues would be lower than their harvest counterparts for vessel trips landing at least one pound of any snapper grouper species.

Assuming the no action alternative for gag quota and closure of other snapper-grouper species, net revenue reductions would range from about $0.74 million (16%) under **Alternative 2A** to ~~65 percent~~ $3.02 million (65%) under **Alternative 2F**. Larger net revenue reductions, ranging from $1.18 million (26%) under **Alternative 2Ai** to $3.33 million (72%) under **Alternative 2Fi**, would ensue if a gag quota and seasonal closure for other snapper grouper species were also imposed. For vessel trips landing at least one pound of any snapper grouper species, the percent reductions in net operating revenues would be lower than their corresponding reductions in harvests, and with the exception of **Alternative 2Ai**, this ~~is~~ would be true regardless of whether or not a gag quota and seasonal closures for snapper grouper were assumed. Net revenue reductions would range from about $0.41 million (4%) under **Alternative 2A** to $1.68 million (16%) under **Alternative 2F**, assuming no action for gag quota and closures of snapper grouper species, or from about $1.23 million (12%) under **Alternative 2Ai** to $2.45 million (24%) under **Alternative 2Fi** assuming a gag quota and closures for snapper grouper species.

In terms of absolute magnitudes, the vertical line vessel trips, mainly due to their dominance in the vermilion snapper fishery, would incur the largest reduction under any of the quota alternatives (see Table 4-81). Diving vessel trips would be next in line although at much reduced levels than vertical line vessel trips. For vertical line ~~vessels~~ vessel trips landing at least one pound of vermilion snapper, reductions in net operating revenues would range from about $0.72 million (16%) to $2.92 million (65%) assuming no action for gag quota and snapper grouper closures, or from $1.15 million (26%) to $3.22 million (72%) assuming a gag quota and snapper grouper closures. Note that the percentage reductions in the net operating revenues of vertical line vessel trips are identical to the overall percentage reductions in net operating revenues. In percent terms, the longline vessel trips would experience larger reductions in net operating revenues with alternatives providing for harvest reductions higher than 30%.

From the standpoint of distributional effects by area, North Carolina, South Carolina, and Georgia/Northeast Florida would experience the largest losses in terms of both absolute and percentage values (see Table 4-82) under any of the quota alternatives. These losses are mainly driven by the relatively large participation of these areas in the commercial vermilion snapper fishery. Assuming no action for gag quota and seasonal closures, net operating revenue losses would range from $0.27 million to $1.04 million for North Carolina, $0.29 million to $1.23 million for South Carolina, and $0.17 million to $0.70

million for Georgia/Northeast Florida. Losses in other areas would be less than $45 thousand at the largest percent reduction in harvest.

Table 4-81. Reductions in commercial vessels' net operating revenues from alternative RA measures for vermilion snapper, in thousand 2005 dollars, by gear type.

Model	Diving	Vertical Lines	Longlines	Other Gears	Traps / Pots	Trolling	not recorded	Total
Vessel trips landing at least one pound of vermilion snapper								
Baseline	112	4,478	4	9	18	24	0	4,646
	Assuming no action for gag quota and seasonal closures							
Alt. 2A	-12	-721	0	-1	-3	-3	0	-739
Alt. 2B	-21	-1,039	0	-1	-4	-4	0	-1,069
Alt. 2C	-35	-1,477	-3	-1	-4	-6	0	-1,526
Alt. 2D	-51	-2,013	-3	-1	-5	-8	0	-2,081
Alt. 2E	-60	-2,512	-3	-3	-7	-11	0	-2,595
Alt. 2F	-71	-2,919	-3	-4	-8	-14	0	-3,019
	Assuming gag quota of 352,940 lbs with PQBM and Jan.-Apr. SG closure							
Alt. 2Ai	-21	-1,153	0	-1	-3	-4	0	-1,184
Alt. 2Bi	-33	-1,464	0	-2	-4	-5	0	-1,507
Alt. 2Ci	-44	-1,824	0	-2	-5	-7	0	-1,881
Alt. 2Di	-57	-2,286	-3	-2	-6	-8	0	-2,362
Alt. 2Ei	-69	-2,800	-3	-3	-7	-11	0	-2,893
Alt. 2Fi	-80	-3,220	-3	-4	-9	-14	0	-3,330
Vessel trips landing at least one pound of any snapper grouper species								
Baseline	634	8,131	544	388	305	347	3	10,351
	Assuming no action for gag quota and seasonal closures							
Alt. 2A	-1	-409	0	0	0	0	0	-410
Alt. 2B	-2	-584	0	0	1	0	0	-585
Alt. 2C	-3	-827	0	0	1	-1	0	-830
Alt. 2D	-4	-1,113	0	0	1	-1	0	-1,118
Alt. 2E	-5	-1,396	0	0	1	-2	0	-1,402
Alt. 2F	-5	-1,670	0	-1	1	-3	0	-1,678
	Assuming gag quota of 352,940 lbs with PQBM and Jan.-Apr. SG closure							
Alt. 2Ai	-103	-1,101	-11	-4	1	-13	0	-1,231
Alt. 2Bi	-104	-1,274	-11	-4	1	-13	0	-1,406
Alt. 2Ci	-106	-1,487	-11	-4	1	-14	0	-1,619
Alt. 2Di	-106	-1,766	-11	-4	1	-14	0	-1,900
Alt. 2Ei	-107	-2,037	-11	-4	2	-15	0	-2,172
Alt. 2Fi	-107	-2,311	-11	-5	1	-15	0	-2,447

Table 4-82. Reductions in commercial vessels' net operating revenues from alternative RA measures for vermilion snapper, in thousand 2005 dollars, by area.

Model	North Carolina	South Carolina	Georgia and northeast FL	Central and south FL	Florida Keys	Other	Total
Vessel trips landing at least one pound of vermilion snapper							
Baseline	1,560	1,867	1,123	71	26	0	4,646
	Assuming no action for gag quota and seasonal closures						
Alt. 2A	-265	-294	-165	-12	-4	0	-739
Alt. 2B	-386	-425	-235	-18	-5	0	-1,069
Alt. 2C	-522	-626	-347	-23	-9	0	-1,526
Alt. 2D	-711	-863	-469	-29	-10	0	-2,081
Alt. 2E	-899	-1,062	-587	-35	-12	0	-2,595
Alt. 2F	-1,038	-1,228	-696	-43	-15	0	-3,019
	Assuming gag quota of 352,940 lbs with PQBM and Jan.-Apr. SG closure						
Alt. 2Ai	-357	-545	-259	-19	-3	0	-1,184
Alt. 2Bi	-484	-666	-327	-25	-5	0	-1,507
Alt. 2Ci	-598	-824	-424	-29	-6	0	-1,881
Alt. 2Di	-757	-1,022	-539	-34	-10	0	-2,362
Alt. 2Ei	-949	-1,238	-653	-41	-11	0	-2,893
Alt. 2Fi	-1,102	-1,399	-768	-47	-15	0	-3,330
Vessel trips landing at least one pound of any snapper grouper species							
Baseline	2,555	2,213	1,352	1,989	2,240	3	10,351
	Assuming no action for gag quota and seasonal closures						
Alt. 2A	-158	-132	-112	-5	-2	0	-410
Alt. 2B	-233	-191	-152	-8	-2	0	-585
Alt. 2C	-317	-278	-222	-9	-3	0	-830
Alt. 2D	-420	-382	-301	-11	-4	0	-1,118
Alt. 2E	-521	-484	-378	-14	-5	0	-1,402
Alt. 2F	-607	-594	-456	-15	-6	0	-1,678
	Assuming gag quota of 352,940 lbs with PQBM and Jan.-Apr. SG closure						
Alt. 2Ai	-332	-423	-261	-114	-101	0	-1,231
Alt. 2Bi	-407	-478	-302	-117	-102	0	-1,406
Alt. 2Ci	-482	-556	-361	-118	-102	0	-1,619
Alt. 2Di	-581	-655	-441	-120	-103	0	-1,900
Alt. 2Ei	-681	-750	-515	-123	-104	0	-2,172
Alt. 2Fi	-776	-848	-594	-124	-105	0	-2,447

4.4.2.3 Recreational Sector

Unlike the commercial sector, the recreational sector would not be subject to quotas and quota closures. In this respect, the management measures consisting of bag limits and seasonal closures are assumed to achieve their expected harvest reductions. With this assumption, the economic impacts of the various alternatives for the recreational sector were estimated without regard to the allocation ratio.

As in the case with the commercial sector, **Alternative 1 (no action)** would not allow the RA to make changes to the recreational management measures based on results of the new SEDAR stock assessment. Again, this alternative would tend to maintain the relatively high level of harvest reduction specified earlier for the recreational vermilion snapper fishery. Under **Preferred Alternative 2**, the RA would have the option to effect harvest reductions ranging from 10% to 60% (based on the 2004-2006 harvests). Thus, this alternative would allow potentially lower harvest reductions. As specified in Table 4-79, only when the required reductions were 30% or higher would there be a change in the management measures (above those implemented in Snapper Grouper Amendment 13C), which would include a bag limit reduction or a combination of bag limit reduction and seasonal closure. For purposes of estimating the economic effects of all sub-alternatives of **Preferred Alternative 2** on the recreational sector, the bag limit or bag limit/seasonal closure combinations were assumed to match exactly the required percent harvest reductions. In this manner, the resulting economic estimates would follow linearly the progression in harvest reductions, with the lowest impacts accruing to **Alternative 2A** and the highest, to **Alternative 2F**. In effect then, the economic ranking of alternatives would be in descending order: **Alternative 2A, Alternative 2B, Alternative 2C, Alternative 2D, Alternative 2E, and Alternative 2F.**

Total economic impacts would range from about $0.18 million for **Alternative 2A** to $1.09 million for **Alternative 2F** (see Table 4-83). In all sub-alternatives of **Preferred Alternative 2**, reductions in consumer surplus would be substantially higher than those in producer surplus. In fact, losses in producer surplus would only be about 4% of those in consumer surplus for all sub-alternatives. In addition, headboats would lose more than charterboats in producer surplus. Among anglers, those fishing through headboats would experience much larger losses in consumer surplus than those fishing through charter or private mode for all alternatives.

Table 4-83. Reductions in producer and consumer surplus from alternative RA measures for vermilion snapper, in 2005 dollars, by fishing mode.

	Charterboats		**Headboats**		**Private**	
	Prod. Surp.	Cons. Surp.	Prod. Surp.	Cons. Surp.	Cons. Surp.	**Total Effects**
Baseline	537	286	173	1,526	1,055	3,577
Alt. 2A	-5	-13	-6	-105	-52	-182
Alt. 2B	-11	-26	-13	-209	-105	-364
Alt. 2C	-16	-39	-19	-314	-157	-545
Alt. 2D	-22	-52	-25	-418	-210	-727
Alt. 2E	-27	-65	-31	-523	-262	-909
Alt. 2F	-33	-78	-38	-627	-315	-1,091

In terms of area distribution, South Carolina would incur the largest total losses, followed by Florida, North Florida, and Georgia (Table 4-84). This distribution of losses mimics the distribution of baseline producer/consumer surplus by state. Similar distributional impacts by area would hold for consumer but not for producer surplus. Florida would lose more producer surplus than other areas, followed by South Carolina, North Carolina, and then Georgia.

The magnitude of each state's producer and consumer surplus losses across the various alternatives would follow a pattern similar to that for overall reductions. That is, each state's producer and consumer surplus losses would be least under **Alternative 2A** and largest under **Alternative 2F**. In addition, each state would lose substantially more consumer surplus than producer surplus in all alternatives. This is merely reflective of the relative magnitude of total producer and consumer surplus.

Table 4-84. Reductions in producer and consumer surplus from alternative RA measures for vermilion snapper, in 2005 dollars, by area.

	Florida		Georgia		South Carolina		North Carolina		Total
	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	P. Sur.	C. Sur.	Effects
Baseline	564	965	11	331	55	793	81	778	3,577
Alt. 2A	-8	-41	0	-30	-2	-61	-2	-39	-182
Alt. 2B	-16	-81	-1	-60	-4	-121	-3	-78	-364
Alt. 2C	-24	-122	-1	-90	-6	-182	-5	-117	-545
Alt. 2D	-31	-163	-2	-120	-8	-242	-6	-155	-727
Alt. 2E	-39	-203	-2	-150	-10	-303	-8	-194	-909
Alt. 2F	-47	-244	-2	-180	-11	-363	-9	-233	-1,091

4.4.3 Social Effects of RA Measures

In principle, the **No Action Alternative 1** would not have any effects on fishing participants. In the current situation, however, certain effects may occur depending on the result of the new stock assessment. If the results necessitate only small changes in quotas and other management measures, **Alternative 1** would not allow the fishing participants to experience immediately smaller reductions in benefits than those that would accompany the management measures established in other sections of this amendment. If the stock status worsened, then establishment of new management measures could take more time. While the short-term effects on fishing participants would be less negative in this situation, the long-term effects could prove to be more negative as measures that are more stringent would have to be instituted.

Preferred Alternative 2 would allow the RA to choose a set of commercial quota and recreational bag limit/seasonal closures with the level of harvest reductions dependent on the results of the new SEDAR stock assessment. In this scenario, the short-term negative or positive effects on fishing participants could take place within a short period. More importantly, the long-term sustainability of the stock would be directly addressed and thus the long-term positive effects would be more likely realized.

For the commercial fishery, the short-run effects of **Preferred Alternative 2** would be positive or negative depending on the results of the stock assessment. Since the current proposal is to reduce commercial quota by 58%, most of the options under **Preferred Alternative 2** would require reductions in harvest lower than 58%. Thus, this alternative would provide a better chance for the commercial fishery to experience more positive or less negative effects. With the harvest reductions implemented through commercial quota reductions, a derby fishery could develop. If not tempered by a trip limit, a derby fishery could expose fishermen to safety hazard (less boat maintenance, continuing to fish in bad weather, more stress and less sleep lead to more accidents) for fishermen. This could lead to a deteriorating sense of community between fishermen, as they must compete tirelessly against each other to get their historical catch. It should be stressed that this derby-like fishery could develop only if higher harvest reductions were required as a result of the new SEDAR stock assessment because as the available quota is lowered, the race to fill the quota speeds up.

For the recreational fishery, measures that are more restrictive would only be necessary if the required harvest reductions would be 30% or higher. At a lower percent reduction, the social effects of **Preferred Alternative 2** would be relatively minimal in the short-run while providing sufficient protection to the stock in the long-term. Higher harvest reductions would result in short-term negative impacts but would allow the stock to remain at the more sustainable trajectory within a relatively short span of time. For the for-hire fishery, the length of stock recovery is important. A longer recovery period might drive some people out of the fishery (or it might be a driving force in eliminating certain for-hire trips). It should also be noted that higher harvest reductions would particularly have adverse impacts on longer headboat trips, especially in North Carolina, because longer trips are often frequented by return clients, as well as “hardcore” fishers. For these people the trip may be more expensive and taxing on the body, but the reward is often a bigger stringer of prized fish for the table. In North Carolina, many of the trips associated with vermilion snapper catches are longer in nature and require longer steam time to offshore locations. If the bag limit is reduced to 5, then it is possible that these trips may be in jeopardy of being lost due to fishers’ perceptions that it is no longer worth their time or money to go fishing for this species.

For the general non-fishing public of the U.S., **Preferred Alternative 2** would offer long-term benefits related to ending overfishing and improving stock status. These alternatives benefit those in the U.S. who derive satisfaction from knowing the marine environment is managed sustainably and is thriving. The U.S. consumer may benefit from potential increased consumption of locally caught fish as the stock recovers.

There is the potential of long-term negative impacts to the general non-fishing public who enjoy coming to the coast to experience a “fishing community,” eat locally caught seafood, and enjoy the heritage tourism benefits of many coastal communities. If the infrastructure for commercial fishing in the South Atlantic continues to wane, and the proposed management measures hasten that decline, communities will lose this attraction for their tourist trade, and visitors may have a diminished coastal tourism experience. However, these communities can only be expected to exist and prosper if healthy resources and fisheries also exist. Therefore, ending overfishing of the vermilion snapper resource, as a component of the marine ecosystem, is essential to the existence and sustenance of these communities.

4.4.4 Administrative Effects of RA Measures

Alternative 1 (no action) would not allow the RA to make adjustments to vermilion snapper management measures based on the outcome of the new SEDAR benchmark assessment. If the RA is unable to adjust the proposed management measures to end overfishing there exists the likelihood the measures implemented may either be insufficient to end overfishing, or they may be unnecessarily restrictive, causing undue economic hardship. The resulting administrative burden of either occurrence could be substantial in the long-term since those issues would have to be addressed through development of a subsequent amendment, and implementation of different management standards. **Preferred Alternative 2** however, would allow the RA to make adjustments to the management measures based on Table 4-79, which would be most appropriate when taking into account the results of the new SEDAR benchmark assessment. This alternative would create a minimal administrative burden in the form of outreach materials and effort to communicate the new management measures. In the long-term, one of the sub-options under **Preferred Alternative 2** would be expected to be less burdensome on the administrative environment than **Alternative 1**.

4.4.5 Council Conclusions

The Council is in a difficult position because of the one-year Magnuson-Stevens Act deadline to develop an amendment that ends overfishing of vermilion snapper, based on the SEDAR Updated Assessment (SEDAR Update #3 2007). The Council was notified in June 2007 that overfishing was occurring.

At the same time, a new benchmark SEDAR Assessment using an age-based model is being conducted in 2008. The outcome, in terms of stock status, of the new assessment is unknown. The Council has approved an action that specifies what management measures (quota by season, bag limit, and closed season) would be implemented based on the nearest 10% reduction from the assessment. The Council recognizes some actions will have serious negative social and economic impacts on affected fishermen, dealers, and consumers. However, the Council must take these actions to comply with the Magnuson-Stevens Act. The actions are based on the best available data from the completed SEDAR assessment, and the assessment has been reviewed and approved by the Council's Scientific and Statistical Committee (SSC). Additionally, the SSC and Council will review the new assessment in December 2008, which will allow the NMFS Regional Administrator (RA) to take action, based on the new assessment, prior to the proposed actions based on the old assessment are implemented.

The Council concluded their proposed actions provide the necessary biological protection while minimizing the social and economic impacts to the maximum extent allowed under the law.

The Council reviewed public comments at the June and September 2008 meetings and determined that their preferred alternative should not be changed. The Council's Snapper Grouper Advisory Panel reviewed this action at their September 2007 and June 2008 meetings and did not recommend any changes to the preferred alternative. The AP recommended the Council use the lease restrictive action to end overfishing using the new age-based assessment.

The Council concluded this approach best meet the requirements of the Reauthorized Magnuson-Stevens Act and objectives of the Snapper Grouper Fishery Management Plan as modified.

4.5 *Research Needs*

Vermilion snapper and gag have been assessed through the SEDAR process. After completion of these assessments, research needs have been identified by the SEDAR workgroup and made available. These needs have been identified and prioritized in the MARFIN request for proposals. Furthermore, a summary of current research was provided in the Snapper Grouper SAFE Report (NMFS 2005a), which is considered to be a "living" document that will be updated as new data become available.

These research needs have been added to the Council's Research Plan and provided to NMFS as required by the Reauthorized Magnuson-Stevens Act.

Biological research needs that have been identified through the SEDAR process are as follows:

4.5.1 Vermilion Snapper

- Quantify discard rates especially in commercial fishery. Estimate discard mortality rates by depth and fishery.
- Research management measures that will reduce release mortality.
- Age sampling from commercial, headboat, and MRFSS that is representative.
- Develop better abundance indices that cover a broader spatial/seasonal scale.
- Fecundity estimates by length and age.
- Collect data on the magnitude and size/age composition of vermilion snapper that are discarded by fishery and gear.
- Develop an index of recruitment.
- Investigate methods of weighting applied to the input data.
- Expand MARMAP area coverage, and include more deep-water habitat.
- Incorporate commercial logbooks for use as an abundance index.
- Need to increase number of age samples, with a minimum of 500 samples annually for specific fishery segments (i.e., hook and line and headboat).
- Externally combine the indices of abundance into one index to be used in parallel with the existing age-structured model, rather than including the individual indices.
- The update assessment workshop strongly suggests that a new model type be investigated for the vermilion snapper assessment, and that the next assessment be conducted as a benchmark assessment.

4.5.2 Gag

- Continue research on the use of otolith chemistry to evaluate the population structure of gag.
- Continue genetic research on gag population structure. Add Mexican (Campeche) samples to determine patterns of gene flow and population connectivity.

- Continue workshops on aging and reproductive biology targeting gag and similar species to eliminate potential methodological differences.
- Long-term continuous monitoring of age structure should be undertaken in the South Atlantic to test the hypothesis that annual recruitment trends are similar between regions.
- Continue oceanographic modeling efforts of recruitment and larval transport associated with development of an Integrated Coastal Ocean Observing System (ICOOS).
- Additional tagging studies should be conducted off the east coast of Florida to examine the extent of northerly and southerly movements.
- Increase sampling to obtain otoliths for aging.
- Improvement in at-sea observation for discards.
- Continue education of samplers for species identification.
- Conversions are needed for different market categories (gutted, headed, filleted, and whole weight).
- Data are needed on effort and discards by depth.
- A fishery independent index of abundance should be developed.
- The gag mature sex ratio is needed, from which it may be possible to infer information about male fertility and the number of sperm required for successful fertilization.
- Reconstruct the catch and total removals history (prior to 1962) from data sources not currently being used in the assessment.
- Employ DNA tagging to provide an independent snapshot of total mortality.
- Effectiveness of effort from technological changes should be examined.

4.5.3 Sociocultural Research Needs

Sociocultural research needs that have been identified by the Council's Scientific and Statistical Committee are as follows:

1. Identification, Definition and Standardization of Existing Datasets to meet short-term social analysis needs (e.g., behavioral networks based on annual rounds). Centrally locate these datasets so they are accessible to researchers and managers (realizing the constraints imposed by confidentiality);

2. Development of New Variables to meet long-term social analytical needs (e.g., community health, individual health, decision-making patterns, cumulative impacts of endogenous, exogenous, and regulatory factors);

3. Longitudinal Data – Monitoring Needs, including historical, ethnographic, and quantitative data over time;

4. Traditional Ecological Knowledge/Local Fisheries Knowledge (TEK/LFK) constructions along with Scientific Ecological Knowledge (SEK);

5. State Data (license/permit data; social survey type data) and Coordination between agencies/levels;

6. Better integration of social, biological, and economic variables in modeling efforts; and

7. Better efforts to include humans and human behavior in the ecosystem-based framework (e.g., representation of humans as keystone predators in the system).

Economic research needs that have been identified by the Council's Scientific and Statistical Committee are as follows:

The following issues were identified as being impediments to conducting economic research:

- Confidentiality of state data and data collected through federal research projects;
- Data collected through certain agency grants cannot be distributed without dealing with confidentiality issues; and
- The inability to display confidential data.

Commercial

1. Explore the feasibility of developing computable general equilibrium models, which can incorporate the entire economy and important ecosystem components (Medium priority, High cost).
2. Develop an input-output model for the South Atlantic commercial fisheries. This model should be similar to the NOAA Fisheries Service model for other regions on shore-based communities (Medium priority, High cost).
3. Consider alternative ways to collect data on both a social and economic basis, e.g., partnerships to develop projects (High priority, Medium cost).
4. Ensure availability, improve upon, and collect basic data: catch, employment, effort, price, and cost/earnings (Very High priority, high cost).
5. Opportunity costs - Rely on the studies completed in the past on the next best jobs. Include collection of data to estimate worker satisfaction bonus.
6. Integrated biological, social, and economic models including dynamic optimization models.
7. Demand analysis – include the effects of imports. Studies of value added product, e.g., branding and marketing strategies.
8. Include data collection and analysis on the processing sector and retail sector.
9. Research on the economic and social effects of capacity reduction.
10. Employment in the primary and secondary sectors of the fishing industry that also includes research on household budgets.
11. Cumulative impacts – economic and social.
12. Models to predict fishing behavior in the face of fishing regulations. This would include description of fishing rounds on a seasonal basis and fishing behavioral networks.

13. Non-consumptive and non-use benefits of marine protected species and essential fish habitat/habitat areas of particular concern. Also, measure the socio-cultural benefits of these species.
14. Research on live product/whole weight conversion factors on a seasonal basis possibly through the TIP program or through other biological sampling programs.

Recreational

1. Assess the feasibility of developing benefits transfer models from existing data and the MRFSS. Complete recreational demand models that are more relevant for fisheries management. These models should focus on policy relevant variables (bag, size limits, individual species and species groups). (High priority, low/medium cost).
2. Develop random utility models for predicting participation changes, economic value, and behavior of recreational fishermen (High priority, high cost for data collection).
3. Develop targeted input-output model to estimate the effects of policy changes on the economic impacts of recreational fishing. Will provide information on jobs, wages, and income on affected sectors such as lodging, restaurants, bait and tackle shops, marinas, and boats (Medium priority, high cost).
4. Include categories/motivations of recreational anglers in models outlined in items 1 and 2 (Medium priority, high cost).
5. Collect data on motivations/behavioral patterns of recreational fishermen (Medium priority, high cost).
6. Characterize participants in subsistence fisheries (Low priority, high cost).
7. Develop Valuation models and I/O models for tournament fishing (Medium priority, high cost).
8. Develop Cost-Earnings model for the for-hire sector (charter and headboat) (High priority, high cost). NOAA Fisheries Service is currently conducting a study.

Ecosystem based management

1. Conduct analyses to facilitate the economic valuation of ecosystem services (Very High priority, High cost).
2. Explore the use of Ecopath and Ecosim (Very High priority, High cost).

4.6 *Cumulative Effects*

As directed by NEPA, federal agencies are mandated to assess not only the indirect and direct impacts, but the cumulative impacts of proposed actions as well. NEPA defines a cumulative impact as *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time"* (40 C.F.R. 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect is when the combined effects are greater than the sum of the individual effects.

Various approaches for assessing cumulative effects have been identified, including checklists, matrices, indices, and detailed models (MacDonald 2000). The Council on Environmental Quality (CEQ) offers guidance on conducting a Cumulative Effects Analysis (CEA) in a report titled "Considering Cumulative Effects under the National Environmental Policy Act". The report outlines 11 items for consideration in drafting a CEA for a proposed action.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.
5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

This CEA for the biophysical environment will follow a modified version of the 11 steps. Cumulative effects for the socio-economic environment will be analyzed separately.

4.6.1 Biological

SCOPING FOR CUMULATIVE EFFECTS

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The CEQ cumulative effects guidance states that this step is done through three activities. The three activities and the location in the document are as follows:

I. The direct and indirect effects of the proposed actions **(Section 4.0)**;
II. Which resources, ecosystems, and human communities are affected **(Section 3.0)**; and
III. Which effects are important from a cumulative effects perspective **(information revealed in this CEA)**?

2. Establish the geographic scope of the analysis.

The immediate impact area would be the federal 200-mile limit of the Atlantic off the coasts of North Carolina, South Carolina, Georgia, and east Florida to Key West. Since the boundaries are solely political in nature and do not prohibit immigration and emigration of fish, and fish larvae, the geographic scope of the CEA must be expanded. Tagging work conducted by the MARMAP program indicates that there is movement of species (e.g., gag and greater amberjack) between the Gulf of Mexico and South Atlantic (McGovern and Meister 1999; McGovern *et al.* 2005). Large-scale movement of vermilion snapper and other species has not been documented (McGovern and Meister 1999). However, vermilion snapper and shallow water grouper species (red grouper, red hind, rock hind, yellowmouth grouper, tiger grouper, black grouper, yellowfin grouper, graysby, coney, and scamp) have pelagic eggs and larvae that may remain in the water column for extended periods of time and travel long distances before late stage larvae or juveniles assume a demersal existence.

In light of the available information, the extent of the boundaries would depend upon the degree of fish immigration/emigration and larval transport, whichever has the greatest geographical range. The CEA cannot establish geographical boundaries in terms of coordinates, but recognizes that the proper geographical boundary to consider effects on the biophysical environment is larger than the entire South Atlantic EEZ. The ranges of affected species are described in Section 3.2. The most measurable and substantial effects would be limited to the South Atlantic region.

3. Establish the timeframe for the analysis.

Establishing a timeframe for the CEA is important when the past, present, and reasonably foreseeable future actions are discussed. It would be advantageous to go back to a time when there was a natural, or some modified (but ecologically sustainable) condition. However, data collection for many fisheries began when species were already fully exploited. Therefore, the timeframe for analyses should be initiated when data collection began for the various fisheries. In determining how far into the future to analyze cumulative effects, the length of the effects will depend on the species and the alternatives chosen. Gag are not overfished but biomass is less than B_{MSY}. Ending overfishing and fishing at a fishing mortality associated with OY will allow biomass to increase to at least B_{MSY}. The overfished status of vermilion snapper is unknown. However, if the stock is overfished, biomass would be expected to increase and positive changes in the size and age structure would be expected to increase. Long-term evaluation is needed to determine if management measures have the intended effect of improving stock status. Therefore, analyses of effects should extend beyond the time when these overfished stocks are rebuilt. Monitoring should continue indefinitely for all species to ensure that management measures are adequate for preventing overfishing in the future.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern (the cumulative effects to the human communities are discussed in Section 4).

Listed are other past, present, and reasonably foreseeable actions occurring in the South Atlantic region. These actions, when added to the proposed management measures, may result in cumulative effects on the biophysical environment.

I. Fishery-related actions affecting vermilion snapper, gag, and shallow water grouper.

A. Past

The reader is referred to **<u>Section 1.2 History of Management</u>** for past regulatory activity for the fish species. These include bag and size limits, spawning season closures (gag), commercial quotas (vermilion snapper), gear prohibitions and limitations, area closures, and a commercial limited access system.

B. Present

The proposed actions in Snapper Grouper Amendment 16 would end overfishing of vermilion snapper and gag. Management measures for the commercial sector would include new or adjusted: sector specific allocations and catch quotas; size limits; trip limits; seasonal closures, including a closure for shallow water groupers during the gag spawning closure and after the gag directed commercial quota is met; fishing year start dates; and gear restrictions. Management measures for the recreational sector would include new or adjusted: catch allocations; bag limits; size limits; and seasonal closures.

C. Reasonably Foreseeable Future

Snapper Grouper Amendment 14 would use marine protected areas (MPAs) as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish). These measures are expected to be implemented in the near future.

Snapper Grouper Amendment 17 would establish Annual Catch Limits (ACLs) and Annual Catch Targets (ACTs) for snapper grouper species undergoing overfishing. Other actions that would be included in Amendment 17 include: (1) SFA parameters for red snapper, greater amberjack, and mutton snapper; (2) interim allocations; (3) management measures to limit recreational and commercial sectors to their ACTs; (4) accountability measures; and (5) extend snapper grouper management regulations into the Mid-Atlantic or New England Fishery Management Council's jurisdiction.

Comprehensive Annual Catch Limit (ACL) Amendment would establish Annual Catch Limits (ACLs) and Annual Catch Targets (ACTs) for all other species. Other actions would include: (1) choosing ecosystem component species; (2) allocations; (3) management measures to limit recreational and commercial sectors to their ACTs; (4) accountability measures; and (5) any necessary modifications to the range of regulations.

The Council is evaluating a limited access privilege program for golden tilefish.

II. Non-Council and other non-fishery related actions, including natural events affecting gag and vermilion snapper.
   A. Past
   B. Present
   C. Reasonably foreseeable future

In terms of natural disturbances, it is difficult to determine the effect of non-Council and non-fishery related actions on stocks of vermilion snapper, gag, and shallow water groupers. Annual variability in natural conditions such as water temperature, currents, food availability, predator abundance, etc. can affect the abundance of young fish, which survive the egg and larval stages each year to become juveniles (i.e., recruitment). This natural variability in year class strength is difficult to predict as it is a function of many interactive and synergistic factors that cannot all be measured (Rothschild 1986). Furthermore, natural factors such as storms, red tide, cold water upwelling, etc. can affect the survival of juvenile and adult fishes; however, it is very difficult to quantify the magnitude of mortality it may have on a stock. Gag occur in estuarine areas along the southeastern United States (Robins and Ray 1986; Heemstra and Randall 1993). Alteration of estuarine habitats could affect survival of juveniles. However, estimates of the abundance of fish, which utilize this habitat, as well as, determining the impact habitat alteration may have on juveniles, is problematic.

AFFECTED ENVIRONMENT

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

In terms of the biophysical environment, the resources/ecosystems identified in earlier steps of the CEA are the fish populations directly or indirectly affected by the regulations. This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components.

The SEDAR stock assessment indicated gag biomass is at 94% of the biomass at MSY (B_{MSY}) and is approaching an overfished condition. Overfishing is occurring with $F/F_{MSY} = 1.3$. Gag are vulnerable to overfishing because they live for at least 26 years, change sex from female to male later in life, and form spawning aggregations at locations known to fishermen. During the 1990s, gag off the Southeastern U.S. was exhibiting many of the symptoms of an exploited population. Harris and Collins (2000) reported a lower age at first maturity and a significant increase in the observed mean length at age in the South Atlantic gag population in 1994-95 in comparison with data from 1976-82. Increased fishing pressure was suggested as a contributing factor in the described life history changes (Harris and Collins 2000). During the same period, McGovern *et al.* (1998) found the sex ratio decreased from 19.6% males in 1976-82, to 5.5% males in 1994-95. The size at 50% maturity also declined in the later period.

There is some indication from a more recent life history study the status of the population has improved since the 1990s. Reichert and Wyanski (2005) found size at maturity during 2004-05 occurred at significantly larger sizes than during 1994-95. Age at maturity also increased since 1994-95, albeit less dramatically than for size at maturity. The percentage of males and individuals undergoing transition in the population increased from 5.5% in 1994-95 to 8.2%; however, the current percentage is still much lower than the revised estimate of 19.4% for samples collected during 1976-82. Sex transition has occurred at progressively larger sizes and younger ages since 1977-82, a trend that is also probably related to the increasing growth rates over time.

The SEDAR 10 (2006) stock assessment also suggested despite continued overfishing, the condition of the gag stock has improved since the middle 1990s, perhaps in response to management measures. A substantial decline in fishing mortality has occurred since 1990 with a second decline occurring after 1998 when the minimum size limit was increased to 24 inches TL and a two-month commercial spawning season closure was put into place.

The recent SEDAR Update #3 (2007) determined the vermilion snapper stock in the South Atlantic is undergoing overfishing. The SSC, in June 2007, recommended the Council not adopt the biomass and yield benchmarks used to determine whether the stock is overfished, as they were deemed unreliable for management purposes.

Commercial landings of vermilion snapper rose from 743,000 to 954,000 lbs gutted weight during 1992 to 1995 (Figure 4-5). Landings declined to 718,000 lbs gutted weight followed by a large increase to 1,682,000 lbs gutted weight in 2001. A large decline in landings to 760,000 lbs gutted weight occurred in 2003 followed by an increase to about 1,000,000 lbs gutted weight in 2004-2005. Landings decreased further in 2006. The CPUE of vermilion snapper taken with MARMAP trapping gear showed similar trends to commercial landings with an increase during 1994-1996 from 5.8 to 6.2 fish caught per hour followed by a decrease to 2.2 fish caught per hour in 1999 (SEDAR Update #3 2007). CPUE increased to 4.7 fish caught per hour in 2001 with a sharp decrease in 2003 to 0.35 fish per trap hour, the lowest value recorded since 1988. Low CPUE in 2003, as well as low commercial catches, was probably due to a prolonged cold water upwelling event. A slight increase in CPUE occurred in 2004 and 2005-2006 values were similar to 2004. Headboat CPUE increased during 1992-2002, decreased in 2003 and then increased again during 2004-2006 (SEDAR Update #3 2007).

Zhao *et al*. (1997) and Zhao and McGovern (1997) report during the middle 1990s, the vermilion snapper stock was exhibiting many of the symptoms of an overexploited population, including a decrease in size at age, possibly caused by fishing pressure. Since these studies were conducted, the Council established a program to limit initial eligibility for the snapper grouper fishery and raised the vermilion snapper recreational size limit to 11" total length in 1999, increased the recreational size limit to 12" total length in 2006, and imposed a 1.1 million pound gutted weight commercial quota. Additionally, the Council recently extended indefinitely the *Oculina* closed area. Although the biological benefits of this area cannot be quantified at this time, evidence indicates there has been an increase in abundance of many species within the area since it was closed (Koenig 2001).

Some of these management measures may have reduced fishing mortality (F) during the late 1990s as the SEDAR stock assessment noted a substantial decline in fishing mortality during 1997 and 1998; however, F increased during 1999-2001. The SEDAR Update #3 (2007) indicates overfishing is still occurring. Such trends are expected to continue if status quo commercial management regulations are maintained, and could have a significant adverse effect on the stocks if allowed to continue indefinitely. The adverse effects of decreasing size and age trends on stock biomass and reproduction, population structure, and the marine ecosystem are described Amendment 13C (SAFMC 2006). A new benchmark assessment is being conducted for vermilion snapper with a completion date expected in late 2008. Results of the new age-based benchmark assessment could be different from either the SEDAR 2 (2003) benchmark assessment or the 2007 SEDAR Update #3 (2007), both of which were length-based.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

This step is important in outlining the current and probable stress factors to gag and vermilion snapper identified in the previous steps. The goal is to determine whether these species are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds can be identified for some resources, which are levels of impact beyond which the resources cannot be sustained in a stable state. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

Fish populations

Definitions of overfishing and overfished for gag and vermilion snapper are identified in Amendment 11 to the Snapper Grouper FMP (SAFMC 1998d). Numeric values of overfishing and overfished thresholds are being updated in this amendment. These values includes maximum sustainable yield (MSY), the fishing mortality rate that produces MSY (F_{MSY}), the biomass or biomass proxy that supports MSY (B_{MSY}), the minimum stock size threshold below which a stock is considered to be overfished (MSST), the maximum fishing mortality threshold above which a stock is considered to be undergoing overfishing (MFMT), and optimum yield (OY). Based on these definitions, gag is approaching an overfished condition (SEDAR 10 2006). The overfished condition of vermilion snapper is unknown due to uncertainties associated with biomass estimates; however, the stock is experiencing overfishing. A new benchmark assessment is being conducted for vermilion snapper, which could provide biomass estimates and update fishing mortality values in late 2008.

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects. The SEDAR assessments show trends in biomass, fishing mortality, fish weight, and fish length going back to the earliest periods of data collection. For some species such as gag and snowy grouper, assessments reflect initial periods when the stocks were above B_{MSY} and fishing mortality was fairly low. However, some species such as vermilion snapper and black sea bass were heavily exploited or possibly overfished when data were first collected. As a result, the assessment must make an assumption of the biomass at the start of the assessment period thus modeling the baseline reference points for the species.

DETERMINING THE ENVIRONMENTAL CONSEQUENCES OF CUMULATIVE EFFECTS

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

The relationship between human activities and biophysical ecosystems within the context of this CEA is solely related to extractive activities and the installment of regulations as outlined in Table 4-85.

Table 4-85. The cause and effect relationship of fishing and regulatory actions within the time period of the Cumulative Effects Analysis (CEA).

Time period/dates (Table 4-85)	**Cause**	**Observed and/or Expected Effects**
1960s-1983	Growth overfishing of many reef fish species.	Declines in mean size and weight of many species including black sea bass.
August 1983	4" trawl mesh size to achieve a 12" TL commercial vermilion snapper minimum size limit (SAFMC 1983).	Protected youngest spawning age classes.
Pre-January 12, 1989	Habitat destruction, growth overfishing of vermilion snapper.	Damage to snapper grouper habitat, decreased yield per recruit of vermilion snapper.
January 1989	Trawl prohibition to harvest fish (SAFMC 1988).	Increase yield per recruit of vermilion snapper; eliminate trawl damage to live bottom habitat.
Pre-January 1, 1992	Overfishing of many reef species including vermilion snapper, and gag.	Spawning stock ratio of these species is estimated to be less than 30% indicating that they are overfished.
January 1992	Prohibited gear: fish traps south of Cape Canaveral, FL; entanglement nets; longline gear inside of 50 fathoms; powerheads and bangsticks in designated SMZs off SC. Size/Bag limits: 10" TL vermilion snapper (recreational only); 12" TL vermilion snapper (commercial only); 10 vermilion snapper/person/day; aggregate grouper bag limit of 5/person/day; and 20" TL gag, red, black, scamp, yellowfin, and yellowmouth grouper size limit (SAFMC 1991).	Protected smaller spawning age classes of vermilion snapper.
Pre-June 27, 1994	Damage to *Oculina* habitat.	Noticeable decrease in numbers and species diversity in areas of *Oculina* off FL
July 1994	Prohibition of fishing for and retention of snapper grouper species (HAPC renamed OECA; SAFMC 1993)	Initiated the recovery of snapper grouper species in OECA.
1992-1999	Declining trends in biomass and overfishing	Spawning potential ratio for vermilion snapper and gag is less than 30% indicating

Time period/dates (Table 4-85)	Cause	Observed and/or Expected Effects
	continue for a number of snapper grouper species including vermilion snapper and gag.	that they are overfished.
February 24, 1999	Gag and black: 24" total length (recreational and commercial); 2 gag or black grouper bag limit within 5 grouper aggregate; March-April commercial closure. Vermilion snapper: 11" total length (recreational). Aggregate bag limit of no more than 20 fish/person/day for all snapper grouper species without a bag limit (1998c).	F for gag vermilion snapper remains declines but is still above F_{MSY}.
October 23, 2006	Snapper Grouper FMP Amendment 13C (SAFMC 2006)	Commercial vermilion snapper quota set at 1.1 million lbs gutted weight; recreational vermilion snapper size limit increased to 12" TL to prevent vermilion snapper overfishing
Regulations not yet effective	Snapper Grouper FMP Amendment 14 (SAFMC 2007)	Use marine protected areas (MPAs) as a management tool to promote the optimum size, age, and genetic structure of slow growing, long-lived deepwater snapper grouper species (e.g., speckled hind, snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish). Gag and vermilion snapper occur in some of these areas.
	Snapper Grouper FMP Amendment 15A (SAFMC 2008a)	
	Snapper Grouper FMP Amendment 15B (SAFMC 2008b)	
Target January 1, 2009	Snapper Grouper FMP Amendment 16 (SAFMC 2008c)	
Target January 1, 2010	Snapper Grouper FMP Amendment 17.	SFA parameters for red snapper; interim allocations; ACLs and ACTs; management measures to limit recreational and commercial sectors to their ACTs; accountability measures; and extend snapper grouper

Time period/dates (Table 4-85)	Cause	Observed and/or Expected Effects
		management regulations into the Mid-Atlantic or New England Fishery Management Council's jurisdiction.
In development	Snapper Grouper FMP Amendment 18	The Council is examining a Limited Access Privilege Program for the Golden Tilefish Fishery.
Target January 1, 2011	Comprehensive ACL Amendment.	ACLs, ACTs, and accountability measures for species not experiencing overfishing; accountability measures; an action to remove species from the fishery management unit as appropriate; and management measures to limit recreational and commercial sectors to their ACTs.

9. Determine the magnitude and significance of cumulative effects.

Current management actions, as summarized in Section 2, should reduce fishing mortality and end overfishing of gag and vermilion snapper and are expected to have a beneficial, cumulative effect on the biophysical environment. These management actions are expected to increase stock biomass, which may affect other stocks. The shallow water grouper closure during the gag spawning closure and after the directed gag commercial quota is met will help a number of species particularly red and black grouper that are listed as undergoing overfishing in the Stock Status Report to Congress.

Because gag, and to a certain extent, vermilion snapper are upper level predators preying primarily on fish, benthic invertebrates, and squid, the degree of competition for food resources between these species and other co-occurring species may increase as stock abundance increases. In addition, gag, red porgy, vermilion snapper, black sea bass, greater amberjack, red snapper, white grunt and other co-occurring species may begin to compete for habitat as they increase in abundance.

Restrictions in the catch of gag and vermilion snapper could result in fishermen shifting effort to other species. The snapper grouper ecosystem includes many species that occupy the same habitat at the same time. For example, vermilion snapper and gag co-occur with tomtate, scup, red porgy, white grunt, red grouper, scamp, and others. Therefore, restricted species are likely to still be caught since they will be incidentally caught when fishermen target other co-occurring species. Continued overexploitation of any snapper grouper species could disrupt the natural community structure of the reef ecosystems that support these species. However, some fishermen may choose to use different gear types and target species in different fisheries such as mackerel and dolphin.

Complex models are needed to better understand competition between resources and the effect of effort shifting of fishermen to other species and fisheries. The Council is working with a number of partners to develop an Ecopath model for the South Atlantic ecosystem. Full development of this model will assist in better understanding these linkages. The Council is also developing an Ecosystem FMP that will address the cumulative effects of management regulations, fishing effort, and biomass of all species in the marine ecosystem. Delaying implementation of proposed actions until these tools are completed could adversely affect gag and vermilion snapper. However, although the cumulative effects of proposed actions cannot be quantified, it is expected that the effects will be positive and synergistic.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
The cumulative effects on the biophysical environment are expected to be positive. Avoidance, minimization, and mitigation are not applicable.

11. Monitor the cumulative effects of the selected alternative and adopt management.
The effects of the proposed action are, and will continue to be, monitored through collection of data by NMFS, States, stock assessments and stock assessment updates, life history studies, and other scientific observations.

4.6.2 Socioeconomic

A description of the human environment, including a description of commercial and recreational snapper grouper fisheries and associated key fishing communities is contained in Section 3.4 and incorporated herein by reference. A description of the history of management of the snapper grouper fishery is contained in Section 1.2 and is incorporated herein by reference.

Participation in and the economic performance of the fishery have been affected by a combination of regulatory, biological, social, and external economic factors. Regulatory measures have obviously affected the quantity and composition of harvests, through the various size limits, seasonal restrictions, trip or bag limits, and quotas. Gear restrictions, notably fish trap and longline restrictions, have also affected harvests and economic performance. The limited access program implemented in 1998/1999 substantially affected the number of participants in the fishery. Biological forces that either motivate certain regulations or simply influence the natural variability in fish stocks have played a role in determining the changing composition of the fishery. Additional factors, such as changing career or lifestyle preferences, stagnant to declining prices due to imports, increased operating costs (gas, ice, insurance, dockage fees, etc.), and increased waterfront/coastal value leading to development pressure for other than fishery uses have impacted both the commercial and recreational fishing sectors.

Given the variety of factors that affect fisheries, persistent data issues, and the complexity of trying to identify cause-and-effect relationships, it is not possible to differentiate actual or cumulative regulatory effects from external cause-induced effects. For each regulatory action, expected effects are projected. However, these projections typically only minimally, if at all, are capable of incorporating the variety of external factors, and evaluation in hindsight is similarly incapable of isolating regulatory effects from other factors, as in, what portion of a change was due to the regulation versus due to input cost changes, random species availability variability, the sale of a fish house for condominium development, or even simply fishermen behavioral changes unrelated to the regulation.

In general, it can be stated, however, that the regulatory environment for all fisheries has become progressively more complex and burdensome, increasing, in tandem with other adverse influences, the pressure on economic losses, business failure, occupational changes, and associated adverse pressures on families, communities, and industries. Some reverse of this trend is possible and expected. The adoption of limited access privilege programs would allow a simplified regulatory environment since trip or seasonal restrictions may no longer be needed and effort issues should be addressed by internal access-rights transfer, while rebuilding plans and the recovery of stocks would allow harvest increases. However, certain pressures would remain, such as total effort and total harvest considerations, increasing input costs, import induced price pressure, and competition for coastal access.

A detailed description of the expected social and economic impacts of the actions in this amendment are contained elsewhere in Section 4, and in Sections 5, 6, and 7, and is incorporated herein by reference. The greatest potential substantive adverse impact of any of the proposed measures is likely associated with the proposed closed season January through April (see Section 5.5.1.4).

Current and future amendments are expected to add to this cumulative effect. Snapper Grouper Amendment 14 (SAFMC 2007)would restrict fishing at a series of MPA sites. The expected economic impacts of these MPAs are unknown since available data cannot identify the incidence or magnitude of harvests from these areas, not is it possible to forecast how fishing behavior or harvests may change to compensate for these restrictions. In the short term, some additional economic losses may occur as a result of this amendment, but in the long term, the stocks are expected to benefit from this increased protection, with spillover benefits to the fishery.

Snapper Grouper Amendment 15A (SAFMC 2008a) specifies management reference points and status determination criteria for snowy grouper, red porgy, and black sea bass; rebuilding schedules for snowy grouper and black sea bass; and rebuilding strategies for snowy grouper, red porgy, and black sea bass. The management reference points, status determination criteria, and rebuilding schedules are not expected to have direct economic or social impacts. The reference point and status determination criteria actions, however, may precipitate future impacts if the resources are evaluated and it is determined that further restrictions on the fisheries are required. The rebuilding schedules also induce indirect impacts by determining the pace of recovery and the overall restrictiveness of measures required to recover the resource, since the faster the recovery period the greater harvest must be restricted. The rebuilding strategies define the annual yield during the recovery period. Although in general, yield increases over the course of the recovery period and net cumulative benefits increase across the fisheries, initial yield reductions at the beginning of the recovery periods are likely to have short-term adverse impacts on some participants or sectors of the fisheries, thereby increasing the general cumulative burden.

Snapper Grouper Amendment 15B (SAFMC 2008b) prohibits sale of bag limit caught snapper grouper species.

Snapper Grouper Amendment 16 (this amendment; SAFMC 2008c) will end overfishing of gag and vermilion snapper. The expected impacts of these actions are presented in Section 4. The corrective action in response to overfishing always requires harvest reductions and regulation that is more restrictive. Thus, additional short-term social and economic impacts would be expected. These restrictions are expected to prevent the stocks from becoming overfished, which would require recovery plans, further harvest restrictions, and additional social and economic losses.

Snapper Grouper Amendment 17 is expected to contain a number of actions addressing general snapper grouper sector overages, black sea bass pot use, annual catch limits/targets and accountability measures for species experiencing overfishing, and the deepwater snapper grouper fishery. The major actions will be measures to end overfishing of red snapper, speckled hind, and Warsaw grouper. While these actions would be expected to aid long-term protection and recovery efforts for snapper grouper, these actions are likely to increase the regulatory burden for some segments of the fishery, with associated increased short-term economic and social hardships for fishery participants and associated industries and communities.

4.7 *Bycatch Practicability Analysis*

The South Atlantic Council is required by MSFCMA §303(a)(11) to establish a standardized bycatch reporting methodology for federal fisheries and to identify and implement conservation and management measures that, to the extent practicable and in the following order, (A) minimize bycatch and (B) minimize the mortality of bycatch that cannot be avoided. The MSFCMA defines bycatch as "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch-and-release fishery management program" (MSFCMA §3(2)). Economic discards are fish that are discarded because they are undesirable to the harvester. This category of discards generally includes certain species, sizes, and/or sexes with low or no market value. Regulatory discards are fish that are required by regulation to be discarded, but also include fish that may be retained but not sold.

NMFS outlines at 50 CFR §600.350(d)(3)(i) ten factors that should be considered in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable. These are:

1. Population effects for the bycatch species;
2. Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);

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

Agency guidance provided at 50 CFR §600.350(d)(3)(ii) suggests the Councils adhere to the precautionary approach found in the Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries (Article 6.5) when faced with uncertainty concerning these ten practicability factors. According to Article 6.5 of the FAO Code of Conduct for Responsible Fisheries, using the absence of adequate scientific information as a reason for postponing or failing to take measures to conserve target species, associated or dependent species, and non-target species and their environment, would not be consistent with a precautionary approach.

4.7.1 Population Effects for the Bycatch Species

4.7.1.1 Background

The directed commercial fishery for gag is prosecuted primarily with hook and line gear (86%) followed by diving gear (12%). Other gear types capture 2% of the landings. Landings are split fairly evenly between commercial and recreational sources. The catch of vermilion snapper is dominated by commercial landings (68%). Almost all vermilion snapper are caught with hook and line gear. Other shallow water grouper species (rock hind, red hind, red grouper, black grouper, scamp, yellowmouth grouper, yellowfin grouper, graysby, and coney are predominantly taken with hook and line gear in the commercial and recreational sectors.

Restrictions, which are currently being used to manage these species, include quotas (vermilion snapper), size limits (vermilion snapper, gag, shallow water grouper species), bag limits (vermilion snapper, gag, shallow water grouper species), and closed seasons (gag).

Management measures proposed in Snapper Grouper Amendment 16 would establish sector allocations for gag and vermilion snapper, establish a commercial quota for gag and reduce the commercial quota for vermilion snapper; prohibit harvest and retention of gag and shallow water groupers after the commercial gag quota is met; establish a January through April recreational and commercial spawning season closure for gag and other shallow water groupers including red and black grouper; modify bag limits for vermilion snapper, gag, and shallow water groupers; establish a recreational closed season for vermilion snapper; and exclude captain and crew on for-hire vessels from retaining vermilion snapper or species in the grouper aggregate.

4.7.1.2 Commercial Fishery

During 2001 to 2006, approximately 20% of snapper grouper permitted vessels from the Gulf of Mexico and South Atlantic were randomly selected to fill out supplementary logbooks. A small number of trips that reported discards but did not report numbers or species were not included in analyses. On average, the total number average number of trips per year during 2001 to 2006 was 15,500 (Table 4-86). Fishermen spent an average of 1.70 days at sea per trip.

Table 4-86. Snapper grouper fishery effort for South Atlantic.

YEAR	Trips	Days	Days per Trip
2001	17,283	29,940	1.73
2002	17,231	29,683	1.72
2003	16,586	27,680	1.67
2004	15,060	24,911	1.65
2005	13,773	22,880	1.66
2006	13,067	22,926	1.75
Mean	15,500	26,337	1.70

Source: NMFS SEFSC Logbook Program.

For species in Snapper Grouper Amendment 16, the number of trips that reported discards was greatest for vermilion snapper followed by scamp and gag (Table 4-87). The average percentage of trips that reported discards was 5.55% for vermilion snapper and 4.21% for gag (Table 4-88).

During 2001-2006, the average number of individuals discarded per trip was greatest for vermilion snapper followed by black grouper and scamp (Table 4-89).

Since the discard logbook database represents a sample, data were expanded to estimate the number of discard fish in the whole fishery. The method for expansion was to (1) estimate the probability of discarding a species; (2) estimate the number of fish discarded per trip; and (3) estimate the number discarded in the whole fishery (total discarded = total trips * discard probability * discard number). During 2001-2006, an average of 65,779 vermilion snapper and 5,003 gag were discarded per year (Table 4-90).

Table 4-87. Annual number of trips reporting discard of vermilion snapper, gag, and shallow water groupers in the South Atlantic.

YEAR	red grouper	red hind	rock hind	yellowmouth grouper	tiger grouper	black grouper	yellowfin grouper	graysby	coney	scamp	vermilion snapper	gag
2001	26	0	0	0	0	4	0	0	0	95	114	80
2002	101	2	5	0	0	34	1	0	0	202	217	169
2003	123	0	17	0	0	21	0	0	0	137	118	140
2004	121	1	1	0	0	5	0	7	0	60	63	113
2005	134	7	2	1	0	43	1	3	0	132	107	81
2006	75	4	1	0	0	14	1	0	0	94	123	25
Mean	96.7	2.3	4.3	0.2	0.0	20.2	0.5	1.7	0.0	120.0	123.7	101.3

Source: NMFS SEFSC Logbook Program.

Table 4-88. Percentage of trips that discarded vermilion snapper, gag, and shallow water groupers in the South Atlantic.

YEAR	red grouper	red hind	rock hind	yellowmouth grouper	tiger grouper	black grouper	yellowfin grouper	graysby	coney	scamp	vermilion snapper	gag
2001	2.21	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	8.09	9.71	6.81
2002	3.73	0.07	0.18	0.00	0.00	1.26	0.04	0.00	0.00	7.46	8.02	6.25
2003	3.41	0.00	0.47	0.00	0.00	0.58	0.00	0.00	0.00	3.80	3.28	3.89
2004	4.17	0.03	0.03	0.00	0.00	0.17	0.00	0.24	0.00	2.07	2.17	3.90
2005	5.31	0.28	0.08	0.04	0.00	1.70	0.04	0.12	0.00	5.23	4.24	3.21
2006	3.60	0.19	0.05	0.00	0.00	0.67	0.05	0.00	0.00	4.52	5.91	1.20
Mean	3.74	0.10	0.14	0.01	0.00	0.79	0.02	0.06	0.00	5.20	5.55	4.21

Source: NMFS SEFSC Logbook Program.

Table 4-89. Average number (unexpanded) of vermilion snapper, gag, and shallow water groupers discarded per trip in the South Atlantic.

YEAR	red grouper	red hind	rock hind	yellowmouth grouper	tiger grouper	black grouper	yellowfin grouper	graysby	coney	scamp	vermilion snapper	gag
2001	3.2	0.0	0.0	0.0	0.0	23.8	0.0	0.0	0.0	15.2	75.8	8.7
2002	5.4	2.5	2.4	0.0	0.0	41.7	0.0	0.0	0.0	11.5	78.1	7.9
2003	4.0	0.0	1.6	0.0	0.0	12.3	0.0	0.0	0.0	14.6	66.1	4.6
2004	0.0	0.0	3.0	0.0	0.0	30.6	0.0	17.6	0.0	13.9	62.4	8.3
2005	4.9	0.0	2.0	5.0	0.0	17.7	0.0	1.7	0.0	10.0	99.4	6.8
2006	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	0.0	10.7	58.3	3.0
Mean	2.9	0.4	1.5	0.8	0.0	23.4	0.0	3.2	0.0	12.7	73.4	6.5

Source: NMFS SEFSC Logbook Program.

Table 4-90. Expanded number of discarded vermilion snapper, gag, and shallow water groupers for the South Atlantic.

YEAR	red grouper	red hind	rock hind	yellowmouth grouper	tiger grouper	black grouper	yellowfin grouper	graysby	coney	scamp	vermilion snapper	gag
2001	1,222	0	0	0	0	1,399	0	0	0	21,302	127,252	10,202
2002	3,464	32	76	0	0	9,036	0	0	0	14,849	107,971	8,495
2003	2,279	0	129	0	0	1,188	0	0	0	9,219	35,935	2,970
2004	0	0	16	0	0	795	0	639	0	4,336	20,419	4,892
2005	3,592	0	22	27	0	4,165	0	27	0	7,189	58,056	2,997
2006	0	0	0	0	0	1,275	0	0	0	6,304	45,041	465
Mean	1,760	5	40	5	0	2,976	0	111	0	10,533	65,779	5,003

The most commonly discarded species are shown in Table 4-91.

Table 4-91. The 50 most commonly discarded species during 2001-2006 for the South Atlantic.

Species	Number trips reported discarding the species	Number discarded
SEA BASSE,ATLANTIC,BLACK,UNC	526	98,206
PORGY,RED,UNC	907	60,138
SNAPPER,VERMILION	**743**	**55,144**
MENHADEN	162	22,445
SHARK,DOGFISH,SPINY	138	22,193
SNAPPER,YELLOWTAIL	1496	14,134
SNAPPER,RED	358	9,867
SEA BASS,ROCK	115	9,469
SCAMP	720	8,937
GRUNT,WHITE	71	4,518
FINFISHES,UNC,BAIT,ANIMAL FOOD	43	4,351
GROUPER,GAG	**609**	**4,258**
KING MACKEREL and CERO	584	4,193
GROUPERS	73	3,858
GRUNTS	153	3,780
SHARK,ATLANTIC SHARPNOSE	143	3,654
SHARK,DOGFISH,UNC	50	3,043
GROUPER,RED	580	2,986
GROUPER,BLACK	424	2,891
SHARK,UNC	375	2,702
GRUNT,TOMTATE	23	2,652
HIND,SPECKLED	202	2,444
AMBERJACK,GREATER	327	2,120
SHARK,BLACKTIP	163	2,042
SNAPPER,MANGROVE (Duplicate of 3760)	203	2,035
BLUEFISH	50	1,799
TRIGGERFISH,GRAY	118	1,655
KING MACKEREL	241	1,647
SHARK,SANDBAR	97	1,544
TRIGGERFISHES	133	1,500
BALLYHOO	31	1,472
TUNA,LITTLE (TUNNY)	242	1,364
SHARK,DOGFISH,SMOOTH	34	1,339
DOLPHINFISH	192	1,225
BONITO,ATLANTIC	252	1,139
BLUE RUNNER	162	1,084
SCUPS OR PORGIES,UNC	101	1,028
SKATES	42	1,020
SNAPPER,MANGROVE	126	944
FINFISHES,UNC FOR FOOD	110	919
SHARK,TIGER	64	918
BARRACUDA	178	848

Species	Number trips reported discarding the species	Number discarded
AMBERJACK	191	797
SPANISH MACKEREL	85	782
SNAPPERS,UNC	28	702
PINFISH,SPOTTAIL	38	571
SNAPPER,MUTTON	184	560
STINGRAYS	49	507
CHUBS	27	493
AMBERJACK,LESSER	10	489

4.7.1.3 Recreational Fishery

For the recreational fishery, estimates of the number of recreational discards are available from MRFSS and the NMFS headboat survey. The MRFSS system classifies recreational catch into three categories:

- Type A - Fishes that were caught, landed whole, and available for identification and enumeration by the interviewers.

- Type B - Fishes that were caught but were either not kept or not available for identification:

    - Type B1 - Fishes that were caught and filleted, released dead, given away, or disposed of in some way other than Types A or B2.

    - Type B2 - Fishes that were caught and released alive.

For species in Snapper Grouper Amendment 16, the number of released fish was greatest for vermilion snapper, gag, and red/black grouper (Table 4-92). During 2001-2006, 75% of gag and 39% of vermilion snapper were released by recreational fishermen (Table 92). The percentage of red grouper, black grouper, red hind was greater than 70%.

Snapper Grouper Amendment 13C increased the size limit of vermilion snapper taken by recreational fishermen from 11 inches TL to 12 inches TL. Examination of Waves 1-5 during 2007 relative to 2006 reveal an increase in the number of discards during Waves 3, 4, and 5 when most of the vermilion snapper are caught (Table 4-93a).

Table 4-92. Estimated number total catch (A+B1+B2), harvests (A+B1), and released (B2) fish in numbers for the South Atlantic during 2001-2006.

Species	**Total**	**A+B1**	**B2**	**% B2**
Vermilion Snapper	2,061,323	1,266,421	794,902	39%
Gag	921,177	226,084	695,093	75%
Red Grouper	767,942	154,589	613,353	80%
Red Hind	60,139	16,947	43,192	72%
Rock Hind	15,459	9,084	6375	41%
Yellowmouth Grouper	1,502	1465	37	2%
Tiger Grouper	0	0	0	0%
Black Grouper	107,732	27,654	80,078	74%
Yellowfin Grouper	1,818	1818	0	0%
Graysby	49,402	40,943	8,459	17%
Coney	18,479	8,599	9,880	53%
Scamp	102,269	58,907	43,362	42%

Source: MRFSS Web Site.

Table 4-93a. Harvested (A+B1) and discards (B2) catch of vermilion snapper for Waves 1-5 during 2006 and 2007.

	2006		
	A+B1	B2	%B2s
Wave 1	8,610	47	0.54%
Wave 2	32,271	53,517	62.38%
Wave 3	47,847	8,482	15.06%
Wave 4	107,442	15,258	12.44%
Wave 5	35,274	21,610	37.99%
Total	231,444	98,914	29.94%
	2007		
	A+B1	B2	%B2s
Wave 1	23,819	7,627	24.25%
Wave 2	33,187	13,543	28.98%
Wave 3	75,918	80,154	51.36%
Wave 4	103,079	99,631	49.15%
Wave 5	43,096	66,212	60.57%
Total	279,099	267,167	48.91%

The effect of increasing the minimum size on the magnitude of discards is more pronounced when annual MRFSS data are examined (Figure 4-10). No increase in the number of discards was observed in 1991 when a 10 inch TL size limit was imposed for vermilion snapper. However, a large spike in the number of discarded vermilion snapper occurred in 1999 when the minimum size limit was increased to 11 inches TL. The number of discards decreased after 2000 as fish grew into the new size limit. Another very large increase in the number of discarded fish occurred in 2007 after the recreational minimum size limit was increased to 12 inches TL through actions taken in Snapper Grouper Amendment 13C.

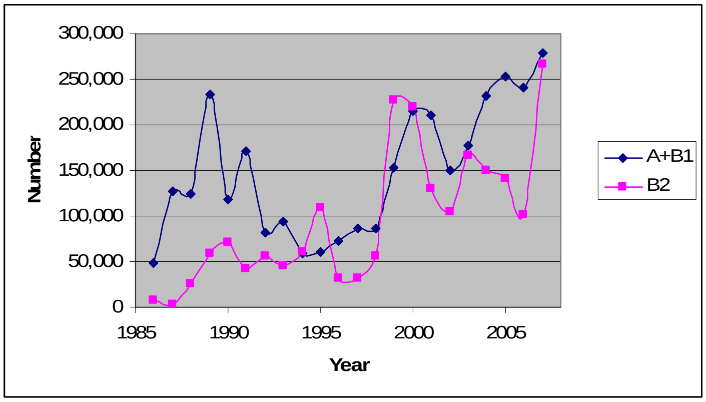


Figure 4-10. Annual number of vermilion snapper harvested (A+B1) and discarded (B2) during 1986 – 2007.
Notes: Data for 2007 do not include Wave 6 (November – December) numbers.

For species in Snapper Grouper Amendment 16, vermilion snapper were most often discarded by headboat fishermen during 2006-2007 (Table 4-93b). Among the grouper species, the species most commonly discarded were gag, red grouper, and scamp. To estimate the number of dead discards, it was assumed the release mortality rate of all shallow water grouper species (25%) was similar to the release mortality rate specified for the gag recreational sector in SEDAR 10 (2007).

Table 4-93b. Total fish released alive or dead on sampled headboat trips during 2004-2007. Dead discards estimated as the number of fish released dead plus 25% of the fish released alive.

Species	released alive	mean#/trip	released dead	mean#/trip	#trips alive	# trips dead	dead discards
Vermilion Snapper	891,479	9.92	31,542	0.35	89,891	89,877	254,412
Gag	12,363	1.81	199	0.03	6,838	6,833	3,290
Black grouper	1,699	1.10	30	0.02	1,539	1,539	455
Red grouper	13,845	2.60	164	0.03	5,324	5,330	3,625
Scamp	16,915	4.44	328	0.09	3,807	3,805	4,557
Rock hind	1,183	0.77	116	0.07	1,537	1,637	412
Red hind	205	0.45	4	0.01	457	457	55
Tiger grouper	0	0.00	0	0.00	0	0	0
Yellowmouth grouper	45	0.36	0	0.00	126	126	11
Yellowfin grouper	54	0.59	1	0.01	91	91	15
Graysby	2,308	1.08	69	0.03	2,128	2,127	646
Coney	178	1.27	11	0.08	140	140	56

Source: NMFS Headboat survey.

4.7.1.4 Finfish Bycatch Mortality

SEDAR 2 (2003) estimates release mortality rates of 25% and 40% for vermilion snapper taken by recreational and commercial fishermen, respectively. However, release mortality rates might be higher than 40%. Release mortality rates from SEDAR 2 (2003) are based on cage studies conducted by Collins (1996) and Collins *et al*. (1999). Burns *et al*. (2002) suggest release mortality rates of vermilion snapper may be higher than estimated from cage studies because cages protect vermilion snapper from predators. A higher release mortality rate is supported by low recapture rates of vermilion snapper in tagging studies. Burns *et al*. (2002) estimate a 0.7% recapture rate for 825 tagged fish; whereas, recapture rates for red grouper, gag, and red snapper range from 3.8% to 6.0% (Burns *et al*. 2002). McGovern and Meister (1999) estimate a 1.6% recapture rate for 3,827 tagged vermilion snapper. Higher recapture rates are estimated for black sea bass (10.2%), gray triggerfish (4.9%), gag (11%), and greater amberjack (15.1%) (McGovern and Meister 1999; McGovern *et al*. 2005). Burns *et al*. (2002) suggest released vermilion snapper do not survive as well as other species due to predation. Vermilion snapper, which do not have air removed from swim bladders, are subjected to predation at the surface of the water. Individuals with a ruptured swim bladder or have air removed from the swim bladder are subject to bottom predators since fish would not be able to join schools of other vermilion snapper hovering above the bottom (Burns *et al*. 2002). Alternatively, recapture rates could be low if population size was very high or tagged fish were unavailable to fishing gear. However, Harris and Stephen (2005) indicate approximately 50% of released vermilion snapper caught by one commercial fisherman were unable to return to the bottom.

SEDAR 10 (2006) estimates release mortality rates of 25% and 40% for gag taken by recreational and commercial fishermen, respectively. A tagging study conducted by McGovern *et al.* (2005) indicated recapture rates of gag decreased with increasing depth. The decline in recapture rate was attributed to depth related mortality. Assuming there was no depth related mortality at 0 m, McGovern *et al.* (2005) estimated depth related mortality ranged from 14% at 11– 20 m (36 – 65 feet) to 85% at 71 – 80 m (233 – 262 feet). Similar trends in depth related mortality were provided by a gag tagging study conducted by Burns *et al.* (2002). Release mortality rates are not known for other shallow water grouper species but could be similar to gag since they have a similar depth distribution.

A recent study conducted by Rudershausen *et al.* (2007) estimated release mortality rates of 15% for undersized vermilion snapper and 33% for undersized gag taken with J- hooks in depths of 25 – 50 m off North Carolina. Immediate mortality of vermilion snapper was estimated to be 10% at depths of 25 – 50 m and delayed mortality was estimated to be 45% at the same depths. For gag caught at depths of 25 – 50 m, no immediate mortality was observed but delayed mortality was estimated to be 49%. McGovern *et al.* (2005) estimated a release mortality rate of 50% at 50 m, which is similar to the findings of Rudershausen *et al.* (2007). Rudershausen *et al.* (2007) concluded minimum size limits were moderately effective for vermilion snapper and gag over the shallower portions of their depth range.

4.7.1.5 Practicability of Management Measures in Directed Fisheries Relative to their Impact on Bycatch and Bycatch Mortality

Vermilion Snapper

Vermilion snapper were one of the most commonly discarded species in the commercial fishery in recent years (Table 4-90). In the recreational fishery, approximately 39% were discarded by private and charter boats (Table 4-92), presumably due to minimum size limits. The discard rate of vermilion snapper is also very in the headboat fishermen (Table 4-93b). Commercial management alternatives would retain the 12 inch total length minimum size and modify the commercial quota of 1,100,000 lbs gutted weight. All the quota alternatives would restrict harvest and would likely close the fishery for a large portion of the year. As a result, the number of regulatory discards could increase after the quota was met since fishermen might target co-occurring species. Vermilion snapper are commonly taken on trips where fishermen catch gag, greater amberjack, and gray triggerfish. However, if the quota was met, fishermen may be able to avoid areas where vermilion snapper occur or modify methods to reduce the chances of bycatch. Commercial quotas have been adjusted to take into consideration dead discards that could occur after a quota was met.

A suite of various management measures are being considered to reduce harvest of vermilion snapper including an increase in the minimum size limit, a reduction in the bag limit, and seasonal closure. An increase in the minimum size limit could be expected to increase the magnitude of discards. Examination of MRFSS data shows very large increases in the number of discards after the recreational minimum size limit was increased to 11 inches total length in 1999 and 12 inches total length in 2006. Size limit analyses take into consideration that 25% of vermilion snapper would die (SEDAR 2-SAR2 2003). However, unobserved mortality due to predation or trauma associated with capture could be substantial (Burns *et al.* 2002; Rudershausen *et al.* 2007). Therefore, mortality of released vermilion snapper could be higher than estimated by SEDAR 2-SAR2 (2003).

Snapper Grouper Amendment 16 includes actions that require the use of venting tools and dehooking devices, which could reduce discard and bycatch mortality in the snapper grouper fishery. Venting, when properly executed, is believed to increase survival of released fish. The use of venting tools may also reduce predation on reef fish species by allowing rapid return to depth making them less vulnerable to predators. Discarded fish stranded at the surface become easy prey for marine mammals, sea birds, and large predators such as amberjack, barracuda, and sharks (Burns *et al.* 2002).

Dehooking devices can allow fishermen to remove hooks with greater ease and more quickly from snapper grouper species without removing the fish from the water. If a fish does need to be removed from the water, dehookers could still reduce handling time in removing hooks, thus increasing survival.

While the increased minimum size could be expected to increase the number of discards, a closed season could be expected to reduce bycatch. It is possible vermilion snapper might still be caught when fishermen target co-occurring species. However, recreational fishermen may be able to avoid locations where vermilion snapper occur. Furthermore, estimates of harvest reductions associated with seasonal closures assume closures will not be 100% effective and some mortality of vermilion snapper will occur when fishermen target co-occurring species.

The Council is also considering reducing the bag limit for vermilion snapper in combination with other alternatives. In addition, the alternatives could exclude the captain and crew from retaining vermilion snapper on for-hire vessels. An increase in discarded fish could occur with a lower bag limit if fishermen continue to fish after a bag limit is met when targeting co-occurring species. Bag limit analyses incorporates the SEDAR accepted 25% mortality rate. However, high-grading could occur and there could be additional discards.

Restricting harvest could increase the number of regulatory discards. However, increased bycatch mortality is accounted for in analyses and overall mortality is expected to decrease. Furthermore, bycatch could be reduced through alternatives that would require the use of venting tools and dehooking devices.

Gag and shallow water groupers

Gag are not a commonly discarded species in the commercial fishery (Table 4-90) since most taken by commercial fishermen are greater than the minimum size limit. Among the Snapper Grouper Amendment 16 grouper species, scamp are most commonly discarded by commercial fishermen. In the recreational fishery (MRFSS), 75% of gag are released primarily because they are less than the current 24 inch total length minimum size (Table 4-92). Most of the MRFSS catch of gag is off Florida. The most commonly discarded grouper species by headboat fishermen are gag, red grouper, and scamp (Table 4-93b).

Commercial management alternatives would retain the minimum size limit for shallow water grouper species, establish a quota for gag, and possibly establish a January through April spawning season closure for gag and the shallow water grouper species. The preferred alternative for gag would result in a directed, commercial quota, which would be met sometime between October through December, depending on the length of the seasonal closure. After the quota is met, regulatory discards could be expected since fishermen might target co-occurring species. However, since all shallow water grouper species would be closed when the gag quota is met, the magnitude of increased discards would be reduced. Gag are commonly taken on trips with vermilion snapper, greater amberjack, red grouper, scamp, and gray triggerfish. Furthermore, if the quota was met, fishermen may be able to avoid areas where gag and other shallow water grouper species occur or modify methods to reduce the chances of bycatch. The gag commercial quota is adjusted to take into consideration dead discards that could occur after a quota was met.

The Council is considering extending the March-April gag/black grouper spawning season closure for the commercial sector and having the same seasonal spawning closure apply to the recreational sector. A longer spawning seasonal closure for the commercial sector and establishing a similar spawning seasonal closure for the recreational closure could enhance the reproductive potential of the stock. Gag are in spawning condition from December through April each year. There is some evidence spawning aggregations may be in place before and after a spawning season (Gilmore and Jones 1992). When aggregated, gag are extremely susceptible to fishing pressure since the locations are often well known by fishermen. Gilmore and Jones (1992) showed that the largest and oldest gag in aggregations are the most aggressive and first to be removed by fishing gear. Since gag change sex, larger and older males can be selectively removed. As a result, a situation could occur where there are not enough males in an aggregation to spawn with the remaining females. Furthermore, the largest, most fecund females could also be selectively removed fishing gear.

A closed season could be expected to reduce bycatch; however, gag might still be caught when fishermen target co-occurring species. Fishermen may be able to avoid locations where gag occur. Estimates of harvest reductions associated with the seasonal closure assumes closures for the commercial and recreational sectors will not be 100% effective and some mortality of gag will occur when fishermen target co-occurring species.

The Council is also considering alternatives that would close the fisheries for other shallow water groupers after a quota is met or during a seasonal closure. Since gag are taken on trips with red grouper and scamp, this action could be expected to reduce bycatch and fishing mortality of gag. The action would also benefit red grouper and black grouper, which are experiencing overfishing.

In addition to gag, other shallow water grouper species are also in spawning condition during January-April. Furthermore, many of the shallow water grouper species including gag, black grouper, scamp, red hind, and rock hind form spawning aggregations. Therefore, a spawning season closure for all shallow water grouper species would be expected to protect grouper species when they are most vulnerable to capture, reduce bycatch of co-occurring grouper species, increase the percentage of males in the grouper populations, enhance reproductive success, and increase the magnitude of recruitment.

The Council is also considering reducing bag limits to 1 gag or black grouper per person per day and reducing the grouper aggregate to 3 fish per person per day. An increase in discarded fish could occur with a lower bag limit if fishermen continue to fish after a bag limit is met when targeting co-occurring species. Bag limit analyses incorporates the SEDAR accepted 25% mortality rate. However, high grading could occur and there could be additional discards.

Restricting harvest could increase the number of regulatory discards. However, increased bycatch mortality is accounted for in analyses and overall mortality is expected to decrease. Furthermore, alternatives are being considered which could reduce bycatch by closing shallow water grouper species when a quota for gag is met or during a seasonal closure for gag.

4.7.1.6 Ecological Effects Due to Changes in the Bycatch

The ecological effects of bycatch mortality are the same as fishing mortality from directed fishing efforts. If not properly managed and accounted for, either form of mortality could potentially reduce stock biomass to an unsustainable level. Management alternatives proposed in Snapper Grouper Amendment 16 for vermilion snapper, gag, and shallow water grouper species could increase the number of regulatory discards. However, alternatives are being considered that could decrease bycatch including closing shallow water groupers during a seasonal closure for gag or after a quota is met and requiring venting tools and dehooking devices for shallow water species.

Overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures, thereby reducing the potential for bycatch. Furthermore, the extent to which the discards increase would depend on the ability of fishermen to avoid regulated species when a quota is met or when a seasonal closure occurs and the extent to which effort would shift to other species and fisheries. Reduced fishing pressure would be expected to result in an increase in the mean size/age of vermilion snapper, gag, and shallow water grouper species. In addition, biomass of gag and other shallow water grouper species would be expected to increase and an increase in the percentage of males in the population could occur. Thus, ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch of species in Snapper Grouper Amendment 16 as well as other species, which have spatial and temporal coincidence with vermilion snapper, gag, and shallow water grouper species.

There is likely to be an interactive effect of the preferred management measures in Snapper Grouper Amendment 16 on bycatch of vermilion snapper, gag, and associated grouper species. Once a quota is met, or during a seasonal closure for a species, effort could shift to other species or fisheries. Vermilion snapper, gag, and shallow water grouper species could continue to be caught when species, which have fewer regulations, are targeted. Post quota bycatch mortality (PQBM) and the incidental catch of vermilion snapper and gag is taken into consideration when quotas are estimated and the effectiveness of a seasonal closure is evaluated. However, fishermen may be able to avoid "hot spots" where a restricted species occurs thereby reducing the potential for bycatch.

Bycatch of gag and other shallow water grouper species in Snapper Grouper Amendment 16 could be reduced through alternatives that would also close shallow water grouper species when a gag quota is met or during a seasonal closure for gag. In addition, there are closures already in place for black grouper and gag (March-April), greater amberjack (April), mutton snapper (May-June), and red porgy (January-April), which overlaps with the proposed commercial/recreational gag spawning season closure. Since gag, red porgy, greater amberjack, and many shallow water grouper species are taken on commercial and recreational trips together, a large reduction in bycatch of gag and associated species is possible from the proposed action. Furthermore, vermilion snapper is also taken on trips with gag. Extending the commercial spawning closure and establishing a recreational spawning season closure for gag and the shallow water grouper species could reduce bycatch of vermilion snapper.

Additional actions in Snapper Grouper Amendment 16, which could reduce bycatch include the requirement of the use of venting tools and dehooking devices in the snapper grouper fishery. Snapper Grouper Amendment 16 could also require the use of venting tools when harvesting snapper grouper species from the EEZ. Venting, when properly executed, is believed to increase survival of released fish. The use of venting tools may also reduce predation on reef fish species by allowing rapid return to depth making them less vulnerable to predators. Discarded fish stranded at the surface become easy prey for marine mammals, sea birds, and large predators such as amberjack, barracuda, and sharks (Burns *et al.* 2002).

Dehooking devices can allow fishermen to remove hooks with greater ease and more quickly from snapper grouper species without removing the fish from the water. If a fish does need to be removed from the water, dehookers could still reduce handling time in removing hooks, thus increasing survival.

Data from North Carolina presented to the Council indicated fishermen with snapper grouper permits also fish in the nearshore gillnet fisheries. Fishermen with snapper grouper permits in other areas also participate in various state fisheries. It is expected that if efforts shift to these fisheries, there could be impacts to protected species. Current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

A Limited Access Privilege (LAP) program was under consideration for the snapper grouper fishery that could substantially reduce bycatch by providing fishery participants an incentive to fish efficiently and to better handle their catch to maximize profits. An IFQ program could stabilize markets and prices by allowing catches to be delivered on demand. This would help fishermen target when they wanted to fish, where they wanted to fish, and which species they wanted to catch thereby reducing bycatch. At the March 2008 meeting, the Council determined this was not the appropriate time to move forward with consideration of a Limited Access Privilege Program for the snapper grouper fishery. However, the Council is exploring use of such a program for the commercial golden tilefish fishery.

The Comprehensive ACL Amendment for species in FMPs not experiencing overfishing could propose additional measures to reduce bycatch in the snapper grouper fishery with the possible establishment of species units. Species grouping would be based on biological, geographic, economic, taxonomic, technical, social, and ecological factors. Each group would be represented by an indicator species that has been recently assessed or is scheduled for a SEDAR assessment in the future. Snapper Grouper Amendment 14 should also be implemented in 2008 or 2009, which would establish Marine Protected

Areas, and could also reduce bycatch of vermilion snapper, gag, and shallow water grouper species.

4.7.1.7 Changes in the Bycatch of Other Fish Species and Resulting Population and Ecosystem Effects

Management measures proposed in Snapper Grouper Amendment 16 are intended to end overfishing of vermilion snapper and gag, and reduce overfishing of red grouper and black grouper. Some proposed actions such as an increase in the size limit of vermilion snapper and a decrease in the bag limit of gag and other shallow water grouper species could increase the number of discards. Analyses take into consideration that an increase in the number of discards could occur and apply the SEDAR accepted release mortality rates. Furthermore, an increase in the magnitude of discards could occur after a quota is met or during a seasonal closure. However, quotas are adjusted for dead discards that would be expected to occur after a quota is met and seasonal closure are assumed to be less than 100% effective because fishermen will likely target co-occurring species and incidental catch of vermilion snapper and gag will occur.

Snapper Grouper Amendment 16 includes actions that would close fisheries for shallow water grouper species when a quota is met or during seasonal closure. Since a commercial/recreational closure for gag and co-occurring species would overlap with closures for co-occurring species, there could be substantial reductions in bycatch and fishing mortality. Other actions, which could reduce bycatch, includes requiring the use of venting tools and dehooking devices.

More restrictive management measures proposed in Snapper Grouper Amendment 16 could result in an effort shift to other species and fisheries causing a change in the magnitude of harvest and number of discards in those fisheries. Reduced fishing pressure on vermilion snapper, gag, and shallow water grouper species would be expected to result in an increase in the mean size and age. In addition, biomass and the percentage of males for the various grouper species would be expected to increase. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure on species in Snapper Grouper Amendment 16 as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch over time.

4.7.1.8 Effects on Marine Mammals and Birds

Under Section 118 of the Marine Mammal Protection Act (MMPA), NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery. Of the gear utilized within the snapper grouper fishery, only the black sea bass pot is considered to pose an entanglement risk to large whales. The southeast U.S. Atlantic black sea bass pot fishery is included in the grouping of the Atlantic mixed species trap/pot fisheries, which the 2008 List of Fisheries classifies as a Category II. Gear types used in these fisheries are determined to have occasional incidental mortality and serious injury of marine mammals (72 FR 66048; November 27, 2007). For the snapper grouper fishery, the best available data on protected species interactions are from the Southeast Fisheries Science Center (SEFSC) Supplementary Discard Data Program (SDDP) initiated in July of 2001 and sub-samples 20% of the vessels with an active permit. To date, no interactions with marine mammals have been reported from this program (8/1/2001-7/31/2004) (Poffenberger 2004; McCarthy SEFSC database).

Although the gear type used within the black sea bass pot fishery can pose an entanglement risk to large whales due to their distribution and occurrence, sperm, fin, sei, and blue whales are unlikely to overlap with the black sea bass pot fishery operated within the snapper grouper fishery since it is executed primarily off North Carolina and South Carolina in waters ranging from 70-120 feet deep (21.3-36.6 meters). There are no known interactions between the black sea bass pot fishery and large whales. NOAA Fisheries Service's biological opinion on the continued operation of the South Atlantic snapper grouper fishery determined the possible adverse effects resulting from the fishery are extremely unlikely. Thus, the continued operation of the snapper grouper fishery in the southeast U.S. Atlantic EEZ is not likely to adversely affect sperm, fin, sei, and blue whales (NMFS 2006).

Northern right and humpback whales may overlap both spatially and temporally with the black sea bass pot fishery. Recent revisions to the Atlantic Large Whale Take Reduction Plan have folded the Atlantic mixed species trap/pot fisheries into the plan (72 FR 193; October 5, 2007). The new requirements will help further reduce the likelihood of northern right and humpback whale entanglement in black sea bass pot gear.

The Bermuda petrel and roseate tern occur within the action area. Bermuda petrels are occasionally seen in the waters of the Gulf Stream off the coasts of North and South Carolina during the summer. Sightings are considered rare and only occurring in low numbers (Alsop 2001). Roseate terns occur widely along the Atlantic coast during the summer but in the southeast region, they are found mainly off the Florida Keys (unpublished USFWS data). Interaction with fisheries has not been reported as a concern for either of these species.

Fishing effort reductions have the potential to reduce the amount of interactions between the fishery and marine mammals and birds. A quota for the commercial black sea bass fishery could reduce the number of pots that are fished each year and reduce the risk of entanglement with right whales and humpback whales, which may overlap both spatially and temporally with the black sea bass pot fishery. Although, the Bermuda petrel and roseate tern occur within the action area, these species are not commonly found and neither has been described as associating with vessels or having had interactions with the snapper grouper fishery. Thus, it is believed that the snapper grouper fishery is not likely to negatively affect the Bermuda petrel and the roseate tern.

4.7.1.9 Changes in Fishing, Processing, Disposal, and Marketing Costs

Management alternatives in Snapper Grouper Amendment 16, which are most likely to reduce bycatch, would be expected to affect the cost of fishing operations. It is likely that east Florida would be impacted most from a spawning season closure for gag and other shallow water grouper species since fewer trips would be taken off North Carolina, South Carolina, and Georgia when the temperatures are cold and weather is poor. Furthermore, grouper species occur most commonly off of Florida and is likely where most spawning occurs.

A LAPP was under consideration for the snapper grouper fishery and could be considered again in the future. The Council is currently evaluating a LAPP for the commercial golden tilefish fishery. An IFQ program may provide greater efficiency in fishing, processing, and disposal. IFQ programs may be an effective method for controlling fishing effort, removing excess capital, generating profits, reducing the incentive to fish during unsafe conditions, and extending the availability of fresh fish products. Additionally, factors such as waterfront property values, availability of less expensive imports, etc. may affect economic decisions made by recreational and commercial fishermen.

4.7.1.10 Changes in Fishing Practices and Behavior of Fishermen

Management regulations proposed in Snapper Grouper Amendment 16 could result in a modification of fishing practices by commercial and recreational fishermen, thereby affecting the magnitude of discards. There is a potential for increased discards with new or reduced quotas, reduced bag limits, seasonal closures, and increased size limits. It is expected some species would continue to be caught after a quota is met or during a closure since fishermen might target species that co-occur with the restricted species. However, fishermen may be able to modify their behavior by avoiding locations where high concentrations of the restricted species occurs or changing fishing methodology such hook size and type.

Snapper Grouper Amendment 16 could also require the use of dehooking tools and venting tools. Use of these devices will require a modification in fishing practices and behavior and have the potential to reduce bycatch if properly used. These new devices will require education about the methods to reduce bycatch and enhance survival of regulatory discards. Gear changes such as the use of venting tools and dehooking devices could have some affect on a reduction in bycatch mortality. Furthermore, closed seasons, new or reduced quotas, reduced bag limits, and increased size limits could cause some commercial and recreational fishermen to reduce effort. Closing all shallow water groupers during a seasonal gag closure or after a gag quota is met may help to reduce bycatch. A LAP program would likely influence fishing practices and behavior, thereby contributing to a reduction in bycatch. However, it is difficult to quantify any of the measures in terms of reducing discards until the magnitude of bycatch has been monitored over several years.

4.7.1.11 Changes in Research, Administration, and Enforcement Costs and Management Effectiveness

Research and monitoring is needed to understand the effectiveness of proposed management measure in reducing bycatch. Additional work is needed to determine the effectiveness of measures being developed in Snapper Grouper Amendment 16 and by future actions being proposed by the Council to reduce bycatch. Some observer information has recently been provided by MARFIN and Cooperative Research Programs but more is needed. Approximately 20% of commercial fishermen are asked to fill out discard information in logbooks; however, a greater percentage of fishermen could be selected with emphasis on individuals that dominate landings. Furthermore, the use of electronic logbooks could be enhanced to enable fishery managers to obtain information on species composition, size distribution, geographic range, disposition, and depth of fishes that are released. Additional administrative and enforcement efforts will be needed to implement and enforce these regulations.

4.7.1.12 Changes in the Economic, Social, or Cultural Value of Fishing Activities and Non-Consumptive Uses of Fishery Resources

Preferred management measures, including those that are likely to increase or decrease discards could result in social and/or economic impacts as discussed in Section 4.

4.7.1.13 Changes in the Distribution of Benefits and Costs

Attempts were made to ensure reductions provided by preferred management measures are equal in the commercial and recreational sectors. The extent to which these management measures will increase or decrease the magnitudes of discards is unknown. Some measures such as the requirement of venting tools and dehooking devices, a recreational/commercial seasonal closure for gag, and closing all shallow water groupers when a gag quota is met or during a gag seasonal closure could help to reduce bycatch. It is likely that some management measures such as reduced or new quotas, bag limits, and increased size limits could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing. Potential increases in dead discards are taken into consideration in bag and size limits, setting commercial quotas, and determining the effectiveness of a seasonal closure.

It is unlikely that the magnitude of discards will be the same in the commercial and recreational sectors. For example, a very large percentage of the recreational catch of vermilion snapper and gag is from small fish. Commercial fishermen catch fewer small fish than recreational fishermen. Therefore, an increase in the minimum size in the vermilion snapper recreational fishery is likely to produce a much higher percentage of discards than management measures being considered for the commercial fishery.

4.7.1.14 Social Effects

The social effects of all the management measure, including those most likely to reduce bycatch, are described in Section 4.

4.7.1.15 Conclusion

This section evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality in the South Atlantic snapper grouper fishery using the ten factors provided at 50 CFR 600.350(d)(3)(i). In summary, the requirement of venting tools and dehooking devices, a recreational/commercial seasonal closure for gag, and closing all shallow water groupers when a gag quota is met or during a gag seasonal closure could help to reduce bycatch. It is likely that some management measures such as reduced or new quotas, bag limits, and increased size limits could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing. Potential increases in dead discards are taken into consideration in bag and size limits, setting commercial quotas, and determining the effectiveness of a seasonal closure. Furthermore, overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures, thereby reducing the potential for bycatch.

There is likely to be an interactive effect of the preferred management measures in Snapper Grouper Amendment 16 on bycatch of vermilion snapper, gag, shallow water groupers, and associated species in reef ecosystems. Once a quota met, or during a seasonal closure, effort could shift to other species or fisheries. Vermilion snapper and gag could continue to be caught when species with fewer regulations are targeted. However, fishermen may be able to avoid areas where a restricted species occurs thereby reducing the potential for bycatch. Furthermore, incidental catch of vermilion snapper and gag is considered when setting quotas and determining the effectiveness of seasonal closures. Reduced fishing pressure on species in Snapper Grouper Amendment 16 would be expected to result in an increase in the mean size/age of vermilion snapper, gag, and shallow water grouper species. In addition, an increase would be expected in the percentage of male groupers and population biomass. Overlapping seasonal closures with red porgy, greater amberjack, and mutton snapper with gag and shallow water groupers could be expected to reduce bycatch and fishing mortality of many co-occurring species. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure on species in Snapper Grouper Amendment 16 as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch over time.

Additional measures to reduce bycatch in the snapper grouper fishery are being developed. Snapper Grouper Amendment 17 to the Snapper Grouper FMP and the Comprehensive ACL Amendment could propose additional measures to reduce bycatch in the snapper grouper fishery. For example, species grouping based on biological, geographic, economic, taxonomic, technical, social, and ecological factors have been proposed in Snapper Grouper Amendment 17. Each group would be represented by an indicator species, which has been recently assessed or is scheduled for a SEDAR assessment in the future.

A LAPP was under consideration for the snapper grouper fishery and could be considered again in the future. Currently the Council is evaluating a LAPP for the commercial golden tilefish fishery. Under an IFQ program, commercial fishermen are allocated percentages of a TAC, which is set by fishery managers based on estimates of what level of catch the fisher can sustain. This program has the potential to substantially reduce bycatch by providing fishermen more flexibility to decide where and when to fish. IFQ systems could give fishermen the flexibility to target more favorable harvesting conditions and avoid areas where bycatch of certain species is more likely.

4.8 *Unavoidable Adverse Effects*

Some actions specified in Snapper Grouper Amendment 16 are expected to have unavoidable adverse effects.

According to the NEPA definitions of direct and indirect effects, defining MSY and OY for gag and vermilion snapper would not directly affect the biological or ecological environment, including ESA-listed protected species, because these parameters are not used in determining immediate harvest objectives. MSY and OY are reference points used by fishery managers to assess fishery performance over the long term. As a result, redefined management reference points could require regulatory changes in the future as mangers monitor long-term performance of the stock with respect to the new reference points. Therefore, these parameter definitions will indirectly affect subject stocks and the ecosystem of which they are a part, by influencing decisions about how to maximize and optimize the long-term yield of fisheries under equilibrium conditions and triggering action when stock biomass decreases below threshold level.

The Total Allowable Catch (TAC) recommended by the Scientific and Statistical Committee (SSC) for gag is 694,000 (lbs gutted weight) based on yield at F_{oy}, which is equivalent to a reduction of 36% in the average catch during 2004-2006. Based on the preferred allocation alternative, the reductions would be 35% to the commercial sector and 37% to the recreational sector. This TAC will be effective for the 2009 fishing year and remain in effect until it is modified.

The vermilion snapper TAC was also based on the yield at F_{oy} and is 566,179 (lbs gutted weight). Based on the preferred vermilion allocation alternative, the resulting harvest reductions would be 58% in the commercial sector and 69% in the recreational sector.

Though the allocation alternatives in and of themselves would not cause any adverse effects, the large reduction in harvest and revenue associated with both TACs would adversely affect fishery participants. The long term-net effects of ending overfishing of these two species are expected to be positive. Gag is not overfished; however, biomass is less than biomass at MSY. Constraining fishing mortality to a sustainable rate will eventually enable stock biomass of gag to increase to a level that is capable of providing maximum sustainable yield and, ultimately, optimum yield, or the greatest overall benefit to the nation. The overfished status of vermilion snapper is unknown. Ending overfishing would be expected to increase the average size and enhance catch per unit effort. If biomass is depleted, action to end overfishing would be expected to increase available yield once the stock is rebuilt to B_{msy}. For this reason all no-action alternatives for gag and vermilion snapper would have adverse effects on the biological, ecological, social, and economic environments.

Proposed management alternatives in this amendment would affect the commercial and recreational sectors of the fishery. Quotas, seasonal closures, and bag limits are designed to reduce the number of targeted fishing trips or time spent pursuing species. The extent to which those measures adversely affect the human and natural environments would depend upon fishing effort changes or shifts resulting from a particular management measure. For example, once bag limits are reached, some fishermen may continue to fish, keeping larger fish and throwing smaller dead fish back. It would be expected fishermen would continue to target the largest most desirable species. Therefore, there still could be a problem with removing the larger faster growing fish, reducing genetic variability, and reducing the variability in the age structure of the population that ensures against recruitment failure.

4.9 *Effects of the Fishery on the Environment*

The biological impacts of the proposed actions are described in Section 4.0, including impacts on habitat. No actions proposed in this amendment are anticipated to have any adverse impact on Essential Fish Habitat (EFH) or Essential Fish Habitat0Habitat Areas of Particular Concern (EFH-HAPCs) for managed species including species in the snapper grouper complex. No additional impacts of fishing on EFH were identified; therefore, the Council has determined no new measures to address impacts on EFH are necessary at this time. The Councils adopted habitat policies, which may directly affect the area of concern, are available for download through the Habitat/Ecosystem section of

the Council's website:
http://www.safmc.net/ecosystem/EcosystemManagement/HabitatProtection/HabitatPolicies/tabid/245/Default.aspx .

NOTE: The Final EFH Rule, published on January 17, 2002, replaced the interim Final Rule of December 19, 1997 on which the original EFH and EFH-HAPC designations were made. The Final Rule directs the Councils to periodically update EFH and EFH-HAPC information and designations within fishery management plans. As was done with the original Habitat Plan, a series of technical workshops were conducted by Council habitat staff and a draft Fishery Ecosystem Plan that includes new information is been completed pursuant to the Final EFH Rule.

4.10 *Damage to Ocean and Coastal Habitats*

The alternatives and proposed actions are not expected to have any adverse effect on the ocean and coastal habitat.

Management measures implemented in the original Snapper Grouper Fishery Management Plan through Amendment 7 (SAFMC 1994a) combined have significantly reduced the impact of the snapper grouper fishery on EFH. The Council has reduced the impact of the fishery and protected EFH by prohibiting the use of poisons and explosives; prohibiting use of fish traps and entanglement nets in the EEZ; banning use of bottom trawls on live/hard bottom habitat north of Cape Canaveral, Florida; restricting use of bottom longline to depths greater than 50 fathoms north of St. Lucie Inlet; and prohibiting use of black sea bass pots south of Cape Canaveral, Florida. These gear restrictions have significantly reduced the impact of the fishery on coral and live/hard bottom habitat in the South Atlantic Region.

Additional management measures in Snapper Grouper Amendment 8 (SAFMC 1997), including specifying allowable bait nets and capping effort, have protected habitat by making existing regulations more enforceable. Establishing a controlled effort program limited overall fishing effort and to the extent there is damage to the habitat from the fishery (e.g., black sea bass pots, anchors from fishing vessels, and impacts of weights used on fishing lines and bottom longlines), limited such impacts.

In addition, measures in Snapper Grouper Amendment 9 (SAFMC 1998b), that include further restricting longlines to retention of only deepwater species and requiring that black sea bass pots have escape panels with degradable fasteners, reduce the catch of undersized fish and bycatch and ensure that the pot, if lost, will not continues to "ghost" fish. Furthermore, Snapper Grouper Amendment 13C (SAFMC 2006) increased mesh size in the back panel of pots, which has reduced bycatch and retention of undersized fish. Limiting the overall fishing mortality reduces the likelihood of over-harvesting of species with the resulting loss in genetic diversity, ecosystem diversity, and sustainability.

Measures adopted in the Coral and Shrimp FMPs have further restricted access by fishermen that had potential adverse impacts on essential snapper grouper habitat. These measures include the designation of the *Oculina* Bank HAPC and the Rock Shrimp closed area (see the Shrimp and Coral FMP/Amendment documents for additional information).

The Council's Comprehensive Habitat Amendment (SAFMC 1998c) contains measures that expanded the *Oculina* Bank HAPC and added two additional satellite HAPCs. Snapper Grouper Amendment 14 (SAFMC 2007), which has been approved by the Council, would establish marine protected areas where fishing for or retention of snapper grouper species would be prohibited.

4.11 *Relationship of Short-Term Uses and Long-Term Productivity*

The relationship between short-term uses and long-term productivity will be affected by this amendment. The proposed actions would significantly restrict the harvest of gag and vermilion snapper in the short-term for both the commercial and recreational sectors of the fishery. However, reductions in harvest are expected to benefit the long-term productivity of these species.

4.12 *Irreversible and Irretrievable Commitments of Resources*

Irreversible commitments are defined as commitments that cannot be reversed, except perhaps in the extreme long-term, whereas irretrievable commitments are lost for a period of time. There are no irreversible commitments for this amendment. While the proposed actions would result in irretrievable losses in consumer surplus and angler expenditures, failing to take action would compromise the long-term sustainability of the stocks.

Since the Snapper Grouper FMP and its implementing regulations are always subject to future changes, proceeding with the development of Amendment 16 does not represent an irreversible or irretrievable commitment of resources. NOAA Fisheries Service always has discretion to amend its regulations and may do so at any time, subject to the Administrative Procedures Act.

4.13 *Monitoring and Mitigation Measures*

The proposed actions would adversely affect immediate, short-term net revenues of some commercial and for-hire fishermen in the South Atlantic. The proposed actions would also adversely affect short-term consumer surplus of some recreational anglers in the South Atlantic and may result in cancelled trips and reduced expenditures to the fishery and associated industries. However, it is anticipated reductions in fishing pressure, which will reduce the likelihood that these stocks will be declared overfished, will assist in restoring the size and age structure to more natural conditions and allow stock biomass to increase to more sustainable and productive levels. As a result, the amount of fish that can be harvested should increase as the stocks rebuild. The short-term, adverse effects of ending overfishing can be mitigated to some degree by the type of regulations the Council selects to manage reduced catch levels. The Council's preferred alternatives contain those measures that are believed to best mitigate the unavoidable, short-term, adverse effects of ending overfishing.

4.14 *Unavailable or Incomplete Information*

The Council on Environmental Quality, in its implementing regulations for the National Environmental Policy Act, addressed incomplete or unavailable information at 40 CFR 1502.22 (a) and (b). That direction has been considered. There are two tests to be applied: (1) does the incomplete or unavailable information involve "reasonable foreseeable adverse effects…" and (2) is the information about these effects "essential to a reasoned choice among alternatives…".

Stock assessments have been conducted on vermilion snapper and gag using the best available data. Status determinations for gag and vermilion snapper were derived from the SEDAR process, which involves a series of three workshops designed to ensure each stock assessment reflects the best available scientific information. The findings and conclusions of each SEDAR workshop are documented in a series of reports that are ultimately reviewed and discussed by the Council and their Scientific and Statistical Committee (SSC). SEDAR participants, the Council advisory committees, the SSC, the Council, and NMFS staff reviewed and considered any concerns about the adequacy of the data. Section 4.5 lists data/research needs that resulted from these assessments. The Council's SSC determined that the assessments were based on the best available data.

The Council acknowledged, while stock assessment findings are uncertain, there is no reason to assume such uncertainty leads to unrealistically optimistic conclusions about stock status. Rather, the stocks could be in worse shape than indicated by the stock assessment. Uncertainty due to unavailable or incomplete information should not be used as a reason to avoid taking action. Therefore, there are reasonable foreseeable significant adverse effects of not taking action to end overfishing. Failure to take action could result in a worsening of stock status, persistent foregone economic benefits, and more severe corrective actions to end overfishing in the future.

Where information is unavailable or incomplete, such as is the case with estimates of dead discards that could occur when a species is incidentally caught during a seasonal closures or after a quota is met, management measures have been designed to adopt a conservative approach to increase the probability overfishing does not occur. Furthermore, this amendment includes an action that should lessen bycatch of snapper grouper species by requiring the use of venting tools and dehooking devices further adopting a conservative approach to increase the probability overfishing does not occur. This amendment also includes an action allowing the NMFS Regional Administrator (RA) to make adjustments to management measures for vermilion snapper when new information becomes available on stock status late in 2008.

5 Regulatory Impact Review

5.1 *Introduction*

The NOAA Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the proposed regulations are a 'significant regulatory action' under the criteria provided in Executive Order (E.O.) 12866 and provides information that may be used in conducting an analysis of impacts on small business entities pursuant to the Regulatory Flexibility Act (RFA). This RIR analyzes the expected impacts of this action on the commercial and recreational snapper grouper fisheries, with particularly focus on the gag and vermilion snapper fisheries. Additional details on the expected economic effects of the various alternatives in this action are included in Section 4.0 and are incorporated herein by reference.

5.2 *Problems and Objectives*

The purpose and need, issues, problems, and objectives of the proposed Amendment are presented in Section 1.0 and are incorporated herein by reference. In summary, the purpose of this amendment includes (1) implementation of new status determination criteria that reflect current scientific information for both gag and vermilion snapper stocks; (2) redesigning the management structure to end overfishing of both gag and vermilion snapper; (3) providing for adoption of bycatch reduction devices; and (4) allowing the NMFS RA to adjust management measures on the basis of the new stock assessment results for vermilion snapper. The underlying goal for these changes is to achieve OY for gag and vermilion snapper in the South Atlantic snapper grouper fishery on a more scientific, consistent basis.

5.3 *Methodology and Framework for Analysis*

This RIR assesses management measures from the standpoint of determining the resulting changes in costs and benefits to society. To the extent practicable, the net effects of the proposed measures are stated in terms of producer and consumer surplus, changes in profits, and participation by for-hire vessel fishermen and private anglers. In addition, the public and private costs associated with the process of developing and enforcing regulations of this amendment are provided.

5.4 *Description of the Fishery*

A description of the South Atlantic snapper grouper fishery, with particular focus on gag and vermilion snapper, is contained in Section 3.4 and is incorporated herein by reference.

5.5 *Impacts of Management Measures*

Details on the economic impacts of all alternatives are included in Section 4 and are included herein by reference. The following discussion provides a summary of the expected effects of the preferred alternatives.

5.5.1 Gag

5.5.1.1 Management Reference Points

Defining the MSY and OY for gag does not alter the current harvest or use of the resource. Specification of these measures merely establishes benchmarks for fishery and resource evaluation from which additional management actions for the species would be based. Since there would be no direct effects on resource harvest or use, there would be no direct effects on fishery participants, associated industries, or communities. Direct effects only accrue to actions that alter harvest or other use of the resource. Specifying MSY and OY, however, has indirect effects in that it establishes the platform for future management, specifically from the perspective of bounding allowable harvest levels.

Combined recreational and commercial gag harvests averaged approximately 1.044 million pounds from 2001 to 2006. The estimated MSY for **Preferred Alternative 2** is 1.238 million pounds gutted weight, meaning current harvest is within the preferred MSY threshold. However, current recommendations are for a reduction in harvests to end overfishing. The expected effects of these reductions are described in Section 5.5.1.4 and are incorporated herein by reference.

The OY specified under **Preferred Alternative 2b,** 1.217 million pounds gutted weight**,** would allow an increase in harvest over current harvest levels when the resource is healthy, with associated increased economic benefits, while providing an adequate buffer to ensure sustainable harvests. Current requirements, however, are a reduction in harvest to end overfishing. The expected effects of this reduction are discussed in Section 5.5.1.4 and are incorporated herein by reference.

5.5.1.2 Gag Total Allowable Catch

Preferred Alternative 2 sets the total allowable catch (TAC) level at 694,000 pounds gutted weight and this harvest level is expected to end overfishing of gag. The expected effects of this harvest level are dependent on the management measures adopted to restrict the fishery to this TAC. These are described in Section 5.5.1.4 and are incorporated herein by reference.

5.5.1.3 Interim Gag Allocation

5.5.1.3.1 *Commercial Sector*

The commercial allocation specified by **Preferred Alternative 2** is expected to result in an annual reduction in net operating revenues of $870,000 (2005 dollars) for vessel trips landing at least one pound of gag and by $634,000 for vessel trips landing at least one pound of any snapper grouper species.

5.5.1.3.2 *Recreational Sector*

The recreational allocation specified by **Preferred Alternative 2** is expected to result in an annual reduction of $316,000 in producer surplus to vessels in the for-hire sector and an annual reduction of $45,000 in consumer surplus to recreational anglers, or a total annual reduction of $361,000.

5.5.1.4 Management Regulations

5.5.1.4.1 *Commercial Sector*

The preferred management measures for the commercial sector include a January through April spawning closure (**Preferred Alternative 2a**) and a single, non-regionalized directed commercial quota (**Preferred Alternative 4**). Under the preferred allocation ratio of 51% commercial (**Preferred Alternative 2**), the commercial fishery is expected to incur a reduction in annual net operating revenues of $834,000 for trips that landed at least one pound of gag and $848,000 for trips that landed at least one pound of snapper grouper. These effects would be expected to continue until either adaptive behavior occurs by the fishermen or resource conditions improve and allow more liberal harvest regulations.

5.5.1.4.2 *Recreational Sector*

Preferred Alternative 2 would establish a January through April spawning closure. **Preferred Alternative 7a** would reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black to 1 within the aggregate bag limit, and exclude captain and crew from retaining a bag limit. This measures are expected to result in an annual reduction in producer surplus to for-hire vessels of $653,000 and an annual reduction in consumer surplus to recreational anglers of $828,000, or a total annual reduction in economic value of $1.48 million. These effects would be expected to continue until either adaptive behavior occurs by the fishermen or resource conditions improve and allow more liberal harvest regulations.

5.5.2 Vermilion Snapper

5.5.2.1 Management Reference Points

Defining the MSY and OY for vermilion snapper does not alter the current harvest or use of the resource. Specification of these measures merely establishes benchmarks for fishery and resource evaluation from which additional management actions for the species would be based, should comparison of the fishery and resource with the benchmarks indicate that management adjustments are necessary. Since there would be no direct effects on resource harvest or use, there would be no direct effects on fishery participants, associated industries or communities. Direct effects only accrue to actions that alter harvest or other use of the resource. Specifying MSY and OY, however, has indirect effects in that it establishes the platform for future management, specifically from the perspective of bounding allowable harvest levels.

Combined recreational and commercial harvests of vermilion snapper averaged approximately 1.6 million pounds gutted weight from 2001 to 2006. The estimated MSY for **Preferred Alternative 2** is 2.4 million pounds gutted weight, which is significantly greater than current harvests. As a result, **Preferred Alternative 2** would accommodate current and increased harvests, with associated economic benefits, over current harvest levels. However, this amendment recommends harvest reductions to end overfishing. The expected economic effects of these reductions are discussed in Section 5.5.2.4 and are incorporated herein by reference.

The OY specified by **Preferred Alternative 2b**, 566,179 pounds gutted weight is approximately 35% of the 2001-2006 average annual harvests. Thus, the preferred alternative will result in lower harvests and associated short-term benefits than current levels. Section 5.5.2.4 discusses the expected effects of the preferred harvest levels and associated management measures. Although **Preferred Alternative 2b** will result in lower annual harvests and associated short-term benefits. The resource protection afforded by this OY should increase the likelihood of a stable resource and fishery and reduce the need for restrictive management with associated costs.

5.5.2.2 Vermilion Snapper Total Allowable Catch

Preferred Alternative 2 sets the TAC for vermilion snapper at 566,170 pounds gutted weight that is approximately 35% lower than the 2001-2006 average annual vermilion snapper harvest. The expected effects of the management measures proposed to restrict harvest to this TAC are discussed in Section 5.5.2.4 and are incorporated herein by reference.

5.5.2.3 Interim Vermilion Snapper Allocation

5.5.2.3.1 *Commercial Sector*

The commercial allocation specified by **Preferred Alternative 2** is expected to reduce commercial annual average net operating revenues by $2.84 million for trips landing at least one pound of vermilion snapper and $1.59 million for trips landing at least one pound of snapper grouper species

5.5.2.3.2 *Recreational Sector*

The recreational allocation specified by **Preferred Alternative 2** is expected to result in an annual reduction of $81,000 in producer surplus to vessels in the for-hire sector and an annual reduction of $1.17 million in consumer surplus to recreational anglers, or a total annual reduction of $1.25 million in recreational benefits.

5.5.2.4 Management Regulations

5.5.2.4.1 *Commercial Sector*

The preferred management measures for the commercial sector include a directed commercial quota (**Preferred Alternative 2**) equally divided into January-June and July-December seasons (**Preferred Alternative 3a**). Under this management, the commercial fishery is expected to incur a reduction in annual net operating revenues of $2.97 million for trips landing at least one pound of vermilion snapper and $1.64 million for trips landing at least one pound of any snapper grouper species. These effects would be expected to continue until either adaptive behavior occurs by the fishermen or resource conditions improve and allow more liberal harvest regulations.

5.5.2.4.2 *Recreational Sector*

Preferred Alternative 5d is expected to result in an annual reduction in producer surplus to for-hire vessels of $77,000 and an annual reduction in consumer surplus of $1.12 million to recreational anglers, or a total annual reduction in economic value of $1.2 million. These effects would be expected to continue until either adaptive behavior occurs by the fishermen or resource conditions improve and allow more liberal harvest regulations.

5.5.3 Reduce Bycatch of Snapper Grouper Species

Preferred Alternative 3 would only require the use of venting and dehooking tools. These gear are inexpensive, estimated to cost $15 or less each, and are widely used by many fishermen. Thus, this action would not be expected to impose any new costs on many fishermen and only minimal costs on those who currently do not possess this gear.

5.5.4 Allow NMFS RA to Make Adjustments to Management Measures

Alternative 1, the no action alternative, does not allow the RA to make adjustments based on the new stock assessment. **Preferred Alternative 2** would allow the RA to make the necessary adjustments based on the new stock assessment. The type of management changes considered under **Preferred Alternative 2** focuses on quota changes for the commercial sector and bag limit and seasonal closures changes for the recreational sector. The general economic implications of these management measures have already been discussed in previous sections. The current discussion focuses on the specific level of reductions required to achieve the yield at Foy, assuming the period 2004-2006 as the baseline period for calculating the required harvest reductions. Percent reductions of 10% to 60% are considered. Noting that a 58% commercial and 69% recreational harvest reduction is the current preferred option based on the 2007 stock assessment, most of the options considered under the **Preferred Alternative 2** would tend to alleviate this amendment's overall short-run negative impacts on both the commercial and recreational sectors.

5.5.4.1 Commercial Sector

While each of the harvest adjustment options available to the RA under **Preferred Alternative 2** would be accompanied by expected short-term reductions in annual net operating revenues, these reductions would be motivated by biological need of the resource. As such, while similar harvest adjustment, as required, could be accomplished by subsequent management action through a framework action or plan amendment, such action would take longer to implement, increasing both the cost of the action process and the likely necessary harvest reduction, thus, increasing the severity of correction and associated costs. Recovery benefits under both scenarios are equal and, therefore, not relevant. While specific meaningful cost differences cannot be provided because the cost of delay is unknown, **Preferred Alternative 2** is expected to result in lower short-term economic costs.

5.5.4.2 Recreational Sector

The discussion in Section 5.5.4.1 applies equally to the recreational sector effects and is incorporated herein by reference.

5.6 *Public and Private Costs of Regulations*

The preparation, implementation, enforcement, and monitoring of this or any Federal action involves the expenditure of public and private resources that can be expressed as costs associated with the regulations. Costs associated with this amendment include:

Council costs of document preparation, meetings, public hearings, and information dissemination	$200,000
NOAA Fisheries administrative costs of document preparation, meetings and review	$250,000
Annual law enforcement costs	unknown
TOTAL	$450,000

Law enforcement currently monitors regulatory compliance in these fisheries under routine operations and does not allocate specific budgetary outlays to these fisheries, nor are increased enforcement budgets expected to be requested to address any component of this action.

5.7 *Summary of Economic Impacts*

The specifications of MSY, OY, TAC, and allocations have functional meaning only when translated through the specific management measures, such as trip limits, bag limits, and closed seasons, adopted to limit harvests to the allowable quantities. Thus, the relevant effects are those are described in association with the respective management measures discussed above. As such, the proposed gag management measures are expected to result in an annual reduction in net operating revenues of $834,000 for trips harvest at least 1 pound of gag and $848,000 for trips that harvest at least 1 pound of snapper grouper. These totals are not additive. For the recreational sector, the proposed management is expected to result in an annual reduction in economic value (consumer surplus and producer surplus) of $1.48 million. The proposed vermilion snapper management measures are expected to result in an annual reduction in net operating revenues of $2.97 million for trips that harvest at least one pound of vermilion snapper and $1.64 million for trips that harvest at least one pound of snapper grouper. For the recreational sector, the proposed management is expected to result in an annual reduction in economic value of $1.2 million.

5.8 *Determination of Significant Regulatory Action*

Pursuant to E.O. 12866, a regulation is considered a ‘significant regulatory action’ if it is expected to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in this executive order. Based on the information provided above, this action has been determined to not be economically significant.

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6 Initial Regulatory Flexibility Analysis

6.1 *Introduction*

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the RIR, the regulatory flexibility analysis provides: (1) a statement of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for the proposed rule; (3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; (4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; (5) an identification, to the extent practical, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule; and (6) a description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.

In addition to the information provided in this section, additional information on the expected economic impacts of the proposed action was presented in Sections 4.0 and 5.0 and is included herein by reference.

6.2 *Statement of Need for, Objectives of, and Legal Basis for the Rule*

The purpose and need, issues, problems, and objectives of the proposed rule are presented in Section 1.0 and are incorporated herein by reference. In summary, the purpose of this amendment includes (1) implementation of new status determination criteria that reflect current scientific information for both gag and vermilion snapper stocks; (2) redesigning the management structure to address the overfishing condition for both gag and vermilion snapper; (3) providing for adoption of bycatch reduction devices; and (4) allowing the RA to adjust management measures on the basis of new stock assessment results for vermilion snapper. The underlying goal for these changes is to achieve OY for gag and vermilion snapper in the South Atlantic snapper grouper fishery on a more scientific, consistent basis. The Magnuson-Stevens Fishery Conservation and Management Act provides the statutory basis for the proposed rule.

6.3 *Identification of All Relevant Federal Rules Which May Duplicate, Overlap, or Conflict with the Proposed Rule*

No duplicative, overlapping, or conflicting Federal rules have been identified.

6.4 *Description and Estimate of the Number of Small Entities to Which the Proposed Rule will Apply*

This proposed action is expected to directly impact commercial fishers and for-hire operators. The SBA has established size criteria for all major industry sectors in the U.S. including fish harvesters and for-hire operations. A business involved in fish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $4.0 million (NAICS code 114111, finfish fishing) for all its affiliated operations worldwide. For for-hire vessels, the other qualifiers apply and the annual receipts threshold is $6.5 million (NAICS code 713990, recreational industries).

From 2001-2006, which is the period of data used in the analysis of the expected impacts of this action, an average of 1,101vessels per year were permitted to operate in the commercial snapper grouper fishery, ranging from a low of 974 in 2006 to a high of 1,264 vessels in 2001. Total dockside revenues from snapper grouper species and other species on trips that harvested snapper grouper species averaged $15.50 million (2005 dollars) over this period, resulting in a per vessel average of approximately $14,078. The highest per vessel average occurred in 2005 at approximately $13,980. An average of 27 vessels per year harvested more than 50,000 pounds of snapper grouper species per year, generating at least, at an average of $2.00 (2005 dollars) per pound, dockside revenues of $100,000. Vessels that operate in the snapper grouper fishery may also operate in other fisheries, the revenues of which cannot be determined with available data and are not reflected in these totals.

While a vessel that possesses a commercial snapper grouper permit can harvest any snapper grouper species, during the period 2001-2006, only 299 vessels per year on average harvested any gag and only 259 vessels harvested any vermilion snapper Tables 3-11 and 3-13). The two numbers are not additive, because some vessels landed both species. Total dockside revenues from all snapper grouper species and other species on trips that harvested gag averaged $5.74 million (2005 dollars) over this period, resulting in a per vessel average of approximately $19,197. Total dockside revenues from all snapper grouper species and other species on trips that harvested vermilion snapper averaged $6.98 million (2005 dollars) over this period, resulting in a per vessel average of approximately $26,950. An average of 12 vessels per year harvested more than 10,000 pounds of gag per year, generating at least, at an average of $2.93 (2005 dollars) per pound, dockside revenues of $29,300. An average of 43 vessels per year harvested more than 10,000 pounds of vermilion snapper per year, generating at least, at an average of $2.40 (2005 dollars) per pound, dockside revenues of $24,000. Revenues from activity in other fisheries cannot be determined with available data and are not reflected in these totals.

Based on revenue information, all commercial vessels affected by measures in this amendment can be considered as small entities.

For the period 2001-2006, an average of 1,456 vessels were permitted to operate in the snapper grouper for-hire fishery, of which 82 are estimated to have operated as headboats (Table 3-25). Within the total number of vessels, 235 also possessed a commercial snapper grouper permit and would be included in the summary information provided on the commercial sector. The for-hire fleet is comprised of charterboats, which charge a fee on a vessel basis, and headboats, which charge a fee on an individual angler (head) basis. The charterboat annual average gross revenue is estimated to range from approximately $62,000-$84,000 for Florida vessels, $73,000-$89,000 for North Carolina vessels, $68,000-$83,000 for Georgia vessels, and $32,000-$39,000 for South Carolina vessels. For headboats, the appropriate estimates are $170,000-$362,000 for Florida vessels, and $149,000-$317,000 for vessels in the other states. Based on these average revenue figures, it is determined, for the purpose of this assessment, that all for-hire operations that would be affected by this action are small entities.

Some fleet activity may exist in both the commercial and for-hire snapper grouper sectors, but the extent of such is unknown and all vessels are treated as independent entities in this analysis.

6.5 *Description of the Projected Reporting, Record-keeping and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities Which will be Subject to the Requirement and the Type of Professional Skills Necessary for the Preparation of the Report or Records*

The proposed action does not impose any new reporting, record-keeping or other compliance requirements.

6.6 *Substantial Number of Small Entities Criterion*

The proposed action would be expected to directly affect all vessels that operate in the commercial snapper grouper fishery and all vessels that have a Federal snapper grouper for-hire permit. All affected entities have been determined, for the purpose of this analysis, to be small entities. Therefore, it is determined that the proposed action will affect a substantial number of small entities.

6.7 *Significant Economic Impact Criterion*

The outcome of 'significant economic impact' can be ascertained by examining two issues: disproportionality and profitability.

<u>Disproportionality</u>: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All entities that are expected to be affected by the proposed rule are considered small entities so the issue of disproportionality does not arise in the present case.

<u>Profitability</u>: Do the regulations significantly reduce profit for a substantial number of small entities?

The measures in this amendment would reduce harvest and associated revenues and net profits of affected small entities. The proposed MSY, OY, TAC, and allocation actions only have meaningful content when evaluated through the management measures proposed to restrict the respective fisheries to the allowable harvest levels. The proposed gag management measures are expected to reduce annual net operating revenues to commercial vessels that harvest at least one pound of gag by $834,000 and by $848,000 for vessels that harvest at least one pound of snapper grouper. Using the average annual number of vessels that harvested gag and snapper grouper over the 2001 through 2006 fishing years, 299 vessels and 922 vessels, respectively, these reductions in net revenues average $2,800 and $900 to the two fleets. While net revenues are not directly comparable to gross revenues, as discussed above, the average annual revenues from all species on trips that harvested gag or snapper grouper were $19,197 and $16,200, respectively. For the for-hire fleet, the proposed gag management measures are expected to reduce average annual producer surplus by $285,000. Although 1,456 vessels are permitted to operate in the snapper grouper fishery, not all would be expected to harvest or be affected by the gag regulations. However, a meaningful method for determining how to apportion the expected reduction in producer surplus over the vessels in the fleet has not been identified.

The proposed vermilion snapper management measures are expected to reduce annual net operating revenues to commercial vessels that harvest at least one pound of vermilion snapper by $2.97 million and by $1.64 million for vessels that harvest at least one pound of snapper grouper. Using the average annual number of vessels that harvested vermilion snapper and snapper grouper over the 2001 through 2006 fishing years, 259 vessels and 922 vessels, respectively, these reductions in net revenues average $11,500 and $1,800 to the two fleets. While net revenues are not directly comparable to gross revenues, as discussed above, the average annual revenues from all species on trips that harvested vermilion snapper or snapper grouper were $26,950 and $16,200, respectively (Tables 3-10 and 3-13). For the for-hire fleet, the proposed vermilion snapper management measures are expected to reduce average annual producer surplus by $77,000. Similar to the discussion on the gag management measures, a meaningful method for determining how to apportion the expected reduction in producer surplus over the vessels in the fleet has not been identified.

The proposed gear requirements to reduce the bycatch of snapper grouper species are expected to reduce gear costs by less than $15 per entity. Most fishermen would not be expected to incur any new gear costs since the possession and use of this gear is believed to currently be widespread.

The proposed action that would allow the Regional Administrator to make adjustments to the management measures for vermilion snapper based on the outcome of the new, age-based vermilion snapper stock assessment is expected to allow corrective action, if necessary, to be taken in a more expedient manner. Because corrective action can occur quicker, potential adverse effects on the vermilion snapper resource can be minimized. This would be expected to minimize the potential adverse economic effects of more severe management restrictions that could be required should management adjustment be delayed.

6.8 *Description of Significant Alternatives*

Currently, the South Atlantic Council's preferred alternatives are:

Management Reference Points for Gag

Alternative 2: MSY equals the yield produced by $F_{MSY.}$ MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by $F_{OY.}$ If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. $F_{OY} = 75\% F_{MSY}$. MSY is currently estimated to be 1,238,000 pounds gutted weight and OY is set to be 1,217,000 pounds gutted weight.

Total Allowable Catch for Gag

Alternative 2: Set the TAC = 694,000 pounds gutted weight for 2009 onwards based on the yield at $F_{OY.}$

Interim Allocation for Gag

Alternative 2: Define interim allocations for gag based upon landings from the NMFS Landings (ALS), Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1999-2003. The allocation would be 51% commercial and 49% recreational. This alternative would establish a commercial quota of 353,940 pounds gutted weight (without PQBM) and a recreational allocation of 340,060 pounds gutted weight.

Management Alternatives for Gag

Alternative 2: Establish a gag spawning season closure January through April that applies to both the commercial and recreational sectors; no fishing for and/or possession of gag would be allowed. In addition, no fishing for and/or possession of the following species would be allowed: black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 4: Establish a directed commercial gag quota of 352,940 pounds gutted weight (with PQBM already subtracted) for 2009 onwards until modified. After the commercial quota is met, all purchase and sale of the following species is prohibited and harvest and/or possession is limited to the bag limit: gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Alternative 7a: Reduce the 5-grouper aggregate bag limit to a 3-grouper aggregate bag limit, reduce the existing bag limit from 2 gag or black grouper to 1 gag or black grouper within the grouper aggregate bag limit, and exclude the captain and crew on for-hire vessels from possessing a bag limit for groupers.

Management Reference Points for Vermilion Snapper

Alternative 2: MSY equals the yield produced by $F_{MSY.}$ MSY and F_{MSY} are defined by the most recent SEDAR. OY equals the yield produced by $F_{OY.}$ If a stock is overfished, F_{OY} equals the fishing mortality rate specified by the rebuilding plan designed to rebuild the stock to SSB_{MSY} within the approved schedule. After the stock is rebuilt, F_{OY} = a fraction of F_{MSY}. . F_{OY} = 75%F_{MSY}. MSY is currently unknown and OY is set to be 2,432,394 pounds gutted weight.

Total Allowable Catch for Vermilion Snapper

Alternative 2: Set the TAC = 566,179 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.

Interim Allocation for Vermilion Snapper

Alternative 2: Define interim allocations for vermilion snapper based upon landings from the NMFS landings (ALS), NMFS Marine Recreational Fisheries Statistics Survey (MRFSS), and NMFS headboat databases. The allocation would be based on landings from the years 1986-2005. The allocation would be 68% commercial and 32% recreational. This alternative would establish a commercial quota of 385,002 pounds gutted weight (427,352 pounds whole weight) and a recreational allocation of 181,177 pounds gutted weight (201,107 pounds whole weight).

Management Alternatives for Vermilion Snapper

Alternative 2: Establish a directed commercial vermilion snapper quota of 328,002 pounds gutted weight (with PQBM already subtracted) based on an interim allocation of 68% commercial and 32% recreational. After the commercial quota is met, all purchase and sale is prohibited and harvest and/or possession is limited to the bag limit.

Alternative 3a: Allocate the directed commercial vermilion snapper quota 50% to the period January 1^{st} through June 30^{th} and 50% to the period July 1^{st} through December 31^{st}. Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Alternative 5d: Reduce the bag limit from 10 to 4 vermilion snapper and a season closure (no fishing for and/or possession) of October through May 15^{th}.

Bycatch Reduction of Snapper Grouper Species

Alternative 3: Reduce recreational and commercial bycatch mortality by requiring the following for a person on board a vessel to fish for snapper grouper species in the South Atlantic EEZ: (a) use of venting and de-hooking tools.

RA Adjustments to Management Measures

Alternative 2: Allow the NMFS Regional Administrator (RA) to make adjustments to the management measures based on the outcome of new vermilion snapper SEDAR benchmark assessment as ranging from 10 to 60% (based on the table specifying what actions are to be implemented).

A description of the expected economic effects of all alternatives is provided in Section 5 and is included herein by reference. The following is a summary of the alternatives to the preferred alternatives.

Two alternatives, including the proposed action, were considered for the action to specify gag management reference points. The first alternative to the proposed action, the no action alternative, would retain the current definitions of MSY and OY. These definitions are not consistent with the most recent scientific advice and would not achieve the Council's objective of basing management decisions on the best available scientific information. The second alternative contains three sub-alternatives for the specification of OY, one of which is the proposed OY specification. Each of the two alternative specifications to the proposed OY are based on the same specification of MSY, but specify different levels of OY, one more than the proposed OY and one less. All OY levels, including the proposed action, would result in relatively restrictive management measures. However, the proposed OY is expected to provide the best balance between short-term adverse economic impacts and long-term protection to the stock .

Two alternatives, including the proposed action, were considered for the action to specify the gag TAC. The single alternative to the proposed TAC is the no action alternative, which would not set a TAC for gag. Because a TAC is required to make management determinations, the no action alternative would not achieve the Council's objective.

Four alternatives, including the proposed action, were considered for the action to specify an interim allocation for gag. In general, an allocation alternative will result in adverse economic impacts to small entities in the commercial sector if harvests are re-allocated to the recreational sector, upon which small entities, such as for-hire vessels, would be expected to receive increased economic benefits. The converse is true if harvests are re-allocated to the commercial sector. The first alternative to the proposed action, the no action alternative, would not establish an allocation of gag between the commercial and recreational sectors. The absence of an allocation would hinder overall TAC management and the ability to take corrective action in the appropriate sector should TAC overages occur. This alternative, therefore, would not achieve the Council's objective. The other two alternatives would result in higher TAC allocations to the commercial sector than the proposed action and, thus, would result in lower adverse economic impacts on the commercial small entities. However, these alternatives would increase the adverse impacts on recreational small entities (for-hire businesses). Overall net effects cannot be estimated at this time due to the absence of appropriate data and comparable commercial and recreational models. The proposed allocation was selected because it best matches current harvest distributions, would minimize the re-allocation from and to either sector and, thereby, is expected to be the least disruptive to current harvest practices, resulting in the least adverse economic effects across all sectors.

Seven alternatives (plus sub-alternatives), including the proposed actions, were considered for the action to specify gag management measures. The proposed action encompasses three separate alternatives: one alternative to establish a spawning closure, one alternative to establish a directed commercial quota, and one alternative to establish recreational management measures. The first alternative to the proposed action is the no action alternative, which would apply to both the commercial and recreational sectors. The no action alternative would not achieve the Council's objective of ending overfishing of gag. Two alternatives to the proposed action would only apply to the commercial sector. The first of these alternatives would divide the commercial quota in the proposed action into North/South Carolina and Georgia/Florida regional sub-quotas. Although this alternative may result in a more even distribution of the adverse economic effects of the proposed reduced quota across participants in all states, the total adverse economic effects are expected to be greater than those of the proposed action. The second of these commercial alternatives would establish a 1,000-lb trip limit. This alternative is expected to result in greater adverse economic effects than the proposed action. One alternative to the proposed action would only apply to the recreational sector, would extend the proposed spawning closure by an additional month. As a result, this alternative would increase the adverse economic effects on small entities in the recreational sector. A final alternative would apply to both the commercial and recreational sectors. This alternative would establish special management regulations for waters off Monroe County, Florida. This alternative is expected to result in greater adverse economic effects to commercial entities and have only minor economic effects on recreational entities.

Two alternatives, including the proposed action, were considered for the action to specify vermilion snapper management reference points. The first alternative to the proposed action, the no action alternative, would retain the current definitions of MSY and OY. These definitions are not consistent with the most recent scientific advice and would not achieve the Council's objective of basing management decisions on the best available scientific information. The second alternative contains three sub-alternatives for the specification of OY, one of which is the proposed OY specification. Each of the two alternative specifications to the proposed OY are based on the same specification of MSY, but specify different levels of OY, one more than the proposed OY and one less. All OY levels, including the proposed action, would result in relatively restrictive management measures. However, the proposed OY is expected to provide the best balance between short-term adverse economic impacts and long-term protection to the stock.

Two alternatives, including the proposed action, were considered for the action to specify the vermilion snapper TAC. The single alternative to the proposed TAC is the no action alternative, which would not set a TAC for vermilion snapper. Because a TAC is required to make management determinations, the no action alternative would not achieve the Council's objective.

Two alternatives, including the proposed action, were considered for the action to specify an interim allocation for vermilion snapper. The only alternative to the proposed action is the no action alternative, which would not establish an allocation for vermilion snapper. The absence of an allocation would hinder overall TAC management and the ability to take corrective action in the appropriate sector should TAC overages occur. This alternative, therefore, would not achieve the Council's objective.

Five alternatives (with multiple sub-alternatives), including the proposed action, were considered for the action to establish management measures for vermilion snapper. The proposed action encompasses three separate alternatives: one alternative to establish a directed commercial quota, one alternative to allocate the commercial quota to two periods, January through June and July through December, and one alternative to establish recreational management measures. The first alternative to the proposed action is the no action alternative, which would not change current management measures for vermilion snapper. The no action alternative would not achieve the Council's objective of ending overfishing of vermilion snapper. Two alternatives to the proposed action would only apply to the commercial sector. The first of these alternatives addresses the seasonal allocation of the commercial quota and contains two sub-alternatives. The first of these alternatives would allocate 40% of the quota to the first season and 60% to the second season instead of the proposed 50% allocation to each period. This alternative is expected to have almost identical effects on commercial entities as the proposed action and is not expected to reduce the adverse economic effects of the proposed action. The second alternative to the proposed seasonal commercial quota allocation would maintain the equal 50% seasonal allocation but would lengthen the first season by two months, thereby establishing 8-month and 4-month seasons. This alternative is expected to result in greater adverse economic impacts on commercial entities than the proposed action. The second alternative to the proposed action that would apply only to the commercial sector would establish a 1,000-lb trip limit and a May 1st start to the fishing year in lieu of seasonal quotas. This alternative is expected to result in lower adverse economic effects than the proposed action. One alternative, which includes four sub-alternatives including the proposed action, would apply only to the recreational sector. Two of these sub-alternatives would maintain the zero bag limit for captains and crew, similar to the proposed action, but would impose higher size limits and lower bag limits. As a result, these two sub-alternatives are expected to result in greater adverse economic impacts on recreational small entities than the proposed action. In addition to maintaining the zero bag limit for captains and crew, the remaining alternative to the proposed recreational management measures would establish a higher size limit, higher bag limit, and a shorter seasonal closure than the proposed action. As a result, the estimated short-term economic impacts of this alternative on recreational small entities would be expected to be lower than those of the proposed action, primarily due to the expected effects of the shorter seasonal closure. However, the Council believes that the longer seasonal closure in the proposed action will increase probability that the target reduction in recreational harvest will be achieved, resulting in increased protection of the vermilion snapper stock and lead to increased future benefits. The net economic effects of these future considerations could not be estimated with currently available information.

Three alternatives (and one set of sub-alternatives), including the proposed action, were considered for the action to reduce the bycatch of snapper grouper. The first alternative to the proposed action is the no action alternative, which would not require additional measures to reduce bycatch of snapper grouper and would not achieve the Council's objective. In addition to the requirement of the proposed action for vessels fishing for snapper grouper to possess de-hooking devices and venting tools, the second alternative to the proposed action would also require the use of circle hooks. This alternative would be expected to adversely affect the harvest of certain target species because the morphology of their mouths and biting habits would not allow circle hooks to be an effective harvest gear. As a result, this alternative would be expected to result in greater adverse economic effects than the proposed action. Additionally, within this alternative, sub-alternatives considered the application of the requirements to just the commercial sector, just the recreational sector, or both sectors. The proposed action would apply to both sectors. Although the application of the requirements to a single sector would result any adverse economic effects, the benefits of bycatch reduction would be reduced. Further, the minimal cost associated with the proposed action effectively eliminates the need to consider sector considerations.

Two alternatives, including the proposed action, were considered for the action to allow the NMFS Regional Administrator (RA) to adjust the vermilion snapper management measures, as necessary, upon completion of the new, age-based, SEDAR benchmark assessment. The alternative to the proposed action was the no action alternative. This alternative would not allow the Regional Administrator to make adjustments and would require that any necessary adjustments be made through framework action or plan amendment. As a result, management adjustment would be delayed, increasing the costs of adjustment and potentially increasing the severity of necessary correction, leading to greater adverse economic effects than the proposed action.

7 Fishery Impact Statement

Amendment 16 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region proposes to: 1) Update management reference points for gag and vermillion snapper; 2) establish TACs for gag and vermilion snapper set at the yield at F_{oy}; 3) define interim allocations for gag and vermillion snapper; 4) implement measures to end overfishing of gag and vermillion snapper; 5) allow the Regional Administrator to adjust management measures pending the outcome of a new benchmark assessment for vermilion snapper; and 6) reduce bycatch mortality of snapper grouper species. The purpose of these measures is to reduce current harvest levels to yields associated with the optimum yield and end overfishing of gag and vermilion snapper in the South Atlantic. Furthermore, red grouper and black grouper are experiencing overfishing and the overfishing status of rock hind, red hind, coney, graysby, yellowmouth grouper, yellowfin grouper, and tiger grouper is unknown. Therefore, the intent of Snapper Grouper Amendment 16 is to improve the status of all shallow water grouper species, some of which are taken incidentally when targeting gag and vermilion snapper.

Summary of Biological Effects

Current management actions, as summarized in Section 2, should reduce fishing mortality in gag and vermilion snapper and are expected to have a beneficial, cumulative effect on the biophysical environment. These management actions are expected to increase stock biomass, which may affect other stocks. Because gag, and to a certain extent, vermilion snapper are upper level predators preying primarily on fish, benthic invertebrates, and squid, the degree of competition for food resources between these species and other co-occurring species may increase as stock abundance increases. In addition, gag, red porgy, vermilion snapper, black sea bass, greater amberjack, red snapper, white grunt and other co-occurring species may begin to compete for habitat as they increase in abundance.

Restrictions in the catch of gag and vermilion snapper could result in fishermen shifting effort to other species. The snapper grouper ecosystem includes many species that occupy the same habitat at the same time. For example, vermilion snapper and gag co-occur with tomtate, scup, red porgy, white grunt, red grouper, scamp, and others. Therefore, restricted species are likely to still be caught since they will be incidentally caught when fishermen target other co-occurring species. Continued overexploitation of any snapper grouper species could disrupt the natural community structure of the reef ecosystems that support these species. However, some fishermen may choose to use different gear types and target species in different fisheries such as mackerel and dolphin.

Summary of Economic Effects

The specifications of MSY, OY, TAC, and allocations have functional meaning only when translated through the specific management measures, such as trip limits, bag limits, and closed seasons, adopted to limit harvests to the allowable quantities. Thus, the relevant effects are those described in association with the respective management measures discussed above. As such, the proposed gag management measures are expected to result in an annual reduction in net operating revenues of $834,000 for trips harvest at least 1 pound of gag and $848,000 for trips that harvest at least 1 pound of snapper grouper. These totals are not additive. For the recreational sector, the proposed gag measures are expected to result in an annual reduction in economic value (consumer surplus and producer surplus) of $1.48 million.

The proposed vermilion snapper management measures are expected to result in an annual reduction in net operating revenues of $2.97 million for trips that harvest at least one pound of vermilion snapper and $1.64 million for trips that harvest at least one pound of snapper grouper. For the recreational sector, the proposed management is expected to result in an annual reduction in economic value of $1.2 million.

Summary of Social Effects

Snapper Grouper Amendment 16 (this amendment) includes measures that will end overfishing of gag and vermilion snapper. The expected impacts of these actions are presented in Section 4. The corrective action in response to overfishing always requires harvest reductions and more restrictive regulation. Thus, additional short-term social and economic impacts would be expected. These restrictions are expected to prevent the stocks from becoming overfished, which would require recovery plans, further harvest restrictions, and additional social and economic losses.

Summary of Administrative Effects

In most cases maintaining the status-quo would be the most administratively burdensome alternative out of all those considered for gag and vermilion, since not implementing measures to end overfishing or prevent overfishing from occurring would likely force the agency to take additional and more restrictive action in the future. Management measures for gag and vermilion snapper would require continued monitoring of landings and extensive outreach and education initiatives aimed at informing the fishing community of new requirements across all sectors. Additionally, all new management measures analyzed in the preferred alternatives would require coordination between NOAA Fisheries Service Office of Law Enforcement, Office of Sustainable Fisheries, the Southeast Fisheries Science Center, the office of General Counsel, and Council staff to organize and implement any new quotas, closures, and/or gear provisions.

8 Other Applicable Law

8.1 *Administrative Procedure Act*

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (APA) (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NMFS is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider, and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day waiting period from the time a final rule is published until it takes effect.

8.2 *Coastal Zone Management Act*

Section 307(c)(1) of the federal Coastal Zone Management Act (CZMA) of 1972 requires that all federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. While it is the goal of the South Atlantic Council to have management measures that complement those of the states, Federal and State administrative procedures vary and regulatory changes are unlikely to be fully instituted at the same time. Based on the analysis of the environmental consequences of the proposed action in Section 4.0, the Council has concluded this amendment would improve Federal management of snapper grouper species.

8.3 *Endangered Species Act*

The Endangered Species Act (ESA) of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or the habitat designated as critical to their survival and recovery. The ESA requires NOAA Fisheries Service to consult with the appropriate administrative agency (itself for most marine species and the U.S. Fish and Wildlife Service for all remaining species) when proposing an action that may affect threatened or endangered species or adversely modify critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. They are concluded informally when proposed actions may affect but are "not likely to adversely affect" threatened or endangered species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" threatened or endangered species or adversely modify designated critical habitat.

NOAA Fisheries Service completed a biological opinion in 2006 evaluating the impacts of the continued authorization of the South Atlantic snapper grouper fishery under the

Snapper Grouper Fishery Management Plan and Amendment 13C on ESA-listed species (see Section 3.2.4) (NMFS 2006). The opinion stated the fishery was not likely to adversely affect northern right whale critical habitat, seabirds, or marine mammals (see NMFS 2006 for discussion on these species). However, the opinion did state that the snapper grouper fishery would adversely affect sea turtles and smalltooth sawfish, but would not jeopardize their continued existence. An incidental take statement was issued for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles, as well as smalltooth sawfish. Reasonable and prudent measures to minimize the impact of these incidental takes were specified, along with terms and conditions to implement them.

NOAA Fisheries Service has also recently conducted an informal Section 7 consultation evaluating the impacts of the South Atlantic snapper grouper fishery on ESA-listed *Acropora* species. The consultation concluded that the continued operation of the snapper grouper fishery was not likely to adversely affect listed *Acropora* species.

8.4 *Executive Order 12612: Federalism*

E.O. 12612 requires agencies to be guided by the fundamental federalism principles when formulating and implementing policies that have federalism implications. The purpose of the Order is to guarantee the division of governmental responsibilities between the Federal government and the States, as intended by the framers of the Constitution. No federalism issues have been identified relative to the actions proposed in this amendment and associated regulations. The affected states have been closely involved in developing the proposed management measures and the principal state officials responsible for fisheries management in their respective states have not expressed federalism related opposition to the proposed action.

8.5 *Executive Order 12866: Regulatory Planning and Review*

E.O. 12866, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that implement a new FMP or that significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the RFA. A regulation is significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or if it has other major economic effects.

8.6 *Executive Order 12898: Environmental Justice*

E.O. 12898 states "*Agency Responsibilities*. To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Marian islands."

Section 3.4.2 describes five fishing communities in North Carolina, two fishing communities in Florida, and one each in Georgia and South Carolina. These communities were identified as key communities involved in the snapper grouper fishery based on fishing permit and employment data. The demographic information reported for these communities were derived from census data. Census data describes community-wide demographics and cannot be partitioned into just those populations that rely on the snapper grouper fishery. A key reason for this is the census data combines fishing occupations with farming and forestry occupations under the occupation category, and with agriculture, forestry, and hunting under the industry category. For this reason, demographic information on snapper grouper fishing communities is not available for use in evaluating the effects of the proposed actions on low-income and minority populations. Nevertheless, although demographics of the snapper grouper fishery are unknown, these actions would apply to all participants in the fishery, regardless of their race, color, national origin, or income level and, as a result are not considered discriminatory. The current demographic make-up of the respective fishing communities is assumed to be the result of historic cultural and economic conditions and not the result of specific historic or current management action that favored or discriminated against minority or low-income participants. Therefore, no environmental justice issues are anticipated and no modifications to any proposed actions have been made to address environmental justice issues. Additionally, none of the proposed actions are expected to affect any existing subsistence consumption patterns or raise any issues thereof.

8.7 *Executive Order 12962: Recreational Fisheries*

E.O. 12962 requires Federal agencies, in cooperation with States and Tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of Federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects. Additionally, the order establishes a seven member National Recreational Fisheries Coordination Council responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by Federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among Federal agencies involved in conserving or managing recreational fisheries. The Council also is responsible for developing, in cooperation with Federal agencies, States and Tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda.

8.8 *Executive Order 13089: Coral Reef Protection*

E.O. 13089, signed by President William Clinton on June 11, 1998, recognizes the ecological, social, and economic values provided by the Nation's coral reefs and ensures that Federal agencies are protecting these ecosystems. More specifically, the Order requires Federal agencies to identify actions that may harm U.S. coral reef ecosystems, to utilize their program and authorities to protect and enhance the conditions of such ecosystems, and to ensure that their actions do not degrade the condition of the coral reef ecosystem.

Previous Snapper Grouper Amendments, including Amendment 13A (SAFMC 2003), eliminated all potential adverse impacts to *Oculina* coral in the *Oculina* Banks HAPC and Experimental Closed Area that are associated with bottom fishing gear and fulfills the intentions of E.O. 13089. The use of bottom trawls, bottom longlines, dredges, fish traps, and fish pots is currently prohibited within the *Oculina* Banks HAPC and Experimental Closed Area and that prohibition would not be affected by the proposed actions.

8.9 *Executive Order 13158: Marine Protected Areas*

E.O. 13158 was signed on May 26, 2000 to strengthen protection of U.S. ocean and coastal resources through the use of Marine Protected Areas (MPAs). The E.O. defined MPAs as "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." It directs federal agencies to work closely with state, local, and non-governmental partners to create a comprehensive network of MPAs "representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources". The South Atlantic Council developed Amendment 14 to the Snapper Grouper Fishery Management Plan to establish a series of deepwater marine protected areas in the South Atlantic EEZ. The amendment was approved by the Council during its June 2007 meeting and submitted to NOAA Fisheries for approval by the Secretary of Commerce on July 18, 2007.

8.10 *Marine Mammal Protection Act*

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

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; development and implementation of take-reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries; and studies of pinniped-fishery interactions. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; and Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4), the must accommodate an observer if requested (50 CFR 229.7(c)) and comply with any applicable take reduction plans.

The commercial hook-and-line components of the South Atlantic snapper grouper fishery (i.e., bottom longline, bandit gear, and handline) are listed as part of a Category III fishery (72 FR 66048; November 27, 2007) because there have been no documented interactions between these gears and marine mammals. The black sea bass pot component of the South Atlantic snapper grouper fishery is part of the Atlantic mixed species trap/pot fishery, a Category II fishery, in the 2008 LOF (72 FR 66048; November 27, 2007). The Atlantic mixed species trap/pot fishery designation was created in 2003 (68 FR 41725, July 15, 2003), by combining several separately listed trap/pot fisheries into a single group. This group was designated Category II as a precaution because of known interactions between marine mammals and gears similar to those included in this group. Prior to this consolidation, the black sea bass pot fishery in the South Atlantic was a part of the "U.S. Mid-Atlantic and Southeast U.S. Atlantic Black Sea Bass Trap/Pot" fishery (Category III). There has never been a documented interaction between marine mammals and black sea bass trap/pot gear in the South Atlantic.

8.11 *Migratory Bird Treaty Act and Executive Order 13186*

The Migratory Bird Treaty Act (MBTA) implemented several bilateral treaties for bird conservation between the United States and Great Britain, the United States and Mexico, the United States and Japan, and the United States and the former Union of Soviet Socialists Republics. Under the MBTA, it is unlawful to pursue, hunt, take, capture, kill, possess, trade, or transport any migratory bird, or any part, nest, or egg of a migratory bird, included in treaties between the signatures, except as permitted by regulations issued by the Department of the Interior (16 U.S.C. 703-712). Violations of the MBTA carry criminal penalties. Any equipment and means of transportation used in activities in violation of the MBTA may be seized by the United States government and, upon conviction, must be forfeited to the U.S. government.

Executive Order 13186 directs each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding (MOU) with the U.S. Fish and Wildlife Service (USFWS) to conserve those bird populations. In the instance of unintentional take of migratory birds, NOAA Fisheries Service would develop and use principles, standards, and practices that will lessen the amount of unintentional take in cooperation with the USFWS. Additionally, the MOU would ensure that National Environmental Policy Act (NEPA) analyses evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

An MOU is currently being developed, which will address the incidental take of migratory birds in commercial fisheries under the jurisdiction of NOAA Fisheries. NOAA Fisheries Service must monitor, report, and take steps to reduce the incidental take of seabirds that occurs in fishing operations. The United States has already developed the U.S. National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries. Under that plan many potential MOU components are already being implemented.

8.12 *National Environmental Policy Act*

Concerned with the degree of damages incurred by human activity on the sensitive ecological environment in the United States, Congress passed, and Richard Nixon signed into law, the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. §§ 4321 *et seq.* NEPA sets the national environmental policy by providing a mandate and framework for federal agencies to consider all reasonably foreseeable environmental effects of their actions. In addition, it requires disclosure of information regarding the environmental impacts of any federal or federally funded action to public officials and citizens before decisions are made and actions taken. The analyses and results are presented to the public and other agencies through the development of NEPA documentation. The Final Environmental Impact Statement (FEIS) integrated into

Amendment 16 to the FMP serves as the documentation to satisfy the requirements of NEPA.

8.13 *National Marine Sanctuaries Act*

Under the National Marine Sanctuaries Act (NMSA) (also known as Title III of the Marine Protection, Research, and Sanctuaries Act of 1972), as amended, the U.S. Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. The National Marine Sanctuary Program is administered by the Sanctuaries and Reserves Division of the NOAA. The Act provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary Program currently comprises 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. The two main sanctuaries in the South Atlantic EEZ are Gray's Reef and Florida Keys National Marine Sanctuaries. The Florida Keys National Marine Sanctuary represents the bulk of the ESA-listed *Acropora* species' range in the South Atlantic region.

8.14 *Paperwork Reduction Act*

The purpose of the Paperwork Reduction Act is to control paperwork requirements imposed on the public by the federal government. The authority to manage information collection and record keeping requirements is vested with the Director of the Office of Management and Budget. This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

The Council is not proposing, in this amendment, measures that would involve increased paperwork and consideration under this Act.

8.15 *Regulatory Flexibility Act*

The Regulatory Flexibility Act (RFA) of 1980 (5 U.S.C. 601 et seq.) requires Federal agencies to assess the impacts of regulatory actions implemented through notice and comment rulemaking procedures on small businesses, small organizations, and small governmental entities, with the goal of minimizing adverse impacts of burdensome regulations and record-keeping requirements on those entities. Under the RFA, NMFS must determine whether a proposed fishery regulation would have a significant economic impact on a substantial number of small entities. If not, a certification to this effect must be prepared and submitted to the Chief Counsel for Advocacy of the Small Business Administration. Alternatively, if a regulation is determined to significantly impact a substantial number of small entities, the Act requires the agency to prepare an initial and final Regulatory Flexibility Analysis to accompany the proposed and final rule, respectively. These analyses, which describe the type and number of small businesses affected, the nature and size of the impacts, and alternatives that minimize these impacts while accomplishing stated objectives, must be published in the *Federal Register* in full or in summary for public comment and submitted to the chief counsel for advocacy of the Small Business Administration. Changes to the RFA in June 1996 enable small entities to seek court review of an agency's compliance with the Act's provisions.

8.16 *Small Business Act*

Enacted in 1953, the Small Business Act requires that agencies assist and protect small-business interests to the extent possible to preserve free competitive enterprise.

8.17 *Public Law 99-659: Vessel Safety*

Public Law 99-659 amended the Magnuson-Stevens Act to require that a FMP or FMP amendment must consider, and may provide for, temporary adjustments (after consultation with the U.S. Coast Guard and persons utilizing the fishery) regarding access to a fishery for vessels that would be otherwise prevented from participating in the fishery because of safety concerns related to weather or to other ocean conditions.

No vessel would be forced to participate in the snapper grouper fishery under adverse weather or ocean conditions as a result of the imposition of management regulations proposed in this amendment.

The fact that low quotas are being implemented with a January 1st start date may force fishermen to fish in the winter.

No concerns have been raised by people participating in the fishery nor by the U.S. Coast Guard that the proposed management measures directly or indirectly pose a hazard to crew or vessel safety under adverse weather or ocean conditions. Therefore, this amendment proposes neither procedures for making management adjustments due to vessel safety problems nor procedures to monitor, evaluate, or report on the effects of management measures on vessel or crew safety under adverse weather or ocean conditions.

9 List of Preparers

Name	Title	Agency	Division	Location
Myra Brouwer	Fishery Scientist	SAFMC	N/A	SAFMC
David Dale	EFH Specialist	NMFS	HC	SERO
Rick DeVictor	Environmental Impact Scientist	SAFMC	N/A	SAFMC
Tracy Dunn	Enforcement Specialist	NMFS	LE	SERO
Andy Herndon	Biologist	NMFS	PR	SERO
Tony Lamberte	Economist	NMFS	SF	SERO
Palma Ingles	Anthropologist	NMFS	SF	SERO
Jennifer Lee	Council Liaison	NMFS	PR	SERO
Jack McGovern	Fishery Biologist	NMFS	SF	SERO
Janet Miller	Permits	NMFS	SF	SERO
Roger Pugliese	Senior Fishery Biologist	SAFMC	N/A	SAFMC
Kate Quigley	Economist	SAFMC	N/A	SAFMC
Monica Smit-Brunello	Attorney Advisor	NOAA	GC	SERO
Jim Waters	Economist	NMFS	Economics	SEFSC
Kate Michie	Fishery Management Specialist	NMFS	SF	SERO
Gregg Waugh	Deputy Director	SAFMC	N/A	SAFMC
Erik Williams	Stock Assessment Biologist	NMFS	SF	SEFSC

10 List of Agencies, Organizations, and Persons To Whom Copies of the Statement Are Sent

Responsible Agency

Amendment 16:
South Atlantic Fishery Management Council
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Toll Free: 866-SAFMC-10
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Environmental Impact Statement:
NMFS, Southeast Region
263 13th Avenue South
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List of Agencies, Organizations, and Persons Consulted
SAFMC Law Enforcement Advisory Panel
SAFMC Snapper Grouper Advisory Panel
SAFMC Marine Protected Areas Advisory Panel
SAFMC Coral Advisory Panel
SAFMC Habitat and Environmental Protection Panel
SAFMC Scientific and Statistical Committee
North Carolina Coastal Zone Management Program
South Carolina Coastal Zone Management Program
Georgia Coastal Zone Management Program
Florida Coastal Zone Management Program
Florida Fish and Wildlife Conservation Commission
Georgia Department of Natural Resources
South Carolina Department of Natural Resources
North Carolina Division of Marine Fisheries
North Carolina Sea Grant
South Carolina Sea Grant
Georgia Sea Grant
Florida Sea Grant
Atlantic States Marine Fisheries Commission
Gulf and South Atlantic Fisheries Development Foundation
Gulf of Mexico Fishery Management Council
National Marine Fisheries Service
- Washington Office
- Office of Ecology and Conservation
- Southeast Regional Office
- Southeast Fisheries Science Center

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Appendix A. Alternatives the Council considered but eliminated from detailed study, and a brief discussion of the reasons for their elimination.

This section describes alternatives to the proposed actions that the Council considered in developing this amendment, but decided not to pursue. The description of each alternative is followed by a summary statement of why it was eliminated from more detailed study.

<u>Management Measures for Gag</u>

Rejected Alternative 1. Establish a boat limit for gag.

<u>Rationale for elimination</u>: The Council believes that a boat limit could reduce a fishermen's satisfaction received from a fishing trip. Some people might feel rushed to catch fish before the aggregate limit is met. Furthermore, this alternative could be considered unfair to some individuals on larger party boats if some fishers were able to retain a larger portion of the boat limit compared to others.

Rejected Alternative 2. Implement four separate commercial quotas in the South Atlantic, one for each state (Florida, Georgia, South Carolina, and North Carolina).

<u>Rationale for elimination:</u> There are regional differences to the primary fishing season in the South Atlantic. Some feel that state-by-state quotas would ensure that the retention of gag is allowed during a region's primary fishing season. The Council examined the seasonal trend in landings and determined there was not a great deal of difference between the states. Furthermore, the Council and NOAA Fisheries feel that there are significant administrative impacts (particularly in terms of monitoring) with state-by-state quotas. The Council is considering an alternative that would divide the directed commercial quota into two larger geographic regions North Carolina/South Carolina and Georgia/Florida.

The Council discussed allowing each state to monitor and administrate their own quotas as a way to mitigate the potential effects to NOAA Fisheries. Such a system is used by the Mid-Atlantic Fishery Management Council, in conjunction with the Atlantic States Marine Fisheries Commission, for summer flounder and black sea bass. In the South Atlantic, however, it would not be possible to develop and implement a system that utilizes state-monitored quotas before the mandate to end overfishing of vermilion snapper expires.

Rejected Alternative 3. Specify an annual catch limit for gag.

Rationale for elimination: Annual Catch Limits (ACLs) are numerical thresholds that must be set each year by the Council for each managed stock at a level that ensures overfishing does not occur. ACLs must be implemented in fishing year 2010 for fisheries determined to be subject to overfishing and in fishing year 2011 for all other species. The Council chose not to specify ACLs in Amendment 16 because the needed guidelines are not available. In addition, the Council is developing Amendment 17, which will specify ACLs for all snapper grouper species experiencing overfishing. Once guidelines become available, the Council will discuss in Amendment 17 how actions taken in Amendment 16 relate to the specification of ACLs and Annual Catch Targets for gag.

Rejected Alternative 4. Establish a shallow water grouper unit.

Rationale for elimination: The Council initially considered establishing a shallow water grouper unit to reduce bycatch of gag and other species. However, the Council deferred this action to future amendments such as Amendment 17 or the Comprehensive ACL Amendment as it was felt the action would slow down Amendment 16 and actions intended to end overfishing of gag and vermilion snapper.

Management Measures for Vermilion Snapper

Rejected Alternative 5. Prohibit recreational retention of vermilion snapper during summer months (May through September).

Rationale for elimination: The Council believes that an extensive closure during the summer months would have significant, adverse impacts to commercial and recreational fishermen. The Council identified June through August as a core fishing season, especially amongst the for-hire sector. The Snapper Grouper Advisory Panel advised the Council that prohibiting harvest of vermilion snapper during the summer months would have significant impacts to the headboat industry. Between 2001 and 2006, 55% and 45% of the recreational and commercial vermilion harvest, respectively, occurred during May through September.

Rejected Alternative 6. Implement commercial trip limits for vermilion snapper.

Rationale for elimination: The primary purpose of a trip limit would be to extend the fishing season. However, the Council believes that trip limits could impose significant hardship to fishermen, particularly with the high cost of fuel. Instead, the Council is considering splitting the year into two quotas as a method to extend the fishing season. The two quota system also has the added benefit of ensuring that retention of vermilion would be allowed later in the fishing season when a large portion of the catch has historically been taken. The Council also chose not to consider establishing a trip limit for the 225 pound trip-limited permit holders because their catch is a very small portion of the overall catch. Amendment 15B proposes to prohibit all bag limit sales and this is not expected to affect the proportion caught by trip-limited permit holders.

Rejected Alternative 7. Implement four separate commercial quotas in the South Atlantic, one for each state (Florida, Georgia, South Carolina, and North Carolina).

Rationale for elimination: There are regional differences to the primary fishing season in the South Atlantic. Some feel that state-by-state quotas would ensure that the retention of vermilion snapper is allowed during a region's primary fishing season. However, the Council and NOAA Fisheries feel that there are significant administrative impacts (particularly in terms of monitoring) with state-by-state quotas. The Council is considering dividing the year into two quotas as a method to extend the fishing season that would mitigate the effects of some of these regional differences in fishing seasons.

The Council discussed allowing each state to monitor and administer their own quotas as a way to mitigate the potential effects to NOAA Fisheries. Such a system is used by the Mid-Atlantic Fishery Management Council, in conjunction with the Atlantic States Marine Fisheries Commission, for summer flounder and black sea bass. In the South Atlantic, however, it would not be possible to develop and implement a system that utilizes state-monitored quotas before the mandate to end overfishing of vermilion snapper expires.

Rejected Alternative 8. Specify an annual catch limit for vermilion snapper.

Rationale for elimination: Annual Catch Limits (ACLs) are numerical thresholds that must be set each year by the Council for each managed stock at a level that ensures overfishing does not occur. ACLs must be implemented in fishing year 2010 for fisheries determined to be subject to overfishing and in fishing year 2011 for all other species. The Council chose not to specify ACLs in Amendment 16 because the needed ACL guidelines from NOAA Fisheries are not available. In addition, the Council is developing Amendment 17, which will specify ACLs for all snapper grouper species experiencing overfishing. Once the guidelines become available, the Council will discuss in Amendment 17 how actions taken in Amendment 16 relate to the specification of ACLs and Annual Catch Targets for gag.

Measures Rejected from the March 2008 Meeting - Vermilion Snapper

Rejected Alternative 9. Allow the Regional Administrator to make adjustments to the management measures based on outcome of new benchmark assessment.

Alternative 9a. Change measures in the following order: (1) Reduce or eliminate closed season, (2) reduce size limit, and (3) increase the bag limit.

Alternative 9b. Change measures in the following order: (1) Reduce or eliminate closed season, (2) increase the bag limit, and (3) reduce size limit.

Alternative 9c. Change measures in the following order: (1) Reduce size limit, (2) REDUCE or eliminate closed season, and (3) increase the bag limit.

Table 1. Reductions from size limit, bag limit, and seasonal closures.
Assumes 25% release mortality, non compliance with size limit, and excludes captain and crew. Vermilion Snapper 12” TL size limit; 88% effectiveness of seasonal closure

closure	open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	65.99%	66.87%	68.37%	69.82%	71.54%	73.44%	75.82%	78.63%	82.31%
sept-april	May-Aug	57.69%	58.78%	60.65%	62.46%	64.59%	66.95%	69.92%	73.42%	77.99%
oct-april	May-Sept	52.06%	53.29%	55.41%	57.46%	59.88%	62.55%	65.91%	69.88%	75.06%
nov-april	May-Oct	46.14%	47.53%	49.90%	52.21%	54.93%	57.93%	61.70%	66.16%	71.98%
nov-mar	April-Oct	40.86%	42.39%	45.00%	47.53%	50.51%	53.81%	57.96%	62.85%	69.24%
dec-mar	April-Nov	38.11%	39.70%	42.43%	45.08%	48.21%	51.66%	55.99%	61.11%	67.80%
dec-feb	Mar-Nov	34.77%	36.45%	39.33%	42.12%	45.41%	49.05%	53.62%	59.02%	66.06%
jan-feb	Mar-Dec	33.30%	35.02%	37.96%	40.82%	44.18%	47.90%	52.58%	58.09%	65.30%
jan-mar	Apr-Dec	36.64%	38.27%	41.07%	43.78%	46.98%	50.51%	54.95%	60.19%	67.04%
jan-apr	May-Dec	41.91%	43.41%	45.97%	48.46%	51.39%	54.63%	58.70%	63.50%	69.78%
sept-oct	nov-aug	40.97%	42.49%	45.09%	47.62%	50.60%	53.89%	58.03%	62.91%	69.29%
no closure	All year	29.41%	31.23%	34.35%	37.37%	40.93%	44.87%	49.81%	55.65%	63.28%

Table 2. Reductions from size limit, bag limit, and seasonal closures.
Assumes 25% release mortality, non compliance with size limit, and excludes captain and crew. Vermilion Snapper 13” TL size limit; 88% effectiveness of seasonal closure.

Closure	open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	74.51%	75.16%	75.16%	77.38%	78.67%	80.09%	81.87%	83.98%	86.74%
sept-april	May-Aug	68.28%	69.10%	69.10%	71.86%	73.46%	75.23%	77.45%	80.07%	83.50%
oct-april	May-Sept	64.06%	64.99%	64.99%	68.11%	69.93%	71.93%	74.45%	77.42%	81.30%
nov-april	May-Oct	59.62%	60.67%	60.67%	64.18%	66.21%	68.46%	71.29%	74.63%	79.00%
nov-mar	April-Oct	55.67%	56.82%	56.82%	60.67%	62.91%	65.38%	68.48%	72.15%	76.94%
dec-mar	April-Nov	53.61%	54.80%	54.80%	58.84%	61.18%	63.76%	67.01%	70.85%	75.86%
dec-feb	Mar-Nov	51.10%	52.36%	52.36%	56.61%	59.08%	61.81%	65.23%	69.28%	74.56%
jan-feb	Mar-Dec	50.00%	51.29%	51.29%	55.64%	58.16%	60.95%	64.45%	68.59%	73.99%
jan-mar	Apr-Dec	52.50%	53.73%	53.73%	57.86%	60.25%	62.90%	66.23%	70.16%	75.29%
jan-apr	May-Dec	56.46%	57.58%	57.58%	61.36%	63.56%	65.99%	69.04%	72.64%	77.35%
sept-oct	nov-aug	55.75%	56.89%	56.89%	60.74%	62.97%	65.44%	68.54%	72.20%	76.98%
no closure	All year	47.09%	48.45%	48.45%	53.05%	55.72%	58.67%	62.38%	66.76%	72.47%

Table 3. Reductions from size limit, bag limit, and seasonal closures.
Assumes 25% release mortality, non compliance with size limit, and excludes captain and crew. Vermilion Snapper 14" TL size limit; 88% effectiveness of seasonal closure.

Closure	open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	80.09%	80.60%	80.60%	82.33%	83.34%	84.45%	85.84%	87.49%	89.64%
sept-april	May-Aug	75.23%	75.87%	75.87%	78.02%	79.27%	80.65%	82.39%	84.44%	87.11%
oct-april	May-Sept	71.93%	72.65%	72.65%	75.09%	76.51%	78.08%	80.04%	82.36%	85.40%
nov-april	May-Oct	68.47%	69.28%	69.28%	72.02%	73.61%	75.37%	77.58%	80.19%	83.60%
nov-mar	April-Oct	65.38%	66.27%	66.27%	69.28%	71.03%	72.96%	75.39%	78.25%	81.99%
dec-mar	April-Nov	63.77%	64.70%	64.70%	67.85%	69.68%	71.70%	74.24%	77.23%	81.15%
dec-feb	Mar-Nov	61.81%	62.79%	62.79%	66.11%	68.04%	70.17%	72.85%	76.01%	80.13%
jan-feb	Mar-Dec	60.95%	61.96%	61.96%	65.35%	67.32%	69.50%	72.24%	75.47%	79.68%
jan-mar	Apr-Dec	62.90%	63.86%	63.86%	67.09%	68.96%	71.03%	73.63%	76.69%	80.70%
jan-apr	May-Dec	65.99%	66.87%	66.87%	69.83%	71.54%	73.44%	75.82%	78.63%	82.31%
sept-oct	nov-aug	65.44%	66.33%	66.33%	69.33%	71.08%	73.00%	75.43%	78.29%	82.02%
no closure	All year	58.68%	59.74%	59.74%	63.33%	65.42%	67.72%	70.62%	74.04%	78.50%

Alternative 10 has a range of commercial quotas from which the regional administrator can make a selection based on the outcome of the new benchmark assessment.

Rejected Alternative 10. Allow the Regional Administrator to make adjustments to the commercial quotas based on outcome of the new vermilion snapper benchmark assessment.

The directed commercial quota would be calculated using the 68% commercial, 32% recreational allocations specified in Alternative 2; the same estimate of post quota bycatch mortality (PQBM) is to be used.

Alternative 10a. Allocate the directed commercial quota 50% to the period January 1st through June 30th and 50% to the period July 1st through December 31st (Table 2-13). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Alternative 10b. Allocate the directed commercial quota 40% to the period January 1st through June 30th and 60% to the period July 1st through December 31st (Table 2-14). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Alternative 10c. Allocate the directed commercial quota 50% to the period January 1st through August 31st and 50% to the period September 1st through December 31st (Table 2-15). Any remaining quota from period 1 would transfer to period 2. Any remaining quota from period 2 would not be carried forward.

Rationale for elimination: The Council replaced Alternatives 9 and 10 with a table that specifies the actual management regulations that would be implemented based on various percentage reductions from the new SEDAR assessment. The new alternative better reflects the Council's intent and sets forth exactly what the Council wants done depending on the outcome of the new SEDAR assessment.

Rejected Alternative 11. Old **Alternative 4d.** Reduce the bag limit from 10 to 4 vermilion snapper (45% reduction) and a season closure (no fishing for and/or possession) of October through April (32% reduction) (Total reduction = 63%).

Rationale for elimination: The Council rejected this alternative because it did not achieve the required reduction of 69%. The Council replaced this alternative with an alternative including a longer closure in order to achieve the required percentage reduction in harvest.

Measures Rejected from the September 2008 Meeting - Vermilion Snapper

Rejected Alternative 12. New Alternative for Monroe County Florida

Monroe County
South of the Miami-Dade/Monroe County line, no fishing for and/or possession of gag would be allowed year-round for the commercial and recreational sectors. Reduce the five grouper aggregate bag limit in Monroe County to a two grouper aggregate bag limit.

North of Monroe County
No fishing and/or possession for gag or shallow water groupers during January-April for the commercial and recreational sectors. Once the quota for gag is met, gag and all shallow water grouper species would be closed. Reduce the five grouper aggregate to three grouper aggregate limit and reduce the two fish bag limit for gag or black grouper (combined) to one fish gag or black limit (combined).

Summary
A prohibition of gag in Monroe County could result in a 0.48% reduction in commercial harvest and a 7% reduction in recreational harvest of gag for the whole South Atlantic. Since commercial landings of gag are small, a small reduction in harvest of shallow water groupers would be expected from the proposed measure. For areas north of Monroe County, a 32% reduction in harvest of shallow water groupers could be expected from the gag commercial quota and January – April spawning season closure.

Since gag make up 20 to 30% of headboat landings of shallow water grouper, a closure of gag for the whole year would reduce harvest of shallow water grouper in Monroe County by 25 to 30%. In contrast, the January-April closure for shallow water grouper north of Monroe County would reduce headboat harvest by 12 to 15%.

For areas north of Monroe County, the January – April seasonal closure could reduce MRFSS gag landings by 25 to 30% and all shallow water grouper landings (MRFSS) by about 26%. For Monroe County, the overall reduction in MRFSS landings of shallow water grouper associated with closing gag would be about 7%.

The values above do not take into consideration that a commercial or recreational closure for gag will not be 100% effective. Since gag are part of a multispecies fishery, some incidental catch and mortality of gag would be expected when fishermen target co-occurring species. Analysis conducted in Amendment 16 indicated a commercial January – April closure could be 95% effective in reducing mortality of gag assuming 20% of the trips would be reduced and fishermen were able to avoid locations where gag occur. A recreational closure January-April was estimated to be 89% effective using the same assumptions. Assuming dead discards are part of the harvest, applying these effectiveness values suggest a complete closure of gag in Monroe County would reduce harvest of gag by 0.46% in the commercial sector and 6% in the recreational sector.

The reduction in harvest associated with decreasing the bag limit from a maximum of five to three or two fish per person per day is small because the average number of groupers retained by fishermen is less than one fish per person per day. For areas north of Monroe County, the majority of harvest reduction for shallow water grouper species in the recreational sector would be attained by the January – April seasonal closure and not the reduction in the bag limit.

Commercial

Commercial landings

Analysis of ALS commercial data for 2003 through 2007 indicates gag made up 1.2% of the landings of shallow water grouper species for the Atlantic side of Monroe County, Florida (Table 1). Data from 1999 through 2005 show that gag made up 1.1% of the landings of shallow water grouper species for the Atlantic side of Monroe County, Florida (Table 2). Data from 1999-2005 are provided in addition to the 2003-2007 information because 1999-2005 data were used in Amendment 16. Monroe County shallow water grouper landings are dominated by black grouper and red grouper (Tables 1 and 2). Most of the black grouper landings (91% during 2003-2007) in the South Atlantic are from Monroe County.

Table 1. Average commercial landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including the Atlantic portion of Monroe County, Florida during 2003-2007.

Species	Monroe	All South Atl	% Monroe
Black grouper	121,088	133,514	90.69%
Red Grouper	96,628	336,612	28.71%
Scamp	5,588	278,720	2.00%
Gag	2,642	555,512	0.48%
Red Hind	1,571	48,191	3.26%
Yellowfin Grouper	155	5,608	2.76%
Graysby	55	19,387	0.28%
Rock hind	15	157	9.29%
Yellowmouth Grouper	5	3,444	0.14%
Coney	0	11	0.00%
Total	227,747	1,381,155	16.49%

Table 2. Average commercial landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including the Atlantic portion of Monroe County, Florida during 1999-2005.

Species	Monroe	All South Atl	% Monroe
Black grouper	129,442	145,545	88.94%
Red Grouper	131,664	354,928	37.10%
Scamp	5,076	275,971	1.84%
Gag	2,868	549,933	0.52%
Red Hind	2,593	15,813	16.40%
Yellowfin Grouper	361	3,455	10.45%
Graysby	22	19,291	0.11%
Rock hind	10	104	9.98%
Yellowmouth Grouper	13	3,117	0.43%
Coney	0	24	0.51%
Total	272,051	1,368,179	19.88%

Because commercial landings of gag are low in Monroe County, a complete closure of the species would only reduce harvest by 0.48% when compared to the magnitude of gag landed in the all of the South Atlantic during 2003-2007. Assuming a closure is 95% effective, the closure would provide a 0.46% reduction in harvest.

Tables 3 and 4 illustrate expected landings for areas north of Monroe County and in Monroe County based on the new suggested alternative and the preferred alternative for areas north of Monroe contained in Amendment 16. It is assumed the March – April commercial closure would continue to apply for black grouper in Monroe County. A slight reduction in commercial landings of shallow water grouper would occur in Monroe County since only catches of gag would be restricted and gag landings are small. If the intent of the action is to eliminate the March-April closure for black grouper, there would be an increase in the magnitude of shallow water grouper landings for Monroe County.

Table 3. Expected commercial catch (lbs gutted weight) of shallow water grouper species expected with the new alternative for Monroe County and the preferred alternative from Amendment 16 for areas north of Monroe County. Based on landings from 2003-2007.

Species	Monroe 03-07	New Monroe	North of Monroe 03-07	New North of Monroe
Black grouper	121,088	121,088	12,426	8,353
Red Grouper	96,628	96,628	239,984	180,756
Scamp	5,588	5,588	273,132	191,671
Gag	2,642	0	552,870	352,940
Red Hind	1,571	1,571	46,619	31,430
Yellowfin Grouper	155	155	5,453	2,566
Graysby	55	55	3,439	2,629
Rock hind	15	15	19,332	12,978
Yellowmouth Grouper	5	5	142	116
Coney	0	0	11	6
Total	227,747	225,105	1,153,407	783,445

The preferred alternative from Amendment 16 would close all shallow water grouper species during January – April and implement a new quota for areas north of Monroe County. This quota would apply everywhere including Monroe County. If possession of gag was prohibited in Monroe County, then the new directed quota for areas north of Monroe would take into consideration the dead discards expected in Monroe County. After the quota is met, no harvest of gag or other shallow water groupers would be allowed. Based on data from 2003-2007, it is estimated that the 352,940 lb gutted weight quota in the preferred alternative in Amendment 16 would be met in November (Table 5). The combined effect of a January – April closure and closing harvest shallow water grouper species in December after the quota is met could result in a 32% reduction in harvest of shallow water grouper species (Tables 3 and 4) for areas north of Monroe County. If it assumed the closure is 95% effective, the closure would result in a 30% reduction in harvest.

Table 4. Expected commercial catch (lbs gutted weight) of shallow water grouper species expected with the new alternative for Monroe County and the preferred alternative from Amendment 16 for areas north of Monroe County.

Species	Monroe 99-05	New Monroe	North of Monroe 99-05	New North of Monroe
Black grouper	129,442	129,442	16,103	8,985
Red Grouper	131,664	131,664	223,263	164,645
Scamp	5,076	5,076	270,895	192,358
Gag	2,868	0	547,065	382,445
Red Hind	2,593	2,593	13,220	9,981
Yellowfin Grouper	361	361	3,094	1,730
Graysby	22	22	19,269	2,310
Rock hind	10	10	94	13,632
Yellowmouth Grouper	13	13	3,104	83
Coney	0	0	24	4
Total	272,051	269,182	1,096,129	776,173

Table 5. Average cumulative monthly catch of gag (lbs gutted weight) from the South Atlantic including Atlantic portion of Monroe County.

Month	Avg 03-07
1	0
2	0
3	0
4	0
5	85,658
6	156,950
7	209,339
8	257,845
9	293,002
10	344,037
11	400,242
12	452,446

<u>Recreational</u>

Headboat Landings

Headboat landings of gag are generally very small in Monroe County, averaging 17,447 lbs gutted weight during 2003-2007 and 13,236 lbs gutted weight during 1999-2005 (Tables 6 and 7). Landings of other shallow water grouper species were also low for Monroe County. Red grouper, gag, and black grouper are the most abundant shallow water grouper species taken by headboat fishermen in Monroe County, Florida. Approximately 88 to 89% of the black grouper from headboat catches were landed in Monroe County during 2007-2007 and 1999-2005 (Tables 6 and 7). Data from 1999-2005 are included because these years were used in Amendment 16.

Headboat landings of gag throughout the South Atlantic averaged 59,023 lbs gutted weight during 2003-2007 (Table 6) and 61,729 lbs gutted weight during 1999-2005. A complete closure of the gag taken by headboats in Monroe County would reduce headboat harvest of gag by 29.5% when compared to gag landed in the all of the South Atlantic based on data from 2003-2007. However, if it is assumed the closure was 89% effective, the reduction would be 26.3%.

Table 6. Average headboat landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including the Atlantic portion of Monroe County, Florida during 2003-2007.

Species	Monroe	All S Atl	% Monroe
Red Grouper	23,437	43,069	54.42%
Gag	17,447	59,023	29.56%
Black grouper	11,908	13,340	89.26%
Rock Hind	2,372	6,216	38.15%
Scamp	1,902	62,276	3.05%
Graysby	689	6,734	10.23%
Yellowmouth Grouper	342	1,159	29.48%
Yellowfin Grouper	341	693	49.15%
Red Hind	225	1,055	21.34%
Coney	61	85	72.60%
Total	58,723	193,650	30.32%

Table 7. Headboat landings (lbs gutted weight) of gag and other shallow water grouper species from South Atlantic including the Atlantic portion of Monroe County, Florida during 1999-2005.

Species	Monroe	All S Atl	% Monroe
Red Grouper	22,113	41,882	52.80%
Gag	11,345	52,911	21.44%
Black grouper	8,467	9,631	87.92%
Rock Hind	2,037	5,346	38.10%
Scamp	891	60,522	1.47%
Graysby	566	5,167	10.95%
Yellowmouth Grouper	281	723	38.83%
Yellowfin Grouper	314	336	93.61%
Red Hind	237	798	29.66%
Coney	40	55	74.04%
Total	46,291	177,369	26.10%

Tables 8 and 9 illustrate expected landings for areas north of Monroe County and in Monroe County based on the new suggested alternative and the preferred alternative for areas north of Monroe contained in Amendment 16. Since gag make up 20 to 30% of headboat landings of shallow water grouper, a closure of gag for the whole year would reduce harvest of shallow water grouper in Monroe County by 25 to 30% (22 to 27% if closure is 89% effective). If the intent of the alternative is to eliminate the March-April closure for black grouper, then the reduction of shallow water grouper species would be less. In contrast, the January-April closure for shallow water grouper north of Monroe County would reduce headboat harvest by 12 to 15% (11 to 13% if closure is 89% effective).

Table 8. Expected headboat catch (lbs gutted weight) of shallow water grouper species expected with the new alternative for Monroe County and the preferred alternative from Amendment 16 for areas north of Monroe County. Based on landings from 2003-2007.

Species	Monroe 03-07	New Monroe	North of Monroe 03-07	New North of Monroe
Red Grouper	23,437	23,437	19,632	16,878
Gag	17,447	0	41,576	33,442
Black grouper	11,908	11,908	1,432	1,245
Rock Hind	2,372	2,372	3,845	3,654
Scamp	1,902	1,902	60,374	55,264
Graysby	689	689	6,045	5,592
Yellowmouth Grouper	342	342	817	697
Yellowfin Grouper	341	341	352	1,245
Red Hind	225	225	830	804
Coney	61	61	23	12
Total	58,723	41,276	134,927	118,832

Table 9. Expected headboat catch (lbs gutted weight) of shallow water grouper species expected with the new alternative for Monroe County and the preferred alternative from Amendment 16 for areas north of Monroe County. Based on landings from 1999-2005.

Species	Monroe 99-05	New Monroe	North of Monroe 99-05	New North of Monroe
Red Grouper	22,113	22,113	23,064	19,193
Gag	11,345	0	48,493	37,012
Black grouper	8,467	8,467	1,358	915
Rock Hind	2,037	2,037	3,860	3,628
Scamp	891	891	69,570	62,257
Graysby	566	566	5,368	4,898
Yellowmouth Grouper	281	281	516	457
Yellowfin Grouper	314	314	25	915
Red Hind	237	237	655	629
Coney	40	40	17	7
Total	46,291	34,945	152,925	129,912

MRFSS Landings

MRFSS landings (A+B1) of gag in number of fish retained in Monroe County during 2003 through 2007 averaged 1,875 fish, whereas, landings of other shallow water grouper species averaged 24,350 fish (Table 10). Black grouper and red grouper were the most commonly caught shallow water grouper species during 2003-2007 (Table 11).

Table 10. MRFSS landings (number A+B1) of gag and other shallow water grouper species from Monroe County, Florida.

Year	Gag Jan-Dec	Other SWG Jan-Dec
2003	3,143	41,914
2004	2,065	27,731
2005	328	11,988
2006	1,880	24,202
2007	1,960	15,916
Average	1,875	24,350

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

Table 11. Percentage of shallow water grouper species taken by fishermen (MRFSS) in Monroe County, Florida during 2003-2007. Based on number of fish inspected rather than expanded values.

Species	Percent
Black grouper	49.9%
Red grouper	37.8%
Gag	6.5%
Rock hind	2.6%
Scamp	1.3%
Yellowfin grouper	0.8%
Red hind	0.7%
Yellowmouth grouper	0.2%
Coney	0.1%
Graysby	0.1%

MRFSS landings of gag north of Monroe County averaged 41,695 individuals (A+B1) during 2003-2007. A complete closure of the gag taken by recreational anglers (excluding headboats) in Monroe County (Table 10) would reduce harvest of gag by 4.3 percent when compared to gag landed in the all of the South Atlantic (Table 12). Assuming a closure is 89% effective, the reduction in harvest would be 3.8%.

For areas north of Monroe County, the January – April seasonal closure could be expected to reduce gag landings by 25 to 30% (22 to 27% if closure 89% effective) and all shallow water grouper landings by about 26% (23% if closure 89% effective) (Table 13). For Monroe County, the overall reduction in landings of shallow water grouper associated with closing gag would be about 7% (6% if closure 89% effective). The reduction in harvest of shallow water grouper species for Monroe County would be less if the intent of the action is to eliminate the March – April closure for black grouper.

Table 12. MRFSS landings (number A+B1) of gag and other shallow water grouper species from South Atlantic not including Monroe County, Florida.

Year	Gag	Other SWG
2003	42,117	43,411
2004	44,412	61,188
2005	38,157	65,027
2006	36,975	82,685
2007	46,816	119,536
Average	41,695	74,369

Table 13. MRFSS landings (number A+B1) and expected landings of gag and other shallow water grouper species from South Atlantic not including Monroe County, Florida.

North of Monroe County			
	Gag	Other SWG	All SWG Grouper
2003-07	41,695	74,369	116,064
Expected	31,171	59,463	90,634
Reduction	25.24%	20.04%	21.91%
1999-05	37,482	46,954	84,436
Expected	26,083	36,534	62,617
Reduction	30.41%	22.19%	25.84%

Monroe County			
	Gag	Other SWG	All SWG Grouper
2003-2007	1,875	24,350	26,225
Expected	0	24,350	24,350
Reduction	100.00%	0.00%	7.15%

For the whole recreational sector (MRFSS and headboat combined) a closure of the fishery for gag in Monroe County would reduce harvest of gag by 7% (6% if closure 89% effective) for the whole South Atlantic (Table 14).

Table 14. Landings (lbs gutted weight) of gag in South Atlantic versus Monroe County, Florida for 2003-2007. Monroe County numbers converted to lbs using relationship of numbers to pounds for South Atlantic gag.

	South Atlantic	Monroe	percent
HB	59,023	17,447	29.56%
MRFSS	494,525	21,281	4.30%
Total	553,548	38,728	7.00%

Reduction in Aggregate Bag Limit

The action proposed for Monroe County, Florida would reduce the aggregate bag limit for all shallow water groupers, except gag and black grouper, from five fish to two fish per person per day. Possession of gag would be prohibited and it is assumed the bag limit for black grouper would remain at a maximum of two fish per person per day. While the proposed reduction in bag limit from five fish to two fish represents 60 percent reduction in the number of shallow water grouper a recreational fisherman could potentially retain, it would not represent a 60 percent reduction in the actual harvest because all fishermen do not catch five groupers on every trip. On trips where any fishermen caught at least one shallow water grouper, the average number of grouper retained per person per trip was less than one fish. Therefore, the reduction in harvest associated with decreasing the bag limit from a maximum of five to three or two fish per person per day is small (Tables 15 and 16). For areas north of Monroe County, the majority of harvest reduction for shallow water grouper species would be attained by the January – April seasonal closure and not the reduction in the bag limit.

Table 15. Reduction in harvest (percent) associated with reducing the aggregate grouper bag limit for all shallow water grouper species except gag and black grouper for areas **north of Monroe County** based on data from 1999-2005. Includes effect of excluding captain and crew from for-hire sector, non-compliance with bag limit, and 25% release mortality.

Sector	Bag limit 3	Bag limit 2	Bag limit 1
Private	2%	3%	9%
Charter	1%	3%	12%
Headboat	1%	3%	10%

Table 16. Reduction in harvest associated (percent) with reducing the aggregate grouper bag limit for all shallow water grouper species except gag and black grouper for **Monroe County** based on data from 1999-2005. Includes effect of excluding captain and crew from for-hire sector, non-compliance with bag limit, and 25% release mortality.

Sector	Bag limit 3	Bag limit 2	Bag limit 1
Private	2%	3%	8%
Charter	1%	3%	7%
Headboat	<1%	1%	2%

The combined effect of reducing the gag and black grouper bag limit to 1 fish, reducing the grouper aggregate bag limit to 3 fish, excluding captain and crew on for-hire vessels from possessing groupers, and a January – April spawning closure is expected to reduce recreational harvest of gag by about 36% for areas north of Monroe County. The management measures proposed for Monroe County would reduce harvest of gag by 100%, although incidental catch and mortality of gag would be expected.

While the proposed management measures would eliminate all catch of gag from Monroe County, fishermen would still target shallow water grouper species during January – April when some of the species would be in spawning condition. Black grouper and red grouper dominate commercial and MRFSS catches in Monroe County. Species most commonly caught in Monroe County in the headboat fishery are red grouper, gag, and black grouper. Black grouper, gag, and scamp form spawning aggregations with peak spawning of females occurring from January to March for black grouper and gag. Red grouper do not appear to form spawning aggregations but spawning in the South Atlantic occurs during February – June, with a peak in April. Therefore, the proposed action could allow fishermen to harvest black grouper from spawning aggregations when they are vulnerable to capture. This alternative would also allow capture of red grouper in spawning condition. Allowing catch and release of gag during the spawning season could disrupt gag spawning. Furthermore, it is expected 25% of recreationally caught gag and 40% of gag caught by the commercial sector would die due to trauma experienced during capture.

Rationale for elimination: *This alternative arose in response to the alternatives set forth in the SDEIS and it was first brought to the Council at their September 2008 meeting, during which they were slated to take final action on Amendment 16.* The Council rejected this alternative because: (1) it would not provide a more effective closure of gag during their spawning season when they form spawning aggregations; (2) it would allow continued fishing for black grouper and red grouper during their spawning season; (3) it would not provide additional measures to address overfishing of black grouper and red grouper; and (4) this alternative surfaced late in the process and there was insufficient time to complete and include economic analyses in the material that was presented to the Council during the September 2008 meeting. The Council will examine measures to address the specific requirements of Monroe County, Florida fishermen in a future amendment.

Appendix B. Glossary

Allowable Biological Catch (ABC): Maximum amount of fish stock than can be harvested without adversely affecting recruitment of other components of the stock. The ABC level is typically higher than the total allowable catch, leaving a buffer between the two.

ALS: Accumulative Landings System. NMFS database which contains commercial landings reported by dealers.

Biomass: Amount or mass of some organism, such as fish.

B_{MSY}: Biomass of population achieved in long-term by fishing at F_{MSY}.

Bycatch: Fish harvested in a fishery, but not sold or kept for personal use. Bycatch includes economic discards and regulatory discards, but not fish released alive under a recreational catch and release fishery management program.

Caribbean Fishery Management Council (CFMC): One of eight regional councils mandated in the Magnuson-Stevens Fishery Conservation and Management Act to develop management plans for fisheries in federal waters. The CFMC develops fishery management plans for fisheries off the coast of the U.S. Virgin Islands and the Commonwealth of Puerto Rico.

Catch Per Unit Effort (CPUE): The amount of fish captured with an amount of effort. CPUE can be expressed as weight of fish captured per fishing trip, per hour spent at sea, or through other standardized measures.

Charter Boat: A fishing boat available for hire by recreational anglers, normally by a group of anglers for a short time period.

Cohort: Fish born in a given year. (See year class.)

Control Date: Date established for defining the pool of potential participants in a given management program. Control dates can establish a range of years during which a potential participant must have been active in a fishery to qualify for a quota share.

Constant Catch Rebuilding Strategy: A rebuilding strategy where the allowable biological catch of an overfished species is held constant until stock biomass reaches B_{MSY} at the end of the rebuilding period.

Constant F Rebuilding Strategy: A rebuilding strategy where the fishing mortality of an overfished species is held constant until stock biomass reached BMSY at the end of the rebuilding period.

Directed Fishery: Fishing directed at a certain species or species group.

Discards: Fish captured, but released at sea.

Discard Mortality Rate: The percent of total fish discarded that do not survive being captured and released at sea.

Derby: Fishery in which the TAC is fixed and participants in the fishery do not have individual quotas. The fishery is closed once the TAC is reached, and participants attempt to maximize their harvests as quickly as possible. Derby fisheries can result in capital stuffing and a race for fish.

Effort: The amount of time and fishing power (i.e., gear size, boat size, horsepower) used to harvest fish.

Exclusive Economic Zone (EEZ): Zone extending from the shoreline out to 200 nautical miles in which the country owning the shoreline has the exclusive right to conduct certain activities such as fishing. In the United States, the EEZ is split into state waters (typically from the shoreline out to 3 nautical miles) and federal waters (typically from 3 to 200 nautical miles).

Exploitation Rate: Amount of fish harvested from a stock relative to the size of the stock, often expressed as a percentage.

F: Fishing mortality.

Fecundity: A measurement of the egg-producing ability of fish at certain sizes and ages.

Fishery Dependent Data: Fishery data collected and reported by fishermen and dealers.

Fishery Independent Data: Fishery data collected and reported by scientists who catch the fish themselves.

Fishery Management Plan: Management plan for fisheries operating in the federal produced by regional fishery management councils and submitted to the Secretary of Commerce for approval.

Fishing Effort: Usually refers to the amount of fishing. May refer to the number of fishing vessels, amount of fishing gear (nets, traps, hooks), or total amount of time vessels and gear are actively engaged in fishing.

Fishing Mortality: A measurement of the rate at which fish are removed from a population by fishing. Fishing mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous is that percentage of fish dying at any one time.

Fishing Power: Measure of the relative ability of a fishing vessel, its gear, and its crew to catch fishes, in reference to some standard vessel, given both vessels are under identical conditions.

$F_{30\%SPR}$: Fishing mortality that will produce a static SPR = 30%.

$F_{45\%SPR}$: Fishing mortality that will produce a static SPR = 45%.

F_{OY}: Fishing mortality that will produce OY under equilibrium conditions and a corresponding biomass of B_{OY}. Usually expressed as the yield at 85% of F_{MSY}, yield at 75% of F_{MSY}, or yield at 65% of F_{MSY}.

F_{MSY}: Fishing mortality that if applied constantly, would achieve MSY under equilibrium conditions and a corresponding biomass of B_{MSY}

Fork Length (FL): The length of a fish as measured from the tip of its snout to the fork in its tail.

Gear restrictions: Limits placed on the type, amount, number, or techniques allowed for a given type of fishing gear.

Growth Overfishing: When fishing pressure on small fish prevents the fishery from producing the maximum poundage. Condition in which the total weight of the harvest from a fishery is improved when fishing effort is reduced, due to an increase in the average weight of fishes.

Gulf of Mexico Fishery Management Council (GFMC): One of eight regional councils mandated in the Magnuson-Stevens Fishery Conservation and Management Act to develop management plans for fisheries in federal waters. The GFMC develops fishery management plans for fisheries off the coast of Texas, Louisiana, Mississippi, Alabama, and the west coast of Florida.

Head Boat: A fishing boat that charges individual fees per recreational angler onboard.

Highgrading: Form of selective sorting of fishes in which higher value, more marketable fishes are retained, and less marketable fishes, which could legally be retained are discarded.

Individual Fishing Quota (IFQ): Fishery management tool that allocates a certain portion of the TAC to individual vessels, fishermen, or other eligible recipients.

Longline: Fishing method using a horizontal mainline to which weights and baited hooks are attached at regular intervals. Gear is either fished on the bottom or in the water column.

Magnuson-Stevens Fishery Conservation and Management Act: Federal legislation responsible for establishing the fishery management councils and the mandatory and discretionary guidelines for federal fishery management plans.

Marine Recreational Fisheries Statistics Survey (MRFSS): Survey operated by NMFS in cooperation with states that collects marine recreational data.

Maximum Fishing Mortality Threshold (MFMT): The rate of fishing mortality above which a stock's capacity to produce MSY would be jeopardized.

Maximum Sustainable Yield (MSY): The largest long-term average catch that can be taken continuously (sustained) from a stock or stock complex under average environmental conditions.

Minimum Stock Size Threshold (MSST): The biomass level below which a stock would be considered overfished.

Modified F Rebuilding Strategy: A rebuilding strategy where fishing mortality is changed as stock biomass increases during the rebuilding period.

Multispecies fishery: Fishery in which more than one species is caught at the same time and location with a particular gear type.

National Marine Fisheries Service (NMFS): Federal agency within NOAA responsible for overseeing fisheries science and regulation.

National Oceanic and Atmospheric Administration: Agency within the Department of Commerce responsible for ocean and coastal management.

Natural Mortality (M): A measurement of the rate at which fish are removed from a population by natural causes. Natural mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous is that percentage of fish dying at any one time.

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.

Overfished: A stock or stock complex is considered overfished when stock biomass falls below the minimum stock size threshold (MSST) (e.g., current biomass < MSST = overfished).

Overfishing: Overfishing occurs when a stock or stock complex is subjected to a rate of fishing mortality that exceeds the maximum fishing mortality threshold (e.g., current fishing mortality rate > MFMT = overfishing).

Quota: Percent or annual amount of fish that can be harvested.

Recruitment (R): Number or percentage of fish that survives from hatching to a specific size or age.

Recruitment Overfishing: The rate of fishing above which the recruitment to the exploitable stock becomes significantly reduced. This is characterized by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year.

Scientific and Statistical Committee (SSC): Fishery management advisory body composed of federal, state, and academic scientists, which provides scientific advise to a fishery management council.

Selectivity: The ability of a type of gear to catch a certain size or species of fish.

South Atlantic Fisheries Management Council (SAFMC): One of eight regional councils mandated in the Magnuson-Stevens Fishery Conservation and Management Act to develop management plans for fisheries in federal waters. The SAFMC develops fishery management plans for fisheries off North Carolina, South Carolina, Georgia, and the east coast of Florida.

Spawning Potential Ratio (Transitional SPR): Formerly used in overfished definition. The number of eggs that could be produced by an average recruit in a fished stock divided by the number of eggs that could be produced by an average recruit in an unfished stock. SPR can also be expressed as the spawning stock biomass per recruit (SSBR) of a fished stock divided by the SSBR of the stock before it was fished.

% Spawning Per Recruit (Static SPR): Formerly used in overfishing determination. The maximum spawning per recruit produced in a fished stock divided by the maximum spawning per recruit, which occurs under the conditions of no fishing. Commonly abbreviated as %SPR.

Spawning Stock Biomass (SSB): The total weight of those fish in a stock which are old enough to spawn.

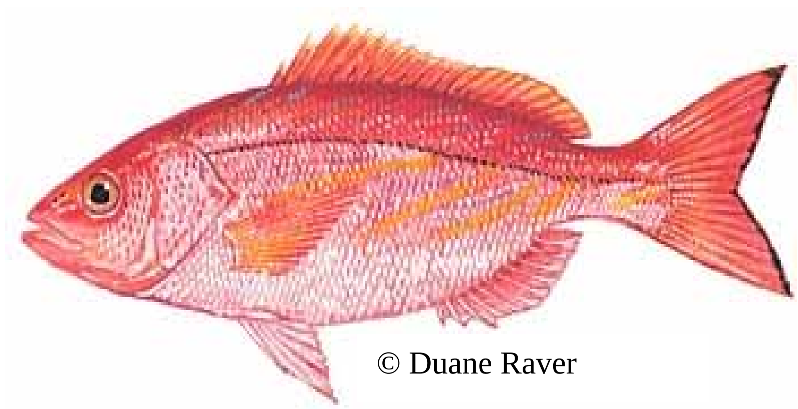
Spawning Stock Biomass Per Recruit (SSBR): The spawning stock biomass divided by the number of recruits to the stock or how much spawning biomass an average recruit would be expected to produce.

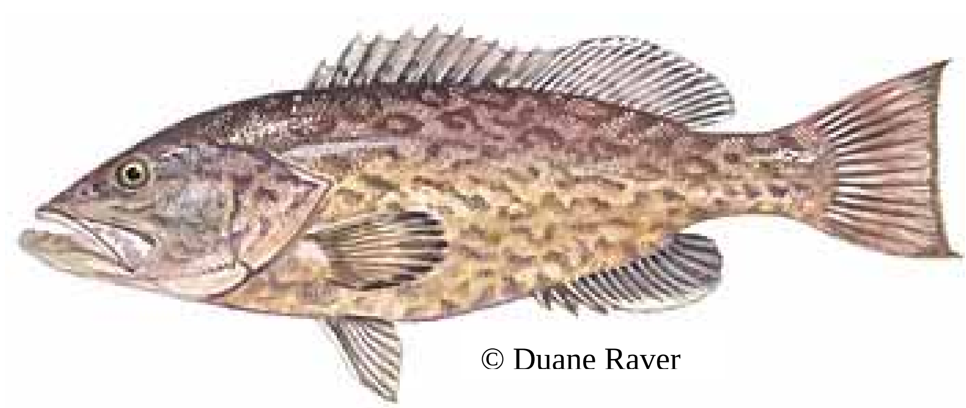
Total Allowable Catch (TAC): The total amount of fish to be taken annually from a stock or stock complex. This may be a portion of the Allowable Biological Catch (ABC) that takes into consideration factors such as bycatch.

Total Length (TL): The length of a fish as measured from the tip of the snout to the tip of the tail.

Amendment 16 to the Snapper Grouper Fishery Management Plan

Incidental Catch of Vermilion Snapper and Gag
An Explanation for the Snapper Grouper Advisory Panel – Input Requested





Jack McGovern
January 18, 2008

Amendment 16 to the Snapper Grouper Fishery Management Plan

Incidental Catch of Vermilion Snapper and Gag
An Explanation to the Snapper Grouper Advisory Panel – Input Requested

1 Introduction

Amendment 16 is being developed to end overfishing of gag and vermilion snapper. A variety of management measures are available including quotas, seasonal closures, bag limits, and size limits. If a quota is met or a seasonal closure is implemented, it is expected there would still be some catch of gag and vermilion snapper when fishermen target co-occurring species. These species would be released and a percentage of the incidentally caught gag and vermilion snapper would die, depending on depth of capture. The magnitude of incidentally caught gag and vermilion snapper that die after a quota is met is referred to as post quota bycatch mortality (PQBM). Furthermore, a decrease in the bag limit or increase in the size limit would be expected to increase the magnitude of dead discards.

The Scientific and Statistical Committee (SSC) recommended quotas be adjusted for dead discards that could occur after a quota is met. Furthermore, the SSC feels a seasonal closure would not be 100% effective in protecting a species since some incidental catch of that species would be expected. The SSC believes the effectiveness of a seasonal closure should be estimated and taken into consideration when considering management measures to achieve a target reduction in harvest. In addition, the SSC recommended size and bag limit analyses take into consideration dead discards occurring from an increase if the number of fish released by fishermen when a bag limit is lowered or a size limit is increased.

At the December 2007 South Atlantic Council (Council) meeting, a methodology to estimate dead discards after a quota is met or during a seasonal closure was presented to both the SSC and the Council. After discussions with the SSC and Council, two issues were unresolved. First, the percentage of trips not be taken by fishermen (commercial and recreational) during a closure or after a quota is met to target a bottom dwelling reef fish species is unknown. Second, the percentage of gag or vermilion snapper that can be avoided by recreational or commercial fishermen by changing fishing methodology and location is also in question. The SSC and Council indicated the Snapper Grouper Advisory Panel (AP) was best suited to provide this information.

Provided herein are methods and examples of estimating dead discards during a closed season. This does not represent the full range of alternatives currently available in Amendment 16. Values are considered preliminary, especially since a new benchmark assessment is being conducted for vermilion snapper in 2008.

Input from the Snapper Grouper AP
Input is needed from commercial and recreational fishermen on the percentage of trips that would not be taken when a fishery was closed and the percentage of gag or vermilion snapper that can be avoided. Any comments on how the methodology can be improved are welcome. A form is provided at the end of this document. The form can be sent to Jack McGovern. An addressed, stamped envelope is provided. Information can also be sent by e-mail (John.McGovern@noaa.gov) or telephone (727-824-5383).

2 Methodology for Determining Dead Discards After a Quota is Met or During a Seasonal Closure

The basic methodology for determining how many dead discards would occur during a closure or after a quota is met is similar for the commercial and recreational sectors:

- Determine average landings over a period of time (1999-2005) for gag and vermilion snapper.
- Identify the species caught with either gag or vermilion snapper.
- Determine the landings of gag of vermilion snapper if co-occurring species were targeted. This is maximum potential incidental catch.
- Determine incidental catch if trips were not taken during a closure (i.e. trips were reduced by 20 to 60%).
- Determine incidental catch if fishermen can avoid a species by modifying gear of changing fishing locations.
- Apply Southeast Data Assessment and Review (SEDAR) accepted release mortality rates to values for incidental catch to determine magnitude of dead discards.
- Determine effectiveness of a closure by comparing the magnitude of estimated dead discards for a particular period of time to the actual historical landings.

3 Commercial Incidental Catch – Assumptions

3.1 Assumptions for estimating dead discards after a commercial quota is met or during a commercial seasonal closure

- Vermilion snapper and gag are taken by many fishermen on the same trip.
- If value of a trip falls below a certain level due to reductions in allowable catch, increased fuel prices, etc., the trip will not be taken.
- Net revenue (total revenue – trip cost) for a trip was calculated. If the net revenue per trip was less than an opportunity cost of labor = $50.00 then the trip was removed from the data set.
- In determining incidental catch, a co-occurring species is targeted if at least 100 lbs whole weight (ww) is taken on a trip.
- After a quota is met or during a seasonal closure, if vermilion snapper or gag make up greater than 75% of the catch on a trip, the trip is not included in analyses.
- Fishermen will not use diving gear to target gag after a quota is met or during a seasonal closure.
- There will not be an increase in fishing effort before or after a seasonal closure.
- Some trips will not be taken after a quota is met. A range of 20 to 60% is used.
- Fishermen can avoid vermilion snapper and gag to some degree by changing hook size, method of fishing, and location. A range of 20 to 60% is used.
- Dead discards determined by applying release mortality rate of 40% for commercially caught vermilion snapper and gag.

3.2 *Example of estimate of dead discards for vermilion snapper and gag associated with commercial quotas assuming no additional gag seasonal closure.*

STEP 1. Estimate the monthly commercial catch of a species.

STEP 2 - Drop trips if net revenue is less than opportunity cost.

STEP 3 - Determine when quotas would be met.

Table 1. Cumulative monthly commercial catch of vermilion snapper (pounds gutted weight) during 2000-2005. Example is for a quota = 385,002 lbs gutted weight. Data from logbook.

Month	2000	2001	2002	2003	2004	2005
1	34,270	58,279	73,541	32,640	47,270	76,883
2	77,486	138,234	113,405	66,216	82,162	126,135
3	158,153	222,928	247,676	114,468	173,477	207,973
4	253,874	332,081	359,135	184,414	248,468	251,640
5	359,532	475,162	410,414	253,252	306,342	358,396
6	485,351	631,198	534,162	290,784	337,279	467,811
7	615,477	754,820	618,333	314,541	410,514	558,802
8	772,874	921,838	759,658	345,000	512,486	648,802
9	879,748	1,114,432	862,847	409,009	564,640	775,351
10	1,023,847	1,243,712	1,009,018	525,252	737,856	874,874
11	1,149,532	1,366,441	1,114,919	619,937	870,207	974,640
12	1,234,550	1,473,514	1,164,009	674,784	951,649	1,009,946

Year	2000	2001	2002	2003	2004	2005	
Date when quota met	6/7/2000	5/10/2001	5/10/2001	9/24/2002	7/24/2004	6/7/2005	Average
Landings after proposed quota	849,548	1,088,512	779,007	289,782	566,647	624,944	839,688

Table 2. Cumulative monthly commercial catch of gag (pounds gutted weight) during 2000-2005. Example is for a quota = 423,340 lbs gutted weight. Data from logbook.

Month	2000	2001	2002	2003	2004	2005
1	36,339	56,797	66,593	38,975	49,619	44,653
2	91,407	121,085	107,398	73,415	87,297	87,924
3	92,373	121,297	108,000	74,449	88,119	89,237
4	94,305	124,627	109,381	76,068	89,619	91,254
5	163,492	193,076	174,119	149,314	170,602	163,034
6	204,992	240,712	220,890	217,424	223,568	210,602
7	240,475	274,678	262,627	272,703	265,831	254,297
8	271,890	308,873	290,576	321,339	294,949	290,644
9	295,110	335,356	312,381	355,703	311,746	321,932
10	329,644	374,737	349,754	405,695	358,746	361,517
11	370,458	406,102	394,110	454,288	411,153	405,508
12	414,195	437,729	444,975	496,847	445,254	437,644

Quota	2000	2001	2002	2003	2004	2005	
Dates when quota met	11/11/2000	10/14/2001	11/3/2002	9/28/2003	10/29/2004	10/23/2005	Average

Landings after proposed quota	60,255	83,789	91,035	142,907	91,314	83,704	110,601

STEP 4 - Remove trips that would not be taken after quota is met.

This step would remove trips that would not be taken after a quota is met because the opportunity cost would exceed the net revenue. This is done by setting the pounds and revenue to 0 after the quota for vermilion snapper or gag is met and adjusting the total lbs and total revenue.

STEP 5 - Determine incidental catch after quota is met.

STEP 5a - Identify most common species taken with vermilion snapper

Table 3. Species most commonly taken on trips with vermilion snapper.

COMMON	Mean	Sum	%	Cum
SNAPPER,VERMILION	460	3,005,272	32.52%	32.52%
GROUPER,GAG	300	1,031,230	11.16%	43.67%
SCAMP	176	779,083	8.43%	52.10%
TRIGGERFISH,GRAY	145	595,067	6.44%	58.54%
AMBERJACK,GREATER	248	553,829	5.99%	64.53%
GROUPER,RED	130	490,283	5.30%	69.84%
JACK,ALMACO	163	407,937	4.41%	74.25%
SNAPPER,RED	104	326,173	3.53%	77.78%
SEA BASSE,ATLANTIC,BLACK,UNC	78	231,433	2.50%	80.29%

Table 4. Species most commonly taken on trips with gag.

COMMON	Mean	Sum	%	Cum
GROUPER,GAG	244	1,166,199	21.67%	21.67%
SNAPPER,VERMILION	481	1,091,995	20.29%	41.96%
SCAMP	182	420,633	7.82%	49.78%
AMBERJACK,GREATER	262	417,058	7.75%	57.53%
GROUPER,RED	175	397,988	7.40%	64.93%
TRIGGERFISH,GRAY	125	228,653	4.25%	69.18%
JACK,ALMACO	181	197,845	3.68%	72.85%
SNAPPER,RED	96	188,736	3.51%	76.36%
SEA BASSE,ATLANTIC,BLACK,UNC	67	119,773	2.23%	81.28%

STEP 5b – Identify trips that target co-occurring species.

Identify trips that caught at least 100 lbs (directed catch) of co-occurring species after quota is met.

STEP 5c - Determine incidental catch.

This step determines the maximum incidental catch that could occur when targeting co-occurring species. It does not adjust incidental catch for the reduction in trips that would not be taken after a quota is met or ability of fishermen to avoid gag or vermilion snapper. That is done is steps 5d and 5e.

Table 5. Maximum incidental catch of vermilion snapper (pounds gutted weight) that could occur after a commercial quota met when targeting co-occurring species. Release mortality = 40%. Trips that contained >75% of vermilion snapper after quota met were removed from analysis.

Month	2000	2001	2002	2003	2004	2005	Average
5		76,054	10,081				
6	69,748	68,342	61,054			44,739	
7	55,018	53,252	46,252		22,162	35,189	
8	79,099	77,153	54,784		38,505	38,279	
9	50,081	73,883	48,387	22,297	20,577	46,126	
10	69,685	60,000	57,279	44,198	74,135	41,234	
11	65,081	57,351	44,784	48,685	64,784	34,486	
12	21,468	54,676	20,604	26,396	33,577	5,748	
Incidental catch	410,180	520,712	343,225	141,577	253,739	245,802	319,206
Dead Discards	164,072	208,285	137,290	56,631	101,495	98,321	127,682

Table 6. Maximum incidental catch of gag (pounds gutted weight) that could occur after a commercial quota met when targeting co-occurring species. Release mortality = 40%. Trips that contained >75% of gag after quota met were removed from analysis. Trips that used diving gear were also removed.

Month	2000	2001	2002	2003	2004	2005	Average
9				1,983			
10		9,907		29,915	1,771	1,686	
11	6,720	7,958	16,610	22,551	18,144	13,788	
12	16,483	12,712	11,559	17,246	12,432	7,322	
Incidental catch	23,203	30,576	28,169	71,695	32,347	22,797	34,798
Dead Discards	9,281	12,231	11,268	28,678	12,939	9,119	13,919

STEP 5d – Determine incidental catch for reduced trips after quota.

Trips that target co-occurring species in STEP 5c were randomly selected to reduce the number of trips from 20% to 60%. This assumes fishermen may stop fishing for vermilion snapper after quota is met.

Table 7. Estimate of vermilion snapper incidental catch and dead discards when trips are reduced after a commercial quota is met. Release mortality = 40%.

Trip reduction	0%	20%	40%	60%
Incidental catch	319,206	177,554	143,839	105,598
Dead Discards	127,682	71,022	57,536	42,239

Table 8. Estimate of gag incidental catch and dead discards when trips are reduced after a commercial quota is met. Release mortality = 40%.

Trip reduction	0%	20%	40%	60%
Incidental catch	34,798	20,456	15,244	11,733
Dead Discards	13,919	8,182	6,098	4,693

STEP 5e – Determine dead discards for reduced trips and behavior after quota.

This step assumes that some trips could be reduced and fishermen could have the ability to avoid vermilion snapper or gag by fishing differently.

Table 9. Estimate of vermilion snapper incidental catch and dead discards when trips are reduced and ability of fishermen avoid vermilion snapper on a trip. Effectiveness determined by comparing estimated dead discards to actual landings for the same period. Release mortality = 40%.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	319,206	255,365	153,219	61,287	177,554	142,043	85,226	34,090	143,839	115,071	69,043	27,617	105,598	84,478	50,687	20,275
Dead Discards	127,682	102,146	61,287	24,515	71,022	56,817	34,090	13,636	57,536	46,029	27,617	11,047	42,239	33,791	20,275	8,110
Effectiveness	84.79%	87.84%	92.70%	97.08%	91.54%	93.23%	95.94%	98.38%	93.15%	94.52%	96.71%	98.68%	94.97%	95.98%	97.59%	99.03%

If 20% of the trips were reduced after a quota was met and fishermen can avoid 40% of vermilion snapper, then the magnitude of incidentally caught vermilion snapper would be 85,226 lbs gutted weight, and the estimate of vermilion snapper that would die is 34,090 lbs gutted weight.

Table 10. Estimate of gag incidental catch and dead discards when trips are reduced and ability of fishermen avoid gag on a trip. Effectiveness determined by comparing estimated dead discards to actual landings for the same period. Release mortality = 40%.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	34,798	27,838	16,703	6,681	20,456	16,365	9,819	3,928	15,244	12,195	7,317	2,927	11,733	9,386	5,632	2,253
Dead Discards	13,919	11,135	6,681	2,672	8,182	6,546	3,928	1,571	6,098	4,878	2,927	1,171	4,693	3,755	2,253	901
effectiveness	87.41%	89.93%	93.96%	97.58%	92.60%	94.08%	96.45%	98.58%	94.49%	95.59%	97.35%	98.94%	95.76%	96.61%	97.96%	99.19%

If 20% of the trips were reduced after a quota was met and fishermen can avoid 40% of gag, then the magnitude of incidentally caught gag would be 9,819 lbs gutted weight, and the estimate of gag that would die is 3,928 lbs gutted weight.

3.3 Example of effectiveness of a January-April commercial seasonal closure for gag

STEP 1. Estimate the monthly commercial catch of a species.

STEP 2 - Drop trips if net revenue is less than opportunity cost.

Table 11. Average commercial landings (pounds gutted weight) of gag during 2001-2005 from logbook after trips removed.

Month	Tot WW	Tot GW	Avg GW
1	309,020	261,881	52,376
2	265,912	225,349	45,070
3	4,883	4,138	828
4	11,809	10,008	2,002
5	430,727	365,023	73,005
6	315,686	267,530	53,506
7	262,087	222,108	44,422
8	211,835	179,521	35,904
9	157,179	133,202	26,640
10	254,353	215,553	43,111
11	263,565	223,360	44,672
12	229,434	194,436	38,887
		sum	460,422

STEP 3 - Determine incidental catch during a seasonal closure.

STEP 3a - Identify most common species taken with vermilion snapper

Table 12. Species most commonly taken on trips with gag.

COMMON	Mean	Sum	%	Cum
GROUPER,GAG	244	1,166,199	21.67%	21.67%
SNAPPER,VERMILION	481	1,091,995	20.29%	41.96%
SCAMP	182	420,633	7.82%	49.78%
AMBERJACK,GREATER	262	417,058	7.75%	57.53%
GROUPER,RED	175	397,988	7.40%	64.93%
TRIGGERFISH,GRAY	125	228,653	4.25%	69.18%
JACK,ALMACO	181	197,845	3.68%	72.85%
SNAPPER,RED	96	188,736	3.51%	76.36%
SEA BASSE,ATLANTIC,BLACK,UNC	67	119,773	2.23%	81.28%

STEP 3b – Identify trips that target co-occurring species.

Identify trips that caught at least 100 lbs (directed catch) of co-occurring species during seasonal closure.

STEP 3c - Determine incidental catch.

This step determines the maximum incidental catch that could occur when targeting co-occurring species. It does not adjust incidental catch for the reduction in trips that would not be taken during a closure or ability of fishermen to avoid gag. That is done is steps 3d and 3e.

Table 13. Estimate maximum incidental catch of gag (pounds gutted weight) that could occur during a commercial seasonal closure when targeting co-occurring species. Release mortality = 40%. Trips that contained >75% of gag during closure were removed from analysis. Trips that used diving gear were also removed.

Month	2001	2002	2003	2004	2005	
1	30,136	27,703	13,610	27,669	32,203	
2	26,780	23,712	15,898	26,890	28,797	
3	93	34	653	195	178	
4	3,093	508	1,331	1,305	314	Average
Incidental catch	60,102	51,958	31,492	56,059	61,492	52,220
Dead Discards	24,041	20,783	12,597	22,424	24,597	20,888

STEP 3d – Determine incidental catch for reduced trips during a closure.

Trips that target co-occurring species in STEP 3c were randomly selected to reduce the number of trips from 20% to 60%. This assumes fishermen may stop fishing for vermilion snapper during a closure.

Table 14. Estimate of gag incidental catch and dead discards during a commercial seasonal closure when trips are reduced. Release mortality = 40%.

Trip reduction	0%	20%	40%	60%
Incidental catch	52,220	14,578	11,815	8,710
Dead Discards	20,888	5,831	4,726	3,484
Effectiveness	79.17%	94.18%	95.29%	96.53%

STEP 3e – Determine dead discards for reduced trips and behavior during a seasonal closure.

This step assumes that some trips could be reduced and fishermen could have the ability to avoid gag by fishing differently.

Table 15. Incidental catch of gag assuming a range in trips (0 to 60%) during a commercial seasonal closure and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	52,220	41,776	25,066	10,026	14,578	11,662	6,997	2,799	11,815	9,452	5,671	2,269	8,710	6,968	4,181	1,672
Dead Discards	20,888	16,711	10,026	4,011	5,831	4,665	2,799	1,120	4,726	3,781	2,269	907	3,484	2,787	1,672	669
Effectiveness	79.17%	83.34%	90.00%	96.00%	94.18%	95.35%	97.21%	98.88%	95.29%	96.23%	97.74%	99.10%	96.53%	97.22%	98.33%	99.33%

A January – April commercial spawning season closure would be 95% effective if one assumes 20% of the trips formerly made would not be taken during the closure and fishermen can avoid 20% of the gag they once caught by modifying fishing gear or changing location.

4 Recreational Incidental Catch – Introduction, Assumptions, and Methods

4.1 Assumptions for estimating dead discards during a seasonal closure for MRFSS

- Vermilion snapper and gag are taken by many fishermen on the same trip.
- Recreational fishermen can avoid vermilion snapper and gag to some degree by changing hook size, method of fishing, and location.
- There will not be an increase in fishing effort before or after a seasonal closure.
- Release mortality for gag and vermilion snapper caught by recreational fishermen is 25%.

4.1.1 Effectiveness of recreational seasonal closure for gag, MRFSS data

STEP 1. Estimate the catch of a species during a seasonal closure
STEP 2 - Identify most common species taken with vermilion snapper

Table 16. Catch (A+B1) in number of gag and other species taken on MRFSS trips with gag during January-April (Waves 1 and 2), 1999-2005. Data represents sample and are not expanded.

common	Sum
vermilion snapper	559
black sea bass	427
red snapper	302
gag	298
gray snapper	220
lane snapper	183
greater amberjack	149
king mackerel	96
white grunt	95

STEP 3a - Determine incidental catch during a seasonal closure.
Determine the catch of gag during a seasonal closure when trips for co-occurring species are made.

STEP 3b – Determine incidental catch for reduced trips during a closure.

Trips that target co-occurring species in STEP 3a were randomly selected to reduce the number of trips from 20% to 60%. This assumes fishermen may stop fishing for vermilion snapper during a closure.

Table 17. Estimate of gag incidental catch in number (when targeting co-occurring species) and dead discards from MRFSS during a recreational seasonal closure when trips are reduced. Release mortality = 25%.

Trip reduction	0%	20%	40%	60%
Incidental catch	221	177	140	131
Dead Discards	55	44	35	33
Effectiveness	81.46%	85.15%	88.26%	89.01%

STEP 3c – Determine dead discards for reduced trips and behavior during a seasonal closure.

This step assumes that some trips could be reduced and fishermen could have the ability to avoid gag by fishing differently.

Table 18. Incidental catch of gag (numbers of fish) from MRFSS assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid gag (range 0 to 60%) by changing fishing methods. Release mortality = 25%. Data represents sample and are not expanded.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	221	177	106	42	177	142	85	34	140	112	67	27	131	105	63	25
Dead Discards	55	44	27	11	44	35	21	8	35	28	17	7	33	26	16	6
Effectiveness	81.46%	85.17%	91.10%	96.44%	85.15%	88.12%	92.87%	97.15%	88.26%	90.60%	94.36%	97.74%	89.01%	91.21%	94.72%	97.89%

A January – April recreational spawning season closure based on MRFSS data would be 88% effective if one assumes 20% of the trips formerly made would not be taken during the closure and fishermen can avoid 20% of the gag they once caught by modifying fishing gear or changing location.

4.1.2 Effectiveness of a recreational seasonal closure for gag, headboat data

STEP 1. Estimate the catch of a species during a seasonal closure
STEP 2 - Identify most common species taken with vermilion snapper

Table 19. Catch (in numbers) of gag and other species taken on Headboat trips with gag during January-April, 1999-2005. Data represents a sample and not data from all trips.

species	Specname	Sum
10	Vermilion Snapper	320,279
33	Black Sea Bass	264,794
50	White Grunt	186,991
15	Yellowtail Snapper	128,381
51	Tomtate	67,170
16	Lane Snapper	44,563
77	Gray Triggerfish	35,832
18	Gray Snapper	35,096
123	Banded Rudderfish	19,421
97	Blue Runner	18,607
4	Spottail Pinfish	16,410
1	Red Porgy	16,396
98	Bigeye	15,529
230	Sharpnose Shark	15,288
11	Red Snapper	13,406
34	Bank Sea Bass	11,355
3	Knobbed Porgy	10,566
74	King Mackerel	9,472
54	Bluestriped Grunt	9,396
30	Scamp	8,538
22	Red Grouper	7,983
29	Gag	7,369

STEP 3a - Determine incidental catch during a seasonal closure.
Determine the catch of gag during a seasonal closure when trips for most abundant co-occurring species are made.

STEP 3b – Determine incidental catch for reduced trips during a closure.

Trips that target co-occurring species in STEP 3a were randomly selected to reduce the number of trips from 20% to 60%. This assumes fishermen may stop fishing for vermilion snapper during a closure.

Table 20. Estimate of gag incidental catch in number (when targeting co-occurring species) and dead discards from Headboat during a Jan-Apr seasonal closure when trips are reduced. Release mortality = 25%.

Trip reduction	0%	20%	40%	60%
Incidental catch	7,220	3,980	3,200	2,341
Dead Discards	1,805	995	800	585
Effectiveness	75.51%	86.50%	89.14%	92.06%

STEP 3c – Determine dead discards for reduced trips and behavior during a seasonal closure.

This step assumes that some trips could be reduced and fishermen could have the ability to avoid gag by fishing differently.

Table 21. Incidental catch of gag from MRFSS assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	7,220	5,776	3,466	1,386	3,980	3,184	1,910	764	3,200	2,560	1,536	614	2,341	1,873	1,124	449
Dead Discards	1,805	1,444	866	347	995	796	478	191	800	640	384	154	585	468	281	112
Effectiveness	75.51%	80.40%	88.24%	95.30%	86.50%	89.20%	93.52%	97.41%	89.14%	91.31%	94.79%	97.92%	92.06%	93.65%	96.19%	98.48%

A January – April recreational spawning season closure would be 89% effective if one assumes 20% of the trips formerly made would not be taken during the closure and fishermen can avoid 20% of the gag they once caught by modifying fishing gear or changing location.

4.2 Estimation of dead discards through bag and size limit analyses.

In conducting bag and size limit analyses, it is assumed that the rate of non-compliance by anglers would be the same regardless of the bag or size limit. Furthermore, reductions in harvest expected with a bag or size limit change take into consideration released fish that would be expected to die.

For example, suppose an existing bag limit is 10 fish. The current take of fish with a bag limit of 10 is 1,000 individuals. If the bag limit was reduced to 8 fish, 900 fish would be retained and 100 would be discarded. Therefore, reducing the bag limit from 10 to 8 fish would reduce harvest by 10% = (1-(900/1000). However, if release mortality is 25% then, of the 100 fish released, 25 would be expected to die. Adding the 25 dead discards to the 900 fish retained with the new 8 fish bag limit would reduce harvest by 7.5% = (1-(925/1000) when incorporating release mortality.

Please fill out the form below and send to Jack McGovern. A self-addressed envelope is included. Information can also be sent to Jack by e-mail (John.McGovern@NOAA.GOV) or phone 727-824-5383.

Question that needs to be answered by fishermen

Commercial

(1) After a quota is met or during a seasonal closure, what percentage of commercial trips will not be taken to catch gag or vermilion snapper? Please circle your best estimate.

a. Gag:	0%	20%	40%	60%	other ____
b. Vermilion snapper:	0%	20%	40%	60%	other ____

(2) What percentage of gag or vermilion snapper can commercial fishermen avoid by modifying fishing gear or location?

a. Gag:	0%	20%	40%	60%	other ____
b. Vermilion snapper:	0%	20%	40%	60%	other ____

Recreational

(3) After a quota is met or during a seasonal closure, what percentage of commercial trips will not be taken to catch gag or vermilion snapper? Please circle your best estimate.

a. Gag:	0%	20%	40%	60%	other ____
b. Vermilion snapper:	0%	20%	40%	60%	other ____

(4) What percentage of gag or vermilion snapper can commercial fishermen avoid by modifying fishing gear or location?

a. Gag:	0%	20%	40%	60%	other ____
b. Vermilion snapper:	0%	20%	40%	60%	other ____

Please send response to:

Jack McGovern
NMFS, Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SUMMARY OF FMP AMENDMENT 16 SCOPING COMMENTS

Prepared by Rick DeVictor, SAFMC Staff

January 18, 2008

I. Summary

The South Atlantic Fishery Management Council (the Council) and the National Marine Fisheries Service (NOAA Fisheries) solicited comments on actions to end overfishing of gag grouper and vermilion snapper in the South Atlantic through Amendment 16 to the Snapper Grouper Fishery Management Plan (FMP)/Draft Environmental Impact Statement. A Notice of Intent was published in the Federal Register on 8/15/07 and a revised notice on 8/23/07 to extend the comment period. Six public scoping meetings were held in November 2007; the table below outlines the attendance at each meeting. The Council received 112 written correspondences in the form of letters, faxes, and e-mails. This document presents a general overview of the comments received from commercial and recreation fishermen, state and federal governmental agencies, environmental organizations, fishing organizations, and County Commissioners. It does not intend to provide a detail report of all the comments and viewpoints received.

Date	Location	Attendance
9/4/07	Wilmington, NC	37
9/4/07	Marathon, FL	2
9/5/07	Atlantic Beach, NC	45
9/6/07	Daytona Beach, FL	55
9/10/07	N. Charleston, SC	24
9/17/07	N. Myrtle Beach, SC	97

II. Summary of Comments

The majority of written comments and verbal testimonies received were against the proposed restrictions for gag grouper and vermilion snapper. A significant number of these comments were received from commercial and recreational fishermen; however two comments of this nature came from North Carolina County Commissioners. The arguments against restrictive measures were based upon three principal ideas: (1) the data and method to collect the data (typically referring to the data obtained through the Marine Recreational Fishing Statistical Survey (MRFSS)) is flawed and unreliable for use); (2) fishermen believed that populations of both species are healthy and the current management regulations are appropriate based upon their observations of abundant fish populations and large fish; and (3) the restrictions would result in adverse social and economic impacts to fishermen and fishing communities.

Many fishermen felt that the data used in the stock assessments was flawed, chiefly due to the processes used to collect them. Some individuals believed the MRFSS data collection program is flawed and highlighted the results of the 2005 review by the National Academy of Science to support their claim. Some recommended that action not be taken until improvements are made to the MRFSS program. In addition, several members of the public felt that the recreational release mortality used for gag was too high. For vermilion snapper, some individuals could not understand how the Council's Scientific and Statistical Committee (SSC) could accept the results of the assessment that was related to overfishing while not having confidence in the biomass determinations.

Many people reported that their observations while fishing and diving do not reflect declining and unhealthy fish population. It was a common sentiment that both species are abundant in terms of the overall number of fish and the number of large fish. One person reported large aggregations of gag grouper in numerous dives, including some deeper dives (greater than 200 feet) in the Florida Keys. A headboat operator from North Carolina reported that it is common to catch 20 - 40 gags in three hours. Another fisherman reported seeing a significant increase in the number of vermilion snappers below the 12 inch size.

Some members of the public, in addition to two County Commissioners, were concerned about the degree of economic and social impacts to coastal communities that would result from the proposed restrictions. Of particular concern was the degree of effects of the proposed actions in addition to other effects, including the rising cost of fuel prices. Fishermen reported that these cumulative effects often lead to a decrease in trip frequency and increase in cost per trip. Many members of the public stated that businesses, including hotels, restaurants, retailers, tackle shops, campgrounds, gas stations, and fishing piers, would be negatively affected by the proposed actions.

Despite the overwhelming support for no action to be taken by the Council, recommendations concerning the types of management measures were received from the public. One fisherman recommended raising the gag size limit from 24 to 26 inches while another individual proposed 28 inches. There was a recommendation to raise the vermilion snapper size limit from 12 to 14 inches.

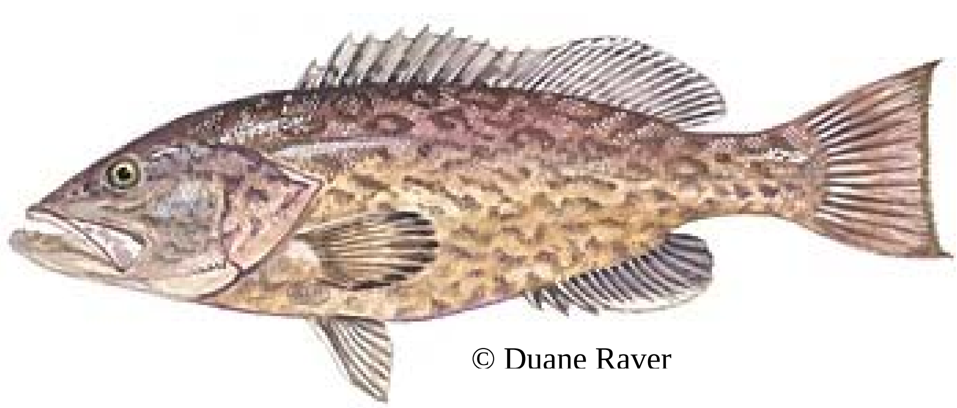
Some people advocated the implementation of management measures to protect these two species when they are most vulnerable such as when they are in spawning condition. One fisherman from Florida recommended the implementation of a commercial bag limit reduction during the period of July 15th to August 15 each year as he reported that large offshore fish in spawning condition migrate inshore due to cold water where these fish are lethargic and susceptible to harvest by divers using powerhead equipment. Another fisherman suggested a seasonal quota or harvest moratorium for the commercial industry when the fish are in spawning condition. One suggestion was for a two month closure for vermilion snapper. The Coastal Conservation Association recommended that if seasonal closures are implemented, that they occur during the species reported spawning season and apply to both commercial and recreational fishermen.

Several members of the public recommended a reduction in the allowable catch. One suggestion was to require the release of all gag grouper caught and decrease the limits of vermillion snapper to five per person and ten per boat. Another individual recommended limiting the harvest of groupers to two per person in addition to five or six per vessel throughout the year with a further reduction of one grouper per person during February and March.

Three organizations (two conservation and one fishing organization) supported Council action to end overfishing within the mandated timeframe. The organizations highlighted that the SSC deemed the assessments to be based on the best available science and that the Council has a legal requirement to end overfishing within one year of notification from NOAA Fisheries Service. One organization reported that gag's life history (spawning aggregations, protogynous hermaphrodism) makes their sustainable harvest susceptible to fishing practices. As a way to support a viable fishery, some of the management measures endorsed by the two conservation organizations include the implementation of: (1) time and area closures, (2) Limited Access Programs, and (3) data collection elements in order to better monitor bycatch and measure effort including observer coverage and in-season monitoring.

The Coastal Conservation Association disagreed with the use of historical landings used as the sole means to determine future allocations and listed five reasons to explain their disparity. They were troubled that allocations would not take into account the economic value of either sector, and that MRFSS was used to determine landings citing that the accuracy of the survey is unknown.

Appendix E
Potential Management Measures for Gag



May 19, 2008

Summary

A benchmark assessment for gag completed in 2007 indicated the stock is experiencing overfishing and approaching an overfished condition as of 2005 (SEDAR 10 2007). The Council's Scientific and Statistical Committee (SSC) recommended the Council restrict harvest to the yield associated with Foy defined as 75% of Fmsy. This would correspond to a catch limit of 694,000 pounds gutted weight for all sectors in 2008, which is equivalent to a reduction of 36% in the average catch during 2004-2006.

The commercial quota depends on the allocation alternative and year (Table 1). Gag is not overfished if biomass is less than Bmsy.

Table 1. Commercial quotas and recreational allocations* for gag (pounds gutted weight) based on the TAC associated with the yield at 75% of F_{MSY}.

		Alternative 2 (preferred)		**Alternative 3**		**Alternative 4**	
Year	**Catch Level**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**
2009 Onwards	694,000	353,940	340,060	458,040	235,960	423,340	270,660

The combined effect of reducing the gag and black grouper bag limit to 1 fish, reducing the grouper aggregate bag limit to 3 fish, excluding captain and crew on for-hire vessels from possessing groupers, and a January through April spawning closure would provide reduction in recreational harvest of approximately 37%. These reductions take into consideration a 25% release mortality rate and continued non-compliance with the bag limit.

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1 Harvest levels recommended by Council's SSC

Table 2. Table 44 from SEDAR 10 (2007). Gag– Base run with constant catchability: Projection results under 75% of Fmsy (starting in 2008) (fishing mortality rate fixed at the current value in 2005-2007). SSB = spawning stock biomass, R = recruits in 1000s, F = fishing mortality rate, L = landings, Sum L = cumulative landings, and D = dead discards. For reference, relevant estimated benchmarks are SSBMSY = 7925 mt, RMSY = 500 recruits in 1000s, FMSY = 0.24/yr, and MSY = 1238 klb.

Year	SSB(klb)	R(1000s)	F(/yr)	L(mt)	L(klb)	Sum L(klb)	D(1000s)	D (klb)
2005	7,468	497	0.315	663	1462	1462	21.4	108
2006	6860	499	0.315	651	1436	2898	21.4	85
2007	6062	497	0.315	589	1299	4197	26	99
2008	5604	494	0.178	315	694	4891	17	70
2009	6096	491	0.178	325	716	5607	18	79
2010	6667	494	0.178	348	768	6,375	18.2	81
2011	7216	496	0.178	381	840	7,215	18.2	81
2012	7693	498	0.178	415	916	8,131	18.2	81
2013	8087	499	0.178	443	976	9,107	18.3	81
2014	8,413	501	–	–	–	–	–	–

2 Gag Landings and Allocation

2.1 Gag Landings

Table 3. Table 16 from SEDAR 10 2007 assessment. Constant catchability model estimated time series of landings in gutted weight (klb) for each fishery.

Year	C.HAL	C.Diving	Headboat	MRFSS	Total	Comm	Rec	% Comm	% Rec
1962	151	13	136	100	400	164	236	41.00%	59.00%
1963	137	13	124	91	365	150	215	41.10%	58.90%
1964	129	12	119	87	347	141	206	40.63%	59.37%
1965	130	12	127	93	362	142	220	39.23%	60.77%
1966	99	12	100	73	284	111	173	39.08%	60.92%
1967	211	12	218	160	601	223	378	37.10%	62.90%
1968	310	11	331	243	895	321	574	35.87%	64.13%
1969	217	9	219	161	606	226	380	37.29%	62.71%
1970	299	7	286	210	802	306	496	38.15%	61.85%
1971	307	5	281	206	799	312	487	39.05%	60.95%
1972	205	4	211	132	552	209	343	37.86%	62.14%
1973	292	5	123	84	504	297	207	58.93%	41.07%
1974	376	6	118	134	634	382	252	60.25%	39.75%
1975	427	8	117	244	796	435	361	54.65%	45.35%
1976	577	4	123	401	1105	581	524	52.58%	47.42%
1977	642	9	130	346	1127	651	476	57.76%	42.24%
1978	984	14	85	539	1622	998	624	61.53%	38.47%
1979	914	19	110	411	1454	933	521	64.17%	35.83%
1980	845	16	71	360	1292	861	431	66.64%	33.36%
1981	974	14	149	595	1732	988	744	57.04%	42.96%
1982	1004	16	124	185	1329	1020	309	76.75%	23.25%
1983	1040	9	158	649	1856	1049	807	56.52%	43.48%
1984	1082	19	186	1515	2802	1101	1701	39.29%	60.71%
1985	865	12	141	458	1476	877	599	59.42%	40.58%
1986	820	6	135	363	1324	826	498	62.39%	37.61%
1987	852	22	174	625	1673	874	799	52.24%	47.76%
1988	669	13	157	402	1241	682	559	54.96%	45.04%
1989	963	22	149	500	1634	985	649	60.28%	39.72%
1990	783	19	116	343	1261	802	459	63.60%	36.40%
1991	656	85	95	256	1092	741	351	67.86%	32.14%
1992	695	107	108	385	1295	802	493	61.93%	38.07%
1993	761	78	103	457	1399	839	560	59.97%	40.03%
1994	799	97	97	552	1545	896	649	57.99%	42.01%
1995	838	84	105	397	1424	922	502	64.75%	35.25%
1996	752	119	68	402	1341	871	470	64.95%	35.05%
1997	607	99	60	281	1047	706	341	67.43%	32.57%
1998	655	139	79	371	1244	794	450	63.83%	36.17%
1999	539	114	60	580	1293	653	640	50.50%	49.50%
2000	439	63	68	342	912	502	410	55.04%	44.96%
2001	450	82	58	477	1067	532	535	49.86%	50.14%
2002	448	85	51	265	849	533	316	62.78%	37.22%
2003	444	117	37	517	1115	561	554	50.31%	49.69%
2004	476	75	76	532	1159	551	608	47.54%	52.46%

Table 4. Commercial gag landings (pounds gutted weight) for gag taken with diving gear and all other gear types. Source: ALS. Commercial ALS data for 2006 are incomplete. Gear = 760, 941, 942, or 943 considered diving.

Year	Other	Diving
1986	697,737	2,583
1987	744,663	6,613
1988	506,193	6,439
1989	835,547	6,505
1990	693,939	0
1991	670,148	0
1992	701,453	6,961
1993	748,875	3,556
1994	863,968	10,660
1995	908,141	5,006
1996	843,300	1,209
1997	571,930	78,123
1998	669,441	99,121
1999	521,988	102,336
2000	434,852	52,960
2001	448,957	72,200
2002	459,369	55,093
2003	457,934	76,730
2004	482,912	53,459
2005	523,725	38,098
2006	471,977	41,395

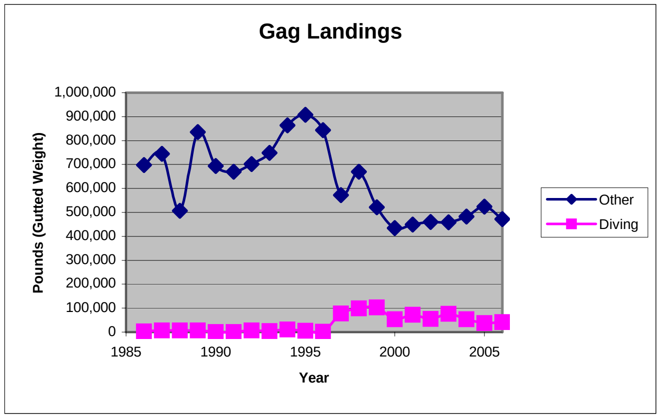


Table 5. Gag Landings – Pounds Gutted Weight. Source: ALS, MRFSS Web site; Headboat survey. Data do not include dead discards and MRFSS data are A+B1; weight not converted from numbers.

Year	comm	mrfss	hb	% comm	% rec
1986	700,785	38,199	113,665	82.19%	17.81%
1987	752,466	427,426	158,687	56.21%	43.79%
1988	513,791	188,438	170,518	58.87%	41.13%
1989	843,223	364,692	147,056	62.23%	37.77%
1990	693,939	296,116	117,536	62.65%	37.35%
1991	670,148	186,415	96,543	70.31%	29.69%
1992	709,667	403,603	105,496	58.23%	41.77%
1993	753,071	461,181	102,856	57.18%	42.82%
1994	876,547	475,081	80,428	61.21%	38.79%
1995	914,047	258,288	94,235	72.17%	27.83%
1996	844,727	240,483	56,221	74.01%	25.99%
1997	664,115	239,049	52,189	69.52%	30.48%
1998	786,403	177,101	60,064	76.83%	23.17%
1999	642,745	518,683	49,444	53.08%	46.92%
2000	497,345	382,843	51,617	53.37%	46.63%
2001	534,153	598,860	44,722	45.35%	54.65%
2002	524,379	327,670	42,845	58.60%	41.40%
2003	548,475	596,335	27,536	46.78%	53.22%
2004	545,994	459,162	82,474	50.20%	49.80%

Year	comm	mrfss	hb	% comm	% rec
2005	568,681	439,520	71,736	52.66%	47.34%
2006	520,824	425,071	46,537	52.48%	47.52%

2.2 Gag Landings Associated With 225 and Unlimited Permits

Table 6. Landings of gag (lbs gw) associated with 225 and unlimited permits.

Year	225 Permit	Unlimited Permit
1999	5,196	556,606
2000	3,401	418,173
2001	2,811	440,544
2002	1,923	449,515
2003	2,145	504,660
2004	3,392	448,125
2005	2,952	456,814
2006	2,214	402,171

2.3 Gag Landings by State

Table 7. Commercial landings by state, 1999-2005.

State	99-05	Avg ww	Avg GW	Percent
FL/GA	1,635,897	233,700	198,051	35.90%
Monroe	38,137	5,448	4,617	0.80%
NC	1,435,185	205,026	173,751	31.50%
SC	1,447,671	206,810	175,263	31.80%

Table 8. Commercial landings by state, 1999-2006.

State	99-05	Avg ww	Avg GW	Percent
FL/GA	1,772,942	221,618	187,811	34.28%
Monroe	42,734	5,342	4,527	0.83%
NC	1,676,135	209,517	177,557	32.41%
SC	1,679,651	209,956	177,929	32.48%

Table 9. Commercial landings by state, 2001-2006.

State	99-05	Avg ww	Avg GW	Percent
FL/GA	1,177,028	196,171	166,246	30.76%
Monroe	31,386	5,231	4,433	0.82%
NC	1,331,478	221,913	188,062	34.80%
SC	1,286,264	214,377	181,676	33.62%

Table 10. Headboat landings by state, 1999-2005.

State	99-05	avg ww	avg gw	percent
GA AND NORTH F	116,885	16,698	14,151	26.7%
NORTH CAROLINA	121,028	17,290	14,652	27.7%
SOUTH CAROLINA	71,294	10,185	8,631	16.3%
SOUTH FLORIDA	127,834	18,262	15,476	29.2%

Table 11. Headboat landings by state, 2001-2006.

State	2001-2006	avg ww	avg gw	percent
GA AND NORTH FL	78,041	13,007	11,023	22.14%
NORTH CAROLINA	104,655	17,290	14,652	29.43%
SOUTH CAROLINA	62,377	10,185	8,631	17.34%
SOUTH FLORIDA	127,631	18,262	15,476	31.09%

Table 12. MRFSS landings (pounds) by state, 1999-2005.

MRFSS	99-05	avg ww	avg gw	percent
FL	3,065,904	510,984	433,037	83.3%
GA	27,082	4,514	3,825	0.7%
SC	188,079	31,347	26,565	5.1%
NC	399,106	66,518	56,371	10.8%

Table 13. MRFSS landings (pounds) by state, 2001-2006.

MRFSS	2001-2006	avg ww	avg gw	percent
FL	2,369,161	394,860	334,627	70.23%
GA	67,200	11,200	9,492	1.99%
SC	140,254	23,376	19,810	4.16%
NC	796,789	132,798	112,541	23.62%

Table 14. MRFFS landings (number A+B1) by state. 1999-2005.

MRFSS	99-05	avg	percent
FL	192,750	27,536	72.7%
GA	3,577	511	1.3%
SC	17,623	2,518	6.6%
NC	51,193	7,313	19.3%

Table 15. MRFFS landings (number A+B1) by state, 2001-2006.

MRFSS	2001-2006	avg	percent
FL	146,979	29,396	64.65%
GA	5,445	1,089	2.40%
SC	10,679	2,136	4.70%
NC	64,245	12,849	28.26%

Table 16. MRFSS number released alive (B2) among states, 1999-2005.

MRFSS	99-05	avg	percent
FL	693,383	115,564	91.0%
GA	4,670	778	0.6%
SC	29,186	4,864	3.8%
NC	34,881	5,814	4.6%

Table 17. MRFSS number released alive (B2) among states, 2001-2006.

MRFSS	2001-2006	avg	percent
FL	623,153	124,631	89.62%
GA	5,878	1,176	0.85%
SC	24,128	4,826	3.47%
NC	42,161	8,432	6.06%

Table 18. Percentage of MRFSS B2s by state. Average 1999-2005.

MRFSS	A+B1	B2	A+B1+B2	% B2
FL	27,536	99,055	126,590	78.2%
GA	511	667	1,178	56.6%
SC	2,518	4,169	6,687	62.4%
NC	7,313	4,983	12,296	40.5%
Total	37,878	108,874	146,752	74.2%

Table 19. Percentage of MRFSS B2s by state. Average 2001-2006.

MRFSS	A+B1	B2	A+B1+B2	% B2
FL	29,396	124,631	154,027	80.92%
GA	1,089	1,176	2,265	56.60%
SC	2,136	4,826	6,962	62.40%
NC	12,849	8,432	21,281	40.50%
Total	45,470	139,065	184,535	75.36%

2.4 Gag Landings by Month and State

2.4.1 Commercial

Table 20. Average gag commercial landings 1999-2005 (lbs gutted weight) by state and month. Includes Monroe County South Atlantic landings.

Month	Total	FL/GA	SC	NC
1	57,110	30,069	13,262	13,779
2	56,700	29,946	10,432	16,322
3	2,110	1,696	103	311
4	1,927	1,536	206	185
5	83,065	32,611	21,468	28,985
6	57,890	19,730	16,564	21,596
7	50,887	16,499	16,332	18,056
8	40,978	14,258	14,792	11,928
9	33,918	8,832	13,464	11,622
10	57,003	14,388	25,430	17,185
11	60,498	15,290	24,353	20,854
12	49,595	17,812	17,344	14,440
Total	551,682	202,668	173,751	175,263

Table 21. Percentage of gag (commercial) landed by month in FL, GA, SC, and NC during 1999-2005 (lbs gutted weight) by state and month.

Month	Total	FL/GA	SC	NC
1	10.35%	14.84%	7.63%	7.86%
2	10.28%	14.78%	6.00%	9.31%
3	0.38%	0.84%	0.06%	0.18%
4	0.35%	0.76%	0.12%	0.11%
5	15.06%	16.09%	12.36%	16.54%
6	10.49%	9.74%	9.53%	12.32%
7	9.22%	8.14%	9.40%	10.30%
8	7.43%	7.04%	8.51%	6.81%

Month	Total	FL/GA	SC	NC
9	6.15%	4.36%	7.75%	6.63%
10	10.33%	7.10%	14.64%	9.81%
11	10.97%	7.54%	14.02%	11.90%
12	8.99%	8.79%	9.98%	8.24%

Table 22. Average gag commercial landings 2001-2006 (lbs gutted weight) by state and month. Includes Monroe County South Atlantic landings.

Month	Total	FL/GA	SC	NC
1	58,389	27,663	15,020	15,706
2	52,953	25,458	10,675	16,821
3	1,274	897	81	296
4	2,106	1,650	238	218
5	79,875	26,494	21,959	31,422
6	60,435	16,717	19,089	24,630
7	51,177	14,591	17,003	19,583
8	44,313	14,016	16,090	14,208
9	34,226	6,330	17,076	10,820
10	51,963	9,924	27,686	14,353
11	55,521	11,599	24,681	19,242
12	48,185	15,344	18,465	14,376
Total	540,418	170,679	188,062	181,676

Table 23. Percentage of gag (commercial) landed by month in FL, GA, SC, and NC during 2001-2006 (lbs gutted weight) by state and month.

Month	Total	FL/GA	SC	NC
1	10.80%	16.21%	7.99%	8.65%
2	9.80%	14.92%	5.68%	9.26%
3	0.24%	0.53%	0.04%	0.16%
4	0.39%	0.97%	0.13%	0.12%
5	14.78%	15.52%	11.68%	17.30%
6	11.18%	9.79%	10.15%	13.56%
7	9.47%	8.55%	9.04%	10.78%
8	8.20%	8.21%	8.56%	7.82%
9	6.33%	3.71%	9.08%	5.96%
10	9.62%	5.81%	14.72%	7.90%
11	10.27%	6.80%	13.12%	10.59%
12	8.92%	8.99%	9.82%	7.91%

2.4.2 Headboat

Table 24. Average gag headboat landings 1999-2005 (lbs gutted weight) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	3,508	2,089	1,311	81	27
2	3,680	2,437	1,159	11	73
3	6,750	4,503	1,483	400	363
4	5,739	1,649	1,934	862	1,294
5	6,854	1,297	2,114	1,120	2,323
6	7,556	1,214	1,648	1,235	3,459
7	7,233	954	1,388	1,418	3,473
8	5,067	784	1,142	1,080	2,061
9	3,055	373	523	1,186	973
10	5,316	876	1,243	1,245	1,951
11	4,415	949	1,271	1,183	1,013
12	2,555	929	1,292	249	85

Table 25. Average gag headboat landings 1999-2005 (percentage) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	5.68%	11.57%	7.94%	0.80%	0.16%
2	5.96%	13.50%	7.02%	0.11%	0.43%
3	10.93%	24.94%	8.98%	3.97%	2.12%
4	9.30%	9.14%	11.71%	8.56%	7.57%
5	11.10%	7.18%	12.81%	11.13%	13.59%
6	12.24%	6.73%	9.98%	12.27%	20.24%
7	11.72%	5.28%	8.41%	14.08%	20.32%
8	8.21%	4.34%	6.91%	10.72%	12.06%
9	4.95%	2.07%	3.17%	11.78%	5.69%
10	8.61%	4.85%	7.53%	12.37%	11.41%
11	7.15%	5.25%	7.70%	11.75%	5.92%
12	4.14%	5.15%	7.83%	2.47%	0.50%

Table 26. Average gag headboat landings 2001-2006 (lbs gutted weight) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	2,832	1,937	779	69	48
2	3,395	2,402	928	3	62
3	6,419	4,573	1,096	383	366
4	5,219	1,759	1,452	848	1,160
5	5,817	1,259	1,464	1,040	2,054
6	5,884	1,180	1,082	1,201	2,419
7	6,464	1,182	796	1,262	3,223
8	4,040	859	619	740	1,823
9	2,712	433	274	808	1,198
10	4,308	661	951	1,049	1,647
11	3,612	929	829	1,133	722
12	1,940	853	753	274	61

Table 27. Average gag headboat landings 2001-2006 (percentage) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	5.38%	10.74%	7.06%	0.78%	0.32%
2	6.45%	13.33%	8.42%	0.04%	0.42%
3	12.19%	25.37%	9.94%	4.35%	2.47%
4	9.91%	9.76%	13.17%	9.63%	7.85%
5	11.05%	6.99%	13.28%	11.80%	13.89%
6	11.18%	6.55%	9.82%	13.64%	16.37%
7	12.28%	6.56%	7.22%	14.32%	21.81%
8	7.67%	4.76%	5.62%	8.40%	12.33%
9	5.15%	2.40%	2.48%	9.17%	8.10%
10	8.18%	3.67%	8.63%	11.91%	11.15%
11	6.86%	5.15%	7.52%	12.86%	4.88%
12	3.69%	4.73%	6.83%	3.11%	0.41%

2.4.3 MRFSS

Table 28. Average gag MRFSS landings 1999-2005 (lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	91,814	91,814	0	0	0
2	82,614	76,366	754	2,576	2,918
3	86,916	63,534	1,860	9,194	12,329
4	86,749	66,548	659	3,178	16,364
5	68,125	35,690	2,519	5,495	24,420
6	86,700	60,631	208	6,173	19,688

Table 29. Average gag MRFSS landings 1999-2005 (percent lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	18.26%	23.27%	0.00%	0.00%	0.00%
2	16.43%	19.35%	12.56%	9.68%	3.85%
3	17.28%	16.10%	31.00%	34.54%	16.28%
4	17.25%	16.87%	10.99%	11.94%	21.61%
5	13.55%	9.05%	41.99%	20.65%	32.25%
6	17.24%	15.37%	3.46%	23.19%	26.00%

Table 30. Average gag MRFSS landings 2001-2006 (lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	80,063	79,656	0	0	406
2	70,416	65,070	188	2,379	2,779
3	104,703	56,314	4,928	8,743	34,718
4	68,075	45,555	1,102	1,888	19,531
5	63,329	27,915	3,057	807	31,551
6	89,922	60,118	218	6,031	23,556

Table 31. Average gag MRFSS landings 2001-2006 (percent lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	16.80%	23.80%	0.00%	0.00%	0.36%
2	14.78%	19.45%	1.98%	11.99%	2.47%
3	21.97%	16.83%	51.92%	44.05%	30.85%
4	14.29%	13.61%	11.61%	9.51%	17.35%
5	13.29%	8.34%	32.20%	4.06%	28.03%
6	18.87%	17.97%	2.29%	30.39%	20.93%

Table 32. Average gag MRFSS landings 1999-2005 (A+B1 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	5,865	5,865	0	0	0
2	4,792	4,356	73	202	161
3	5,425	3,349	141	654	1,281
4	5,350	3,341	157	250	1,602
5	5,615	2,977	85	585	1,968
6	6,993	4,918	5	577	1,494

Table 33. Average gag MRFSS landings 1999-2005 (A+B1 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	17.23%	23.64%	0.00%	0.00%	0.00%
2	14.08%	17.56%	15.86%	8.91%	2.47%
3	15.94%	13.50%	30.57%	28.82%	19.70%
4	15.72%	13.47%	34.18%	11.03%	24.62%
5	16.50%	12.00%	18.38%	25.80%	30.25%
6	20.54%	19.83%	1.01%	25.44%	22.96%

Table 34. Average gag MRFSS landings 2001-2006 (A+B1 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	5,170	5,134	0	0	37
2	4,480	4,103	9	194	174
3	6,853	2,955	398	637	2,863
4	3,702	1,602	80	132	1,888
5	5,078	2,342	267	86	2,382
6	6,827	4,624	14	459	1,730

Table 35. Average gag MRFSS landings 2001-2006 (A+B1 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	16.10%	24.73%	0.00%	0.00%	0.40%
2	13.95%	19.76%	1.21%	12.88%	1.91%
3	21.34%	14.24%	51.78%	42.23%	31.55%
4	11.53%	7.71%	10.38%	8.76%	20.81%
5	15.81%	11.28%	34.79%	5.73%	26.26%
6	21.26%	22.28%	1.84%	30.41%	19.06%

Table 36. Average gag MRFSS landings 1999-2005 (B2 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	21,858	21,858	0	0	0
2	12,338	11,338	34	142	825
3	8,948	7,802	115	550	481
4	11,643	10,322	53	121	1,147
5	18,120	14,960	239	1,498	1,424
6	25,177	22,959	161	1,445	612

Table 37. Average gag MRFSS landings 1999-2005 (B2 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	22.28%	24.49%	0.00%	0.00%	0.00%
2	12.58%	12.71%	5.59%	3.79%	18.37%
3	9.12%	8.74%	19.08%	14.64%	10.73%
4	11.87%	11.57%	8.76%	3.22%	25.55%
5	18.47%	16.76%	39.73%	39.89%	31.71%
6	25.67%	25.73%	26.84%	38.46%	13.64%

Table 38. Average gag MRFSS landings 2001-2006 (B2 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	15,750	15,712	0	0	38
2	12,067	11,006	0	128	933
3	9,732	8,109	325	603	695
4	12,029	11,151	58	44	775
5	18,958	14,688	273	1,155	2,842
6	29,673	27,349	175	1,477	672

Table 39. Average gag MRFSS landings 2001-2006 (B2 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	16.04%	17.85%	0.00%	0.00%	0.64%
2	12.29%	12.50%	0.00%	3.76%	15.67%
3	9.91%	9.21%	39.11%	17.70%	11.67%
4	12.25%	12.67%	6.98%	1.29%	13.01%
5	19.30%	16.69%	32.85%	33.90%	47.72%
6	30.21%	31.07%	21.06%	43.35%	11.28%

2.5 Gag Commercial Percentage

Table 40. Gag % Commercial. Source ALS.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1986	82.19%	66.32%	64.20%	63.60%	63.41%	64.42%	63.44%	62.53%	62.35%	63.41%	64.35%	64.71%	65.54%	64.60%	63.99%	62.78%	62.58%	61.67%	61.10%	60.61%	60.24%
1987		56.21%	57.26%	59.15%	59.98%	61.73%	61.11%	60.47%	60.58%	61.93%	63.08%	63.56%	64.53%	63.62%	63.02%	61.82%	61.66%	60.76%	60.22%	59.76%	59.41%
1988			58.87%	60.91%	61.49%	63.45%	62.30%	61.31%	61.29%	62.74%	63.94%	64.40%	65.41%	64.33%	63.64%	62.29%	62.09%	61.10%	60.50%	60.00%	59.61%
1989				62.23%	62.42%	64.62%	62.94%	61.67%	61.58%	63.13%	64.40%	64.85%	65.89%	64.70%	63.94%	62.49%	62.27%	61.21%	60.58%	60.05%	59.64%
1990					62.65%	66.20%	63.23%	61.50%	61.43%	63.29%	64.74%	65.23%	66.37%	64.98%	64.12%	62.51%	62.27%	61.13%	60.45%	59.88%	59.46%
1991						70.31%	63.53%	61.13%	61.15%	63.41%	65.06%	65.57%	66.81%	65.23%	64.27%	62.50%	62.24%	61.01%	60.29%	59.70%	59.26%
1992							58.23%	57.68%	58.95%	62.15%	64.27%	64.96%	66.41%	64.72%	63.72%	61.86%	61.63%	60.37%	59.65%	59.07%	58.64%
1993								57.18%	59.28%	63.34%	65.70%	66.30%	67.81%	65.67%	64.44%	62.29%	62.00%	60.57%	59.78%	59.14%	58.67%
1994									61.21%	66.35%	68.63%	68.80%	70.22%	67.26%	65.64%	63.02%	62.63%	60.97%	60.06%	59.33%	58.80%
1995										72.17%	73.04%	72.04%	73.16%	68.81%	66.61%	63.36%	62.87%	60.94%	59.90%	59.10%	58.54%
1996											74.01%	71.96%	73.56%	67.83%	65.27%	61.63%	61.26%	59.27%	58.28%	57.56%	57.06%
1997												69.52%	73.30%	65.62%	62.85%	58.97%	58.91%	56.98%	56.16%	55.59%	55.23%
1998													76.83%	63.96%	60.84%	56.64%	56.98%	55.11%	54.46%	54.04%	53.81%
1999														53.08%	53.21%	50.42%	52.16%	50.99%	50.91%	50.97%	51.07%
2000															53.37%	48.90%	51.79%	50.38%	50.42%	50.56%	50.74%
2001																45.35%	51.07%	49.52%	49.78%	50.08%	50.36%
2002																	58.60%	51.90%	51.43%	51.39%	51.47%
2003																		46.78%	48.59%	49.47%	50.02%
2004																			50.55%	50.91%	51.20%
2005																				51.27%	51.54%
2006																					51.83%

2.6 Gag Recreational Percentage

Table 42. Gag % Recreational. Source MRFSS Web site, NMFS Headboat survey.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1986	17.81%	33.68%	35.80%	36.40%	36.59%	35.58%	36.56%	37.47%	37.65%	36.59%	35.65%	35.29%	34.46%	35.40%	36.01%	37.22%	37.42%	38.33%	38.90%	39.39%	39.76%
1987		43.79%	42.74%	40.85%	40.02%	38.27%	38.89%	39.53%	39.42%	38.07%	36.92%	36.44%	35.47%	36.38%	36.98%	38.18%	38.34%	39.24%	39.78%	40.24%	40.59%
1988			41.13%	39.09%	38.51%	36.55%	37.70%	38.69%	38.71%	37.26%	36.06%	35.60%	34.59%	35.67%	36.36%	37.71%	37.91%	38.90%	39.50%	40.00%	40.39%
1989				37.77%	37.58%	35.38%	37.06%	38.33%	38.42%	36.87%	35.60%	35.15%	34.11%	35.30%	36.06%	37.51%	37.73%	38.79%	39.42%	39.95%	40.36%
1990					37.35%	33.80%	36.77%	38.50%	38.57%	36.71%	35.26%	34.77%	33.63%	35.02%	35.88%	37.49%	37.73%	38.87%	39.55%	40.12%	40.54%
1991						29.69%	36.47%	38.87%	38.85%	36.59%	34.94%	34.43%	33.19%	34.77%	35.73%	37.50%	37.76%	38.99%	39.71%	40.30%	40.74%
1992							41.77%	42.32%	41.05%	37.85%	35.73%	35.04%	33.59%	35.28%	36.28%	38.14%	38.37%	39.63%	40.35%	40.93%	41.36%
1993								42.82%	40.72%	36.66%	34.30%	33.70%	32.19%	34.33%	35.56%	37.71%	38.00%	39.43%	40.22%	40.86%	41.33%
1994									38.79%	33.65%	31.37%	31.20%	29.78%	32.74%	34.36%	36.98%	37.37%	39.03%	39.94%	40.67%	41.20%
1995										27.83%	26.96%	27.96%	26.84%	31.19%	33.39%	36.64%	37.13%	39.06%	40.10%	40.90%	41.46%
1996											25.99%	28.04%	26.44%	32.17%	34.73%	38.37%	38.74%	40.73%	41.72%	42.44%	42.94%
1997												30.48%	26.70%	34.38%	37.15%	41.03%	41.09%	43.02%	43.84%	44.41%	44.77%
1998													23.17%	36.04%	39.16%	43.36%	43.02%	44.89%	45.54%	45.96%	46.19%
1999														46.92%	46.79%	49.58%	47.84%	49.01%	49.09%	49.03%	48.93%
2000															46.63%	51.10%	48.21%	49.62%	49.58%	49.44%	49.26%
2001																54.65%	48.93%	50.48%	50.22%	49.92%	49.64%
2002																	41.40%	48.10%	48.57%	48.61%	48.53%
2003																		53.22%	51.41%	50.53%	49.98%
2004																			49.45%	49.09%	48.80%
2005																				48.73%	48.46%
2006																					48.17%

2.7 Allocations

2.7.1 Recreational allocation and commercial quota

Allocations – the Council has chosen 1999-2003 allocation alternative as preferred for gag.

Years 1999-2003 = 51% commercial & 49% recreational
Years 1986-1998 = 66% commercial & 34% recreational
Years 1986-2005 = 61% commercial & 39% recreational

Applying these percentages to the annual catch limit in each year results in commercial and recreational proportions (pounds gutted weight) provided in Table 26.

Table 43. Commercial and recreation proportions of catch (pounds gutted weight) based on three allocation alternatives.

		Alternative 2 (51% comm/49% rec)		Alternative 3 (66% comm/34% rec)		Alternative 4 (61% comm/39% rec)	
Year	**TAC**	**Comm**	**Rec**	**Comm**	**Rec**	**Comm**	**Rec**
2009	694,000	353,940	340,060	458,040	235,960	423,340	270,660

Table 44. Landings data for 2001-2006. 2001-2004 landings data (gutted weight) are from SEDAR 10 (2007). 2005 and 2006 data are from ALS.

Gag Landings (gutted weight)				Total	Total
Year	**Commercial**	**Headboat**	**MRFSS**	**Recreational**	**Landings**
2001	532,000	53,000	455,000	508,000	1,040,000
2002	534,000	51,000	266,000	317,000	851,000
2003	560,000	32,000	519,000	551,000	1,111,000
2004	551,000	82,000	517,000	599,000	1,150,000
2005	568,681	71,736	468,814	540,550	1,109,231
2006	520,824	46,537	437,493	484,031	1,004,854
Avg 04-06	546,835	66,758	474,436	541,194	1,008,028

Allocation Alternative 2 results in a 35% commercial reduction and 37% recreational from the average of 2004-2006 landings. Allocation Alternative 3 results in a 16% commercial reduction and 56% recreational reduction from the average of 2004-2006 landings. Allocation Alternative 4 results in a 22% commercial reduction and 50% recreational reduction from the average of 2004-2006 landings. These would be initial reductions for 2009. As the allowable catch would increase after 2009, the amount of reduction in harvest compared to 2004-2006 landings would gradually decrease.

Alternative	Commercial Reduction	Recreational Reduction
2 (Preferred)	35%	37%
3	16%	56%
4	23%	50%

2.7.2 Regional Quotas

Table 45. Regional quotas by region for two allocation alternatives.

Year	Annual Catch Limit	Allocation Alternative 1. 51%C/49%R			Allocation Alternative 3. 66%C/34%R			Allocation Alternative 4. 61%C/39%R		
		Commercial	FL-GA	SC-NC	Commercial	FL-GA	SC-NC	Commercial	FL-GA	SC-NC
		Quota (gutted weight)	36.70% (gutted weight)	63.30% (gutted weight)	Quota (gutted weight)	36.70% (gutted weight)	63.30% (gutted weight)	Quota (gutted weight)	36.70% (gutted weight)	63.30% (gutted weight)
2009	694,000	353,940	129,896	224,044	458,040	168,101	289,939	423,340	155,366	267,974

3 Monthly catch and reduction provided by seasonal closure

3.1 Commercial

Table 46. Monthly catch (pounds gutted weight) of gag during 1999-2005 (average), 1995, 2006, and 2001-2006. Data are from ALS.

Month	1999-2005	1995	2006	2001-2006
1	57,110	132,081	57,701	58,389
2	56,700	64,236	46,886	52,953
3	2,110	71,979	1,856	1,274
4	1,927	61,990	521	2,106
5	83,065	88,520	70,941	79,875
6	57,890	89,433	57,162	60,435
7	50,887	70,194	46,314	51,177
8	40,978	50,494	47,158	44,313
9	33,918	64,724	42,122	34,226
10	57,003	85,135	51,295	51,963
11	60,498	72,487	45,175	55,521
12	49,595	62,775	53,692	48,185
Total	551,682	914,047	520,824	540,418

3.2 Effectiveness of Commercial Closure

Seven steps were taken to determine the effectiveness of a commercial spawning season closure. Logbook data from 2001-2005 were used for analyses. The data set used also includes value for species and was provided by Dr. Jim Waters. Dr. Waters also provided a SAS program that calculates trip costs, which are adjusted based on changes in fuel prices, days per trip, crew size, total trip landings, and other variables. The SAS program was modified to include the effect of seasonal closures on gag. An opportunity cost of \$50.00 per day was used. It was adjusted to account for inflation. Net revenue (total revenue – trip cost) for a trip was calculated. If the net revenue per trip was less than the opportunity cost of labor, then the trip was removed from the data set.

Logbook data were examined to identify the species most commonly caught on trips with gag by restricting trips to those that caught at least 1 lb of gag. Incidental catch during a seasonal closure was determined by identifying trips that targeted (caught at least 100 lbs) of co-occurring species; and calculating the catch of gag on those trips. Trips targeting gag during the proposed seasonal closures were removed from analyses. A trip would be considered to be targeting gag if greater than 75% of the landings on a trip included the species. In addition, trips, which employed diving gear, were not considered in analyses since fishermen can recognize a species before it is captured.

There is a possibility some trips would not be taken during a seasonal closure. Therefore, trips targeting co-occurring species during a closure were randomly selected to determine the effect of a 0 to 60% reduction in the number of trips on incidental catch of gag. These values were further adjusted by 0 to 60% to account for fishermen's ability to avoid gag by changing hook size, location, and fishing methods. Dead discards were determined by applying a 40% release mortality rate for gag. Effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings.

STEP 1 - Determine landings of gag during 2001-2005

Table 47. Landings of gag during 2001-2005.

Month	Tot WW	Tot GW	Avg GW
1	309,020	261,881	52,376
2	265,912	225,349	45,070
3	4,883	4,138	828
4	11,809	10,008	2,002
5	430,727	365,023	73,005
6	315,686	267,530	53,506
7	262,087	222,108	44,422
8	211,835	179,521	35,904
9	157,179	133,202	26,640
10	254,353	215,553	43,111
11	263,565	223,360	44,672
12	229,434	194,436	38,887
		sum	460,422

STEP 2 - Drop trips if net revenue is less than opportunity cost.

Step in SAS program removed 1,830 of 18,544 trips because the net revenue was less than the opportunity cost.

Table 48. Landings of gag during 2001-2005 when trips removed because the net revenue per trip is less than opportunity cost of labor.

Month	Tot WW	Tot GW	Avg GW
1	302,820	256,627	51,325
2	260,160	220,475	44,095
3	4,700	3,983	797
4	11,610	9,839	1,968
5	423,860	359,203	71,841
6	310,400	263,051	52,610
7	255,990	216,941	43,388
8	207,960	176,237	35,247
9	154,260	130,729	26,146
10	251,730	213,331	42,666
11	260,440	220,712	44,142
12	225,720	191,288	38,258
		sum	452,483

STEP 3 - Identify most common species taken with gag

Table 49. Species most commonly taken on trips with gag.

COMMON	Mean	Sum	%	Cum
GROUPER,GAG	244	1,166,199	21.67%	21.67%
SNAPPER,VERMILION	481	1,091,995	20.29%	41.96%
SCAMP	182	420,633	7.82%	49.78%
AMBERJACK,GREATER	262	417,058	7.75%	57.53%
GROUPER,RED	175	397,988	7.40%	64.93%
TRIGGERFISH,GRAY	125	228,653	4.25%	69.18%
JACK,ALMACO	181	197,845	3.68%	72.85%
SNAPPER,RED	96	188,736	3.51%	76.36%

STEP 4 – Identify trips that target co-occurring species.
Identify trips that caught at least 100 lbs (directed catch) of co-occurring species during a seasonal closure.

STEP 5 - Determine incidental catch.
This step determines the incidental catch gag during a seasonal closure. Trips that use diving gear or target gag (where > 75% of the catch is gag) are dropped. This step does not take into consideration trips that will not be taken during a closure or ability of fishermen to avoid gag.

Table 50. Incidental catch of gag during a seasonal closure. Dead discards determined by applying 40% release mortality rate. Not adjusted for behavior.

Month	2001	2002	2003	2004	2005
1	30,136	27,703	13,610	27,669	32,203
2	26,780	23,712	15,898	26,890	28,797
3	93	34	653	195	178

4	3,093	508	1,331	1,305	314
Incidental catch	60,102	51,958	31,492	56,059	61,492
Dead Discards	24,041	20,783	12,597	22,424	24,597

STEP 6 – Determine incidental catch for reduced trips after quota.
Trips that target co-occurring species in STEP 3c were randomly selected to reduce the number of trips from 20% to 60%. This assumes fishermen may stop fishing for gag during a seasonal closure. Effectiveness of closure compares

Table 51. Incidental catch of during a seasonal closure (Average 2001-2005). Dead discards determined by applying 40% release mortality rate. Assumes some trips will not be made during a seasonal closure.

Trip reduction	0%	20%	40%	60%
Incidental catch	52,220	14,578	11,815	8,710
Dead Discards	20,888	5,831	4,726	3,484
Effectiveness	79.17%	94.18%	95.29%	96.53%

STEP 7 – Determine dead discards for reduced trips and behavior after quota.
This step assumes that some trips could be reduced and fishermen could have the ability to avoid gag by fishing differently.

Table 52. Incidental catch of gag assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	52,220	41,776	25,066	10,026	14,578	11,662	6,997	2,799	11,815	9,452	5,671	2,269	8,710	6,968	4,181	1,672
Dead Discards	20,888	16,711	10,026	4,011	5,831	4,665	2,799	1,120	4,726	3,781	2,269	907	3,484	2,787	1,672	669
Effectiveness	79.17%	83.34%	90.00%	96.00%	94.18%	95.35%	97.21%	98.88%	95.29%	96.23%	97.74%	99.10%	96.53%	97.22%	98.33%	99.33%

Examination of the NMFS Logbook database (8/3/07) revealed the species most commonly taken on commercial trips with gag during 2003-2005 were vermilion snapper, scamp, greater amberjack, red grouper, and red snapper. If fishermen were to target these species during a closure and release mortality of gag is 40% (SEDAR 10 2007), it is anticipated a closure would be 79% effective (Table 30). However, if fishermen choose not to take trips or can avoid gag by using different fishing methods, the effectiveness of a closure could be greater. For the purposes here, it is assumed 20% of the trips would be reduced during a closure but 20% of the catch of gag can be avoided by changing fishing methodology or location of fishing. This scenario would result in a 95% effectiveness of a closure. The Snapper Grouper Advisory Panel is reviewing the methodology.

Examination of the discard logbook database revealed that the average number of discarded gag was less during March and April than during all other months except December through February. The data suggest fishermen can avoid gag to some degree during a closure but also indicates gag are still caught and discarded when targeting other species. The data also indicate that magnitude of gag discarded by commercial fishermen is small.

Table 53. Expanded number of discarded gag during 2002-2005. From NMFS discarded logbook.

month	2002	2003	2004	2005	Mean
1	171	140	153	10	118
2	191	100	111	5	102
3	361	222	89	0	168
4	491	186	0	0	169
5	93	412	272	128	226
6	97	297	234	685	328
7	32	97	170	271	143
8	300	129	289	67	196
9	739	254	868	43	476
10	1,989	261	902	48	800
11	658	193	489	461	450
12	292	18	140	43	123

The following two tables provide reduction from a seasonal closure considering 100% and 95% effectiveness of closure.

Table 54. Monthly reduction in take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	10.4%	20.6%	21.0%	21.4%	36.4%	46.9%	56.1%	63.6%	69.7%	80.0%	91.0%	100.0%
2		10.3%	10.7%	11.0%	26.1%	36.6%	45.8%	53.2%	59.4%	69.7%	80.7%	89.6%
3			0.4%	0.7%	15.8%	26.3%	35.5%	42.9%	49.1%	59.4%	70.4%	79.4%
4				0.3%	15.4%	25.9%	35.1%	42.6%	48.7%	59.0%	70.0%	79.0%
5					15.1%	25.6%	34.8%	42.2%	48.4%	58.7%	69.6%	78.6%
6						10.5%	19.7%	27.1%	33.3%	43.6%	54.6%	63.6%
7							9.2%	16.7%	22.8%	33.1%	44.1%	53.1%
8								7.4%	13.6%	23.9%	34.9%	43.9%
9									6.1%	16.5%	27.4%	36.4%
10										10.3%	21.3%	30.3%
11											11.0%	20.0%
12												9.0%

Table 55. Monthly reduction in take based on 1999-2005 data if a seasonal closure is 95% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	9.8%	19.6%	20.0%	20.3%	34.6%	44.6%	53.3%	60.4%	66.2%	76.0%	86.5%	95.0%
2		9.8%	10.1%	10.5%	24.8%	34.7%	43.5%	50.6%	56.4%	66.2%	76.6%	85.2%
3			0.4%	0.7%	15.0%	25.0%	33.7%	40.8%	46.6%	56.4%	66.9%	75.4%
4				0.3%	14.6%	24.6%	33.4%	40.4%	46.3%	56.1%	66.5%	75.0%
5					14.3%	24.3%	33.0%	40.1%	45.9%	55.7%	66.2%	74.7%
6						10.0%	18.7%	25.8%	31.6%	41.4%	51.9%	60.4%
7							8.8%	15.8%	21.7%	31.5%	41.9%	50.4%
8								7.1%	12.9%	22.7%	33.1%	41.7%
9									5.8%	15.7%	26.1%	34.6%
10										9.8%	20.2%	28.8%
11											10.4%	19.0%
12												8.5%

3.3 Recreational

Table 56. Average landings (pounds gutted weight) of gag taken by headboat and MRFSS during 1999-2005.

Month	HB	MRFSS	Total
1	3,007	43,183	46,191
2	3,154	43,183	46,338
3	5,785	38,857	44,642
4	4,919	38,857	43,776
5	5,875	40,880	46,755
6	6,477	40,880	47,357
7	6,200	41,622	47,822
8	4,343	41,622	45,965
9	2,619	32,042	34,661
10	4,556	32,042	36,598
11	3,785	40,779	44,563
12	2,190	40,779	42,968

Table 57. Average landings (pounds gutted weight) of gag taken by headboat and MRFSS during 2001-2006.

Month	HB	MRFSS	Total
1	2,832	40,031	42,863
2	3,395	40,031	43,426
3	6,419	35,208	41,627
4	5,219	35,208	40,427
5	5,817	52,352	58,169
6	5,884	52,352	58,236
7	6,464	34,038	40,502

Month	HB	MRFSS	Total
8	4,040	34,038	38,078
9	2,712	31,665	34,377
10	4,308	31,665	35,973
11	3,612	44,962	48,574
12	1,940	44,962	46,902

3.4 Effectiveness of Recreational Closure

To determine the effectiveness of a recreational seasonal closure seven steps were taken. First, MRFSS data were examined to determine the most commonly species taken on trips with gag during the proposed January through April closure. Second, trips were identified that caught at least 1 individual of the most common species taken identified in step 1. Third, landings of gag on trips identified in step 2 that targeted co-occurring species were determined. This would be considered to be incidental catch of gag. Fourth, incidental catch was compared to actual catch to determine percentage that would still be caught during a closed season. Fifth, the portion of the gag incidental catch that would die when no retention was allowed was determined by applying a release mortality rate of 25% (SEDAR 10 2007). Sixth, the magnitude of incidental catch was estimated if the number of trips was reduced and if fishermen were able to avoid gag. Seven, determine effectiveness of closure by comparing the magnitude of dead discards to actual landings if a closure did not occur.

Table 58. Most common species taken on MRFSS trips during January – April that also caught gag. Landings are totals in number (A + B1) for 1999-2005. Represents sample not total expanded landings.

common	Obs	Mean	Sum	Percent	Cum %
vermilion snapper	43	13	559	14.52%	14.52%
black sea bass	62	6.887097	427	11.09%	25.60%
red snapper	81	3.728395	302	7.84%	33.45%
gag	407	0.732187	298	7.74%	41.18%
gray snapper	91	2.417582	220	5.71%	46.90%
lane snapper	35	5.228571	183	4.75%	51.65%
greater amberjack	45	3.311111	149	3.87%	55.52%
king mackerel	29	3.310345	96	2.49%	58.01%
white grunt	17	5.588235	95	2.47%	60.48%

Table 59. Incidental catch of during a seasonal closure (Average 1999-2005). Dead discards determined by applying 25% release mortality rate. Assumes some trips will not be made during a seasonal closure.

Trip reduction	0%	20%	40%	60%
Incidental catch	221	177	140	131
Dead Discards	55	44	35	33
Effectiveness	81.46%	85.15%	88.26%	89.01%

Table 60. Incidental catch of gag assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%			20%				40%				60%			
Percent of discards avoided	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	177	106	42	177	142	85	34	140	112	67	27	131	105	63	25
Dead Discards	44	27	11	44	35	21	8	35	28	17	7	33	26	16	6
Effectiveness	85.17%	91.10%	96.44%	85.15%	88.12%	92.87%	97.15%	88.26%	90.60%	94.36%	97.74%	89.01%	91.21%	94.72%	97.89%

Examination of the MRFSS database indicated the species most commonly taken on recreational trips (MRFSS) during January – April with gag during 2001-2005 were vermilion snapper, black sea bass, red snapper, gray snapper, lane snapper, and gray triggerfish. If fishermen were to target these species during a closure and release mortality of gag is 25% (SEDAR 10 2007), it is anticipated that a closure would be 82% effective if effort remained the same and fishermen were unable to avoid gag. If 20% of the trips are not taken and fishermen can avoid 20% of gag by changing fishing methods and locations then the effectiveness would be 88%.

Table 61. Most common species taken on Headboat trips during January – April that also caught gag. Landings are for 1999-2005. Represents sample not total expanded landings.

species	specname	N	Mean	Sum	%	Cum %
10	Vermilion Snapper	3287	97.43809	320279	23.64%	23.64%
33	Black Sea Bass	4822	54.91373	264794	19.54%	43.18%
50	White Grunt	3505	53.34979	186991	13.80%	56.98%
15	Yellowtail Snapper	4011	32.00723	128381	9.47%	66.46%
51	Tomtate	1462	45.94391	67170	4.96%	71.41%
16	Lane Snapper	3937	11.31902	44563	3.29%	74.70%
77	Gray Triggerfish	3802	9.424513	35832	2.64%	77.35%

Table 62. Incidental catch of during a seasonal closure (Average 1999-2005). Dead discards determined by applying 25% release mortality rate. Assumes some trips will not be made during a seasonal closure.

Trip reduction	0%	20%	40%	60%
Incidental catch	7,220	3,980	3,200	2,341
Dead Discards	1,805	995	800	585
Effectiveness	75.51%	86.50%	89.14%	92.06%

Table 63. Incidental catch of gag on headboat trips assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	7,220	5,776	3,466	1,386	3,980	3,184	1,910	764	3,200	2,560	1,536	614	2,341	1,873	1,124	449
Dead Discards	1,805	1,444	866	347	995	796	478	191	800	640	384	154	585	468	281	112
Effectiveness	75.51%	80.40%	88.24%	95.30%	86.50%	89.20%	93.52%	97.41%	89.14%	91.31%	94.79%	97.92%	92.06%	93.65%	96.19%	98.48%

Examination of the Headboat database indicated the species most commonly taken on recreational trips during January – April with gag during 2001-2005 were vermilion snapper, black sea bass, white grunt, and yellowtail snapper. If fishermen were to target these species during a closure and release mortality of gag is 25% (SEDAR 10 2007), it is anticipated that a closure would be 76% effective if effort remained the same and fishermen were unable to avoid gag. If 20% of the trips are not taken and fishermen can avoid 20% of gag by changing fishing methods and locations then the effectiveness would be 89%.

3.4.1 Headboat

Table 64. Average landings (pounds gutted weight) of gag taken by headboat during 1999-2005.

Month	Lbs gw	Percent
1	3,007	5.7%
2	3,154	6.0%
3	5,785	10.9%
4	4,919	9.3%
5	5,875	11.1%
6	6,477	12.2%
7	6,200	11.7%
8	4,343	8.2%
9	2,619	4.9%
10	4,556	8.6%
11	3,785	7.2%
12	2,190	4.1%

Table 65. Monthly reduction in Headboat take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	5.7%	11.6%	22.6%	31.9%	43.0%	55.2%	66.9%	75.1%	80.1%	88.7%	95.9%	100.0%
2		6.0%	16.9%	26.2%	37.3%	49.5%	61.3%	69.5%	74.4%	83.0%	90.2%	94.3%
3			10.9%	20.2%	31.3%	43.6%	55.3%	63.5%	68.5%	77.1%	84.2%	88.4%
4				9.3%	20.4%	32.6%	44.4%	52.6%	57.5%	66.1%	73.3%	77.4%
5					11.1%	23.3%	35.1%	43.3%	48.2%	56.8%	64.0%	68.1%
6						12.2%	24.0%	32.2%	37.1%	45.7%	52.9%	57.0%
7							11.7%	19.9%	24.9%	33.5%	40.6%	44.8%
8								8.2%	13.2%	21.8%	28.9%	33.1%
9									4.9%	13.6%	20.7%	24.9%
10										8.6%	15.8%	19.9%
11											7.2%	11.3%
12												4.1%

Table 66. Monthly reduction in Headboat take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	5.1%	10.4%	20.1%	28.4%	38.3%	49.1%	59.6%	66.9%	71.3%	79.0%	85.3%	89.0%
2		5.3%	15.0%	23.3%	33.2%	44.1%	54.5%	61.8%	66.2%	73.9%	80.3%	83.9%
3			9.7%	18.0%	27.9%	38.8%	49.2%	56.5%	60.9%	68.6%	75.0%	78.6%
4				8.3%	18.2%	29.1%	39.5%	46.8%	51.2%	58.9%	65.2%	68.9%
5					9.9%	20.8%	31.2%	38.5%	42.9%	50.6%	56.9%	60.6%
6						10.9%	21.3%	28.6%	33.0%	40.7%	47.1%	50.7%
7							10.4%	17.7%	22.1%	29.8%	36.2%	39.9%
8								7.3%	11.7%	19.4%	25.7%	29.4%
9									4.4%	12.1%	18.4%	22.1%
10										7.7%	14.0%	17.7%
11											6.4%	10.0%
12												3.7%

3.4.2 MRFSS Private

Table 67. Average landings (pounds gutted weight) of gag taken by private MRFSS during 1999-2005.

Month	Lbs gw	Percent
1	33,916	9.5%
2	33,916	9.5%
3	27,248	7.7%
4	27,248	7.7%
5	24,620	6.9%
6	24,620	6.9%
7	33,682	9.5%
8	33,682	9.5%
9	25,199	7.1%
10	25,199	7.1%
11	33,205	9.3%
12	33,205	9.3%

Table 68. Monthly reduction in private MRFSS take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	9.5%	19.1%	26.7%	34.4%	41.3%	48.2%	57.7%	67.2%	74.2%	81.3%	90.7%	100.0%
2		9.5%	17.2%	24.9%	31.8%	38.7%	48.2%	57.6%	64.7%	71.8%	81.1%	90.5%
3			7.7%	15.3%	22.2%	29.2%	38.6%	48.1%	55.2%	62.3%	71.6%	80.9%
4				7.7%	14.6%	21.5%	31.0%	40.4%	47.5%	54.6%	63.9%	73.3%
5					6.9%	13.8%	23.3%	32.8%	39.9%	46.9%	56.3%	65.6%
6						6.9%	16.4%	25.9%	32.9%	40.0%	49.4%	58.7%
7							9.5%	18.9%	26.0%	33.1%	42.4%	51.8%
8								9.5%	16.6%	23.6%	33.0%	42.3%
9									7.1%	14.2%	23.5%	32.8%
10										7.1%	16.4%	25.8%
11											9.3%	18.7%
12												9.3%

Table 69. Monthly reduction in private MRFSS take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	8.5%	17.0%	23.8%	30.6%	36.8%	42.9%	51.4%	59.8%	66.1%	72.4%	80.7%	89.0%
2		8.5%	15.3%	22.1%	28.3%	34.4%	42.9%	51.3%	57.6%	63.9%	72.2%	80.5%
3			6.8%	13.6%	19.8%	26.0%	34.4%	42.8%	49.1%	55.4%	63.7%	72.0%
4				6.8%	13.0%	19.1%	27.6%	36.0%	42.3%	48.6%	56.9%	65.2%
5					6.2%	12.3%	20.7%	29.2%	35.5%	41.8%	50.1%	58.4%
6						6.2%	14.6%	23.0%	29.3%	35.6%	43.9%	52.2%
7							8.4%	16.9%	23.2%	29.5%	37.8%	46.1%
8								8.4%	14.7%	21.0%	29.3%	37.6%
9									6.3%	12.6%	20.9%	29.2%
10										6.3%	14.6%	22.9%
11											8.3%	16.6%
12												8.3%

3.4.3 MRFSS Charter

Table 70. Average landings (pounds gutted weight) of gag taken by charter MRFSS during 1999-2005.

Month	Lbs gw	Percent
1	9,267	8.3%
2	9,267	8.3%
3	11,059	9.9%
4	11,059	9.9%
5	14,697	13.1%
6	14,697	13.1%
7	7,926	7.1%
8	7,926	7.1%
9	6,712	6.0%
10	6,712	6.0%
11	6,329	5.7%
12	6,329	5.7%

Table 71. Monthly reduction in charter MRFSS take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	8.3%	16.6%	26.4%	36.3%	49.4%	62.6%	69.6%	76.7%	82.7%	88.7%	94.3%	100.0%
2		8.3%	18.2%	28.0%	41.2%	54.3%	61.4%	68.4%	74.4%	80.4%	86.1%	91.7%
3			9.9%	19.8%	32.9%	46.0%	53.1%	60.2%	66.2%	72.1%	77.8%	83.4%
4				9.9%	23.0%	36.1%	43.2%	50.3%	56.3%	62.3%	67.9%	73.6%
5					13.1%	26.2%	33.3%	40.4%	46.4%	52.4%	58.0%	63.7%
6						13.1%	20.2%	27.3%	33.3%	39.3%	44.9%	50.6%
7							7.1%	14.2%	20.2%	26.1%	31.8%	37.4%
8								7.1%	13.1%	19.1%	24.7%	30.4%
9									6.0%	12.0%	17.6%	23.3%
10										6.0%	11.6%	17.3%
11											5.7%	11.3%
12												5.7%

Table 72. Monthly reduction in charter MRFSS take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	7.4%	14.7%	23.5%	32.3%	44.0%	55.7%	62.0%	68.3%	73.6%	78.9%	84.0%	89.0%
2		7.4%	16.2%	24.9%	36.6%	48.3%	54.6%	60.9%	66.2%	71.6%	76.6%	81.6%
3			8.8%	17.6%	29.3%	40.9%	47.2%	53.5%	58.9%	64.2%	69.2%	74.3%
4				8.8%	20.5%	32.2%	38.5%	44.8%	50.1%	55.4%	60.4%	65.5%
5					11.7%	23.4%	29.7%	36.0%	41.3%	46.6%	51.7%	56.7%
6						11.7%	18.0%	24.3%	29.6%	34.9%	40.0%	45.0%
7							6.3%	12.6%	17.9%	23.3%	28.3%	33.3%
8								6.3%	11.6%	17.0%	22.0%	27.0%
9									5.3%	10.7%	15.7%	20.7%
10										5.3%	10.4%	15.4%
11											5.0%	10.1%
12												5.0%

3.4.4 MRFSS All Modes

Table 73. Average landings (pounds gutted weight) of gag taken by MRFSS (all modes) during 1999-2005.

Month	Lbs gw	Percent
1	43,183	9.1%
2	43,183	9.1%
3	38,857	8.2%
4	38,857	8.2%
5	40,880	8.6%
6	40,880	8.6%
7	41,622	8.8%
8	41,622	8.8%
9	32,042	6.7%
10	32,042	6.7%
11	40,779	8.6%
12	40,779	8.6%

Table 74. Monthly reduction in MRFSS (all modes) take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	9.1%	18.2%	26.4%	34.6%	43.2%	51.8%	60.6%	69.3%	76.1%	82.8%	91.4%	100.0%
2		9.1%	17.3%	25.5%	34.1%	42.7%	51.5%	60.2%	67.0%	73.7%	82.3%	90.9%
3			8.2%	16.4%	25.0%	33.6%	42.4%	51.1%	57.9%	64.6%	73.2%	81.8%
4				8.2%	16.8%	25.4%	34.2%	42.9%	49.7%	56.4%	65.0%	73.6%
5					8.6%	17.2%	26.0%	34.8%	41.5%	48.3%	56.8%	65.4%
6						8.6%	17.4%	26.1%	32.9%	39.6%	48.2%	56.8%
7							8.8%	17.5%	24.3%	31.0%	39.6%	48.2%
8								8.8%	15.5%	22.3%	30.9%	39.4%
9									6.7%	13.5%	22.1%	30.7%
10										6.7%	15.3%	23.9%
11											8.6%	17.2%
12												8.6%

Table 75. Monthly reduction in MRFSS (all modes) take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	8.1%	16.2%	23.5%	30.8%	38.4%	46.1%	53.9%	61.7%	67.7%	73.7%	81.4%	89.0%
2		8.1%	15.4%	22.7%	30.3%	38.0%	45.8%	53.6%	59.6%	65.6%	73.3%	80.9%
3			7.3%	14.6%	22.2%	29.9%	37.7%	45.5%	51.5%	57.5%	65.2%	72.8%
4				7.3%	14.9%	22.6%	30.4%	38.2%	44.2%	50.2%	57.9%	65.5%
5					7.7%	15.3%	23.1%	30.9%	36.9%	42.9%	50.6%	58.2%
6						7.7%	15.5%	23.3%	29.3%	35.3%	42.9%	50.6%
7							7.8%	15.6%	21.6%	27.6%	35.3%	42.9%
8								7.8%	13.8%	19.8%	27.5%	35.1%
9									6.0%	12.0%	19.7%	27.3%
10										6.0%	13.7%	21.3%
11											7.6%	15.3%
12												7.6%

3.4.5 MRFSS/Headboat Combined

Table 76. Average landings (pounds gutted weight) of vermilion snapper taken by MRFSS/Headboat during 1999-2005.

Month	Lbs gw	Percent
1	46,191	8.8%
2	46,338	8.8%
3	44,642	8.5%
4	43,776	8.3%
5	46,755	8.9%
6	47,357	9.0%
7	47,822	9.1%
8	45,965	8.7%
9	34,661	6.6%
10	36,598	6.9%
11	44,563	8.4%
12	42,968	8.1%

Table 77. Monthly reduction in MRFSS/Headboat take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	8.8%	17.5%	26.0%	34.3%	43.2%	52.1%	61.2%	69.9%	76.5%	83.4%	91.9%	100.0%
2		8.8%	17.2%	25.5%	34.4%	43.4%	52.4%	61.2%	67.7%	74.7%	83.1%	91.2%
3			8.5%	16.8%	25.6%	34.6%	43.7%	52.4%	58.9%	65.9%	74.3%	82.5%
4				8.3%	17.2%	26.1%	35.2%	43.9%	50.5%	57.4%	65.9%	74.0%
5					8.9%	17.8%	26.9%	35.6%	42.2%	49.1%	57.6%	65.7%
6						9.0%	18.0%	26.8%	33.3%	40.3%	48.7%	56.8%
7							9.1%	17.8%	24.3%	31.3%	39.7%	47.9%
8								8.7%	15.3%	22.2%	30.7%	38.8%
9									6.6%	13.5%	22.0%	30.1%
10										6.9%	15.4%	23.5%
11											8.4%	16.6%
12												8.1%

Table 78. Monthly reduction in MRFSS/Headboat take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	7.8%	15.6%	23.1%	30.5%	38.4%	46.4%	54.5%	62.2%	68.1%	74.2%	81.8%	89.0%
2		7.8%	15.3%	22.7%	30.6%	38.6%	46.7%	54.4%	60.3%	66.4%	74.0%	81.2%
3			7.5%	14.9%	22.8%	30.8%	38.9%	46.6%	52.5%	58.6%	66.1%	73.4%
4				7.4%	15.3%	23.3%	31.3%	39.1%	44.9%	51.1%	58.6%	65.9%
5					7.9%	15.9%	23.9%	31.7%	37.5%	43.7%	51.2%	58.5%
6						8.0%	16.1%	23.8%	29.7%	35.8%	43.3%	50.6%
7							8.1%	15.8%	21.7%	27.8%	35.4%	42.6%
8								7.8%	13.6%	19.8%	27.3%	34.5%
9									5.8%	12.0%	19.5%	26.8%
10										6.2%	13.7%	20.9%
11											7.5%	14.8%
12												7.2%

Gag spawn from December through May with peak spawning during March and April. A January through April spawning season closure would provide a reduction of 34% if closure was 100% effective and a reduction of 31% if closure was 89% effective.

4 Quota and Seasonal Closure

Table 79. Monthly catch (pounds gutted weight) of gag during 1999-2005 (average). Cells highlighted in yellow represents when a 353,940 gutted weight quota would be met and cells highlighted in green represents when a 423,340 pound gutted weight quota would be met.

Month	1995-2005	Cumulative		
		No Action	March-May Closure	Jan-April Closure
1	57,110	57,110	57,110	0
2	56,700	113,810	113,810	0
3	2,110	115,920	115,920	2,110
4	1,927	117,847	117,847	4,037
5	83,065	200,912	117,847	87,101
6	57,890	258,802	175,737	144,992
7	50,887	309,689	226,625	195,879
8	40,978	350,667	267,603	236,857
9	33,918	384,586	301,521	270,775
10	57,003	441,589	358,524	327,778
11	60,498	502,086	419,022	388,276
12	49,595	551,682	468,617	437,871

Table 80. Monthly catch (pounds gutted weight) of gag during 2001-2006 (average). Cells highlighted in yellow represents when a 353,940 gutted weight quota would be met and cells highlighted in green represents when a 423,340 pound gutted weight quota would be met.

		Cumulative		
Month	2001-2006	No Action	March-May Closure	Jan-April Closure
1	58,389	58,389	58,389	0
2	52,953	111,342	111,342	0
3	1,274	112,616	112,616	1,274
4	2,106	114,722	114,722	3,380
5	79,875	194,597	114,722	83,255
6	60,435	255,033	175,157	143,691
7	51,177	306,210	226,334	194,868
8	44,313	350,523	270,648	239,181
9	34,226	384,749	304,874	273,407
10	51,963	436,712	356,836	325,370
11	55,521	492,233	412,357	380,891
12	48,185	540,418	460,542	429,075

Based on data from 1999-2005 and 2001-2006, a 353,940 pound gutted weight quota would be met in September with the current March-April closure, October with a March-May closure, and November with a January-April closure. A 423,340 pound gutted weight quota would be met in October with the current March-April closure and during December with a longer closure. This assumes no reduction in effort associated with management measures imposed on vermilion snapper,

5 Commercial Trip Limit Analysis

Table 81. Trip limit analysis for data from 1999-2005.

	Avg 1999-2005				
Trip Limit (pounds gutted weight)	**Avg no. trips**	**Avg pounds gw over limit**	**Expected catch**	**% trips over limit**	**% reduction in catch from limit**
0	2,538	469,922	0	100.0	100.0
212	641	195,143	274,780	25.2	41.5
254	522	170,615	299,308	20.6	36.3
424	275	106,537	363,385	10.8	22.7
508	211	86,036	383,886	8.3	18.3
593	165	70,264	399,658	6.5	15.0
678	130	57,703	412,219	5.1	12.3
763	104	47,710	422,212	4.1	10.2
847	84	39,765	430,158	3.3	8.5
932	71	33,218	436,704	2.8	7.1

1,017	58	27,775	442,148	2.3	5.9
1,102	48	23,286	446,637	1.9	5.0
1,186	40	19,539	450,383	1.6	4.2
1,271	31	16,547	453,375	1.2	3.5
1,356	26	14,167	455,756	1.0	3.0
1,441	21	12,187	457,735	0.8	2.6
1,525	17	10,605	459,318	0.7	2.3
1,610	15	9,255	460,668	0.6	2.0
1,695	12	8,141	461,781	0.5	1.7
1,907	8	6,059	463,863	0.3	1.3
2,119	6	4,546	465,376	0.2	1.0
2,331	4	3,467	466,455	0.2	0.7
2,542	3	2,614	467,308	0.1	0.6
2,754	3	1,976	467,946	0.1	0.4
2,966	2	1,516	468,407	0.1	0.3
3,178	1	1,204	468,718	0.1	0.3
3,390	1	941	468,981	0.0	0.2
3,602	1	722	469,200	0.0	0.2
3,814	1	551	469,371	0.0	0.1

Table 82. Trip limit analysis for data from 2006.

Trip Limit (pounds gutted weight)	2006				
	Avg no. trips	Avg pounds gw over limit	Expected catch	% trips over limit	% reduction in catch from limit
0	2,585	418,295	0	100.0	100.0
212	578	161,790	256,505	22.4	38.7
254	461	139,836	278,459	17.8	33.4
424	218	85,866	332,429	8.4	20.5
508	167	69,558	348,737	6.5	16.6
593	121	57,763	360,532	4.7	13.8
678	93	48,724	369,570	3.6	11.6
763	78	41,511	376,784	3.0	9.9
847	65	35,449	382,846	2.5	8.5
932	57	30,281	388,014	2.2	7.2
1,017	45	25,933	392,362	1.7	6.2
1,102	36	22,541	395,754	1.4	5.4
1,186	29	19,753	398,542	1.1	4.7
1,271	20	17,734	400,561	0.8	4.2
1,356	18	16,138	402,157	0.7	3.9
1,441	16	14,707	403,588	0.6	3.5
1,525	14	13,398	404,897	0.5	3.2
1,610	14	12,211	406,084	0.5	2.9
1,695	13	11,079	407,216	0.5	2.6
1,907	8	9,043	409,252	0.3	2.2
2,119	6	7,553	410,742	0.2	1.8
2,331	4	6,417	411,878	0.2	1.5
2,542	4	5,570	412,725	0.2	1.3
2,754	3	4,756	413,539	0.1	1.1
2,966	2	4,143	414,152	0.1	1.0
3,178	2	3,719	414,575	0.1	0.9
3,390	1	3,364	414,931	0.0	0.8
3,602	1	3,152	415,143	0.0	0.8
3,814	1	2,940	415,355	0.0	0.7
4,025	1	2,728	415,567	0.0	0.7
4,237	1	2,516	415,779	0.0	0.6
4,449	1	2,304	415,991	0.0	0.6
4,661	1	2,092	416,203	0.0	0.5
4,873	1	1,881	416,414	0.0	0.4
5,085	1	1,669	416,626	0.0	0.4

6 Recreational Bag Limit Analysis (gag, black grouper and gag, aggregate)

Table 83. Estimate of harvest reduction associated with reducing the aggregate bag limit from 5 to 3, gag and black grouper from 2 to 1, and gag from 2 to 1 using data from 1999-2005 for (1) headboat, (2) private MRFSS, (3) charter MRFSS, (4) private/charter MRFSS combined, and (5) all recreational sectors combined. Assumes a release mortality of 25% for gag, black grouper, red grouper, scamp, tiger grouper, yellowfin grouper, coney, sand tilefish, graysby, rock hind, red hind, and yellowmouth grouper. Assumes 100% release mortality for snowy grouper golden tilefish, blueline tilefish, yellowedge grouper, and misty grouper. **Assumes compliance with bag limit.**

	Estimated Harvest Reductions				
Species	Headboat	Private	Charter	MRFSS	Combined
Aggregate	0.8	1.9	3.2	2.2	1.9
Gag and Black	2.6	6.8	11.6	8.0	7.4
Gag	2.7	7.3	10.5	8.1	7.5
Gag w/ aggregate*	3.8	7.3	12.7	8.6	8.1
Gag w/ agg & black*	4.3	7.3	14.8	9.1	8.6

*Includes effect on gag of reducing aggregate bag limit to 3 fish and black grouper to 1 fish.

Table 84. Same as table 83 except **analyses exclude captain and crew** from retaining any grouper species. Adjustments not made to private sector of MRFSS. **Assumes compliance with bag limit.**

	Estimated Harvest Reductions				
Species	Headboat	Private	Charter	MRFSS	Combined
Aggregate	1.1	1.9	4.7	2.6	2.3
Gag and Black	3.6	6.8	17.8	9.4	8.8
Gag	3.8	7.3	11.9	8.4	8.0
Gag w/ aggregate*	4.7	7.3	13.9	8.9	8.5
Gag w/ agg & black*	5.2	7.3	16.2	9.5	9.0

*Includes effect on gag of reducing aggregate bag limit to 3 fish and black grouper to 1 fish.

To determine the reduction in harvest for MRFSS in Tables 83 and 84, reductions in the private and charter sectors of MRFSS were combined based on the proportion of landings represented by each sector. Similarly, reductions in harvest for all sectors (Headboat and MRFSS combined) was based on proportion of landings represented by each sector.

Table 85. Estimate of harvest reduction associated with reducing the bag limit from 2 to 1 gag using data from 1999-2005 for (1) headboat, (2) private MRFSS, (3) charter MRFSS, (4) private/charter MRFSS combined, and (5) all recreational sectors combined. Assumes a release mortality of 25% for gag, black grouper, red grouper, scamp, tiger grouper, yellowfin grouper, coney, sand tilefish, graysby, rock hind, red hind, and yellowmouth grouper. Assumes 100% release mortality for snowy grouper golden tilefish, blueline tilefish, yellowedge grouper, and misty grouper. **Takes into consideration non-compliance with bag limit.**

	Estimated Harvest Reductions				
Species	Headboat	Private	Charter	MRFSS	Combined
Aggregate	0.7	1.3	2.5	1.6	1.4
Gag and Black	2.1	3.1	6.6	4.0	3.8
Gag	2.3	5.4	6.1	5.6	5.3
Gag w/ aggregate*	3.3	5.4	8.4	6.1	5.9

Gag w/ agg & black*	3.8	5.4	10.7	6.7	6.4

*Includes effect on gag of reducing aggregate bag limit to 3 fish and black grouper to 1 fish.

Table 86. Same as Table 85 except analyses **exclude captain and crew** from retaining any grouper species. Adjustments not made to private sector of MRFSS. **Assumes non-compliance with bag limit.**

Species	Estimated Harvest Reductions				
	Headboat	Private	Charter	MRFSS	Combined
Aggregate	0.7	1.3	3.3	1.8	1.6
Gag and Black	2.4	3.1	9.2	4.6	4.4
Gag	2.6	5.4	6.5	5.7	5.4
Gag w/ aggregate*	3.6	5.4	8.7	6.2	5.9
Gag w/ agg & black*	4.1	5.4	11.1	6.8	6.5

*Includes effect on gag of reducing aggregate bag limit to 3 fish and black grouper to 1 fish.

To determine the reduction in harvest for MRFSS in Tables 85 and 86, reductions in the private and charter sectors of MRFSS were combined based on the proportion of landings represented by each sector. Similarly, reductions in harvest for all sectors (Headboat and MRFSS combined) was based on proportion of landings represented by each sector.

Four percent of the A+B1 MRFSS harvest occurred when fishermen landing three or more of the grouper aggregate species. Therefore, a reduction in the grouper aggregate from 5 to 3 fish for MRFSS could be expected to have some effect on reducing gag harvest. An estimate is provided but the exact amount is difficult to quantify.

7 Post Quota Bycatch Mortality

Regulations in Amendment 16 will initially decrease the allowable commercial catch of gag from 18 to 37%, depending on the allocation alternative selected. In addition, a 60% reduction in commercial harvest could occur for vermilion snapper based on a recent assessment update; however, this value could change since a new age based assessment is being conducted. A variety of management measures are available to end overfishing of these species, including a commercial quota. If a commercial quota is met for gag or vermilion snapper, it is expected there would still be some catch when fishermen target co-occurring species. These species would have to be released and a percentage of the incidentally caught gag and vermilion snapper would die, depending on depth of capture. The magnitude of incidentally caught gag and vermilion snapper that die after a quota is met is referred to as post quota bycatch mortality (PQBM). The range of management measures used, how fishermen will behave in response to reduced harvest levels, and ability to avoid a species after the quota is met will affect PQBM.

The Scientific and Statistical Committee (SSC) stated quotas should be adjusted for dead discards that could occur after a quota is. Furthermore, the SSC feels a seasonal closure would not be 100% effective in protecting a species since some incidental catch and mortality of the species would be expected.

At the December 2007 South Atlantic Council (Council) meeting, a methodology to estimate dead discards after a quota is met or during a seasonal closure was presented to the SSC and the Council. After discussions with the SSC and Council, two issues were unresolved. First, what is the percentage of trips that would not be made to target co-occurring snapper grouper species if the fishery for gag or vermilion snapper was closed? Second, what is percentage of gag or vermilion snapper that can be avoided by fishermen targeting co-occurring species during a closure if fishing methodology and or fishing location was changed? The SSC and Council indicated the Snapper Grouper Advisory Panel (AP) was best suited to answer these questions. The AP is currently reviewing the methodology.

<u>Assumptions</u>

- Trip based logbook data are used to estimate incidental catch of vermilion snapper and gag when fishermen target co-occurring species.
- Vermilion snapper and gag are taken by many fishermen on the same trip.
- If a fisherman cannot net at least $50.00/day, the trip is not included in analyses.
- In determining incidental catch of gag or vermilion snapper, a co-occurring species is targeted if at least 100 lbs whole weight is taken on a trip.
- If vermilion snapper or gag make up greater than 75% of the catch on a trip, it is not included in analyses.
- Fishermen will not use diving gear to target gag after a quota is met or during a seasonal closure.
- There will not be an increase in fishing effort before or after a seasonal closure.
- Some trips that target co-occurring species will not be taken after a quota is met. A range of 20 to 60% is used.
- Fishermen can avoid vermilion snapper and gag to some degree by changing hook size, method of fishing, and location. A range of 20 to 60% in reduction of catch is used.
- Dead discards are determined by applying release mortality rate of 40% for commercially caught vermilion snapper and gag.

7.1 Estimate of PQBM with Quota but no Gag Seasonal Closure

Table 87. Incidental catch of gag assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	319,206	255,365	153,219	61,287	177,554	142,043	85,226	34,090	143,839	115,071	69,043	27,617	105,598	84,478	50,687	20,275
Dead Discards	127,682	102,146	61,287	24,515	71,022	56,817	34,090	13,636	57,536	46,029	27,617	11,047	42,239	33,791	20,275	8,110

Table 88. Incidental catch of gag assuming a range in trips (0 to 60%) are not taken after 353,940 lb gutted weight quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	34,798	27,838	16,703	6,681	20,456	16,365	9,819	3,928	15,244	12,195	7,317	2,927	11,733	9,386	5,632	2,253
Dead Discards	13,919	11,135	6,681	2,672	8,182	6,546	3,928	1,571	6,098	4,878	2,927	1,171	4,693	3,755	2,253	901

7.2 Estimate of PQBM With Quota and Seasonal Closure

Table 89. Incidental catch of gag assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	333,884	267,108	160,265	64,106	178,926	143,141	85,885	34,354	150,803	120,643	72,386	28,954	113,592	90,873	54,524	21,810
Dead Discards	133,554	106,843	64,106	25,642	71,571	57,256	34,354	13,742	60,321	48,257	28,954	11,582	45,437	36,349	21,810	8,724

Table 90. Incidental catch of gag assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	4,816	3,853	2,312	925	2,597	2,078	1,247	499	2,640	2,112	1,267	507	1,510	1,208	725	290
Dead Discards	1,927	1,541	925	370	1,039	831	499	199	1,056	845	507	203	604	483	290	116

8 Shallow Water Grouper Unit

8.1 Average landings of shallow water grouper species

Table 91. Average landings (pounds gutted weight) from 1999-2005 by sector for shallow water grouper species.

Species	Avg comm	Avg MRFSS	Avg Headboat	Avg rec	% Comm	% rec
Gag	551,682	474,726	52,911	527,637	51.11%	48.89%
Red Grouper	391,736	132,263	41,882	174,145	69.23%	30.77%
Scamp	277,122	75,906	60,522	136,429	67.01%	32.99%
Black Grouper	163,375	37,019	9,631	46,650	77.79%	22.21%
Rock Hind	19,291	2,695	5,346	8,041	70.58%	29.42%
Red Hind	15,960	2,400	798	3,198	83.31%	16.69%
Yellowfin Grouper	3,459	379	336	714	82.89%	17.11%
Graysby	3,117	4,125	5,167	9,292	25.12%	74.88%
Yellowmouth Grouper	104	764	723	1,487	6.56%	93.44%
Coney	24	612	55	667	3.47%	96.53%
Tiger Grouper	0	0	0	0		

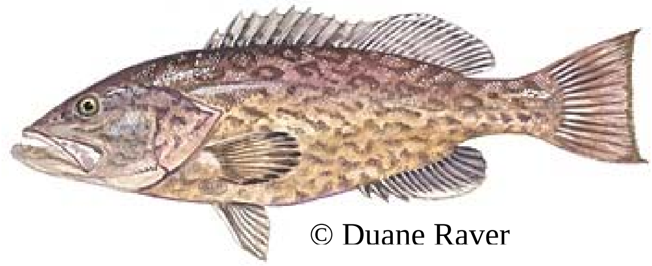
8.2 Spawning seasons of shallow water grouper species

Table 92. Spawning season information for groupers species taken in shallow water.

Species	Spawning Season	Peak
Gag	Dec-May	March-April
Black Grouper	All Year	Jan-March
Scamp	Feb-July	March-May
Red Grouper	Feb-June	April
Red Hind	May-Aug	Unknown
Rock Hind	May-Aug	Unknown
Yellowmouth Grouper	All Year	March-May
Tiger Grouper	Dec-April	Unknown
Yellowfin Grouper	March-August	Unknown
Graysby	May-Aug	Unknown
Coney	Jan-Feb	Unknown

8.3 Species descriptions of shallow water grouper species

8.3.1 Gag, *Mycteroperca microlepis*



Gag occurs in the Western Atlantic from North Carolina to the Yucatan Peninsula, and throughout the Gulf of Mexico. Juveniles are sometimes observed as far north as Massachusetts (Heemstra and Randall 1993). Gag commonly occur at depths of 39-152 m (131-498 ft) (Heemstra and Randall 1993) and prefer inshore-reef and shelf-break habitats (Hood and Schlieder 1992). Bullock and Smith (1991) indicated gag probably do not move seasonally between reefs in the Gulf of Mexico, but show a gradual shift toward deeper water with age. McGovern *et al.* (2005) reported extensive movement of gag along the Southeast United States. In a tagging study, 23% of the 435 recaptured gag moved distances greater that 185 km (100 nautical miles). Most of these individuals were tagged off South Carolina and were recaptured off Georgia, Florida, and in the Gulf of Mexico (McGovern *et al.* 2005).

Gag are probably estuarine dependent (Keener *et al.* 1988; Ross and Moser 1995; Koenig and Coleman 1998; Strelcheck *et al.* 2003). Juveniles (age 0) occur in shallow grass beds along Florida's east coast during the late spring and summer (Bullock and Smith 1991). Sea grass is also an important nursery habitat for juvenile gag in North Carolina (Ross and Moser 1995). Post-larval gag enter South Carolina estuaries when they are 13 mm (0.5 inches) TL and 40 days old during April and May each year (Keener *et al.* 1988), and utilize oyster shell rubble as nursery habitat. Juveniles remain in estuarine waters throughout the summer and move offshore as water temperatures cool during September and October. Adults are often seen in shallow water 5-15 m (16-49 ft) above the reef (Bullock and Smith 1991) and as far as 40-70 km (22-38 nautical miles) offshore.

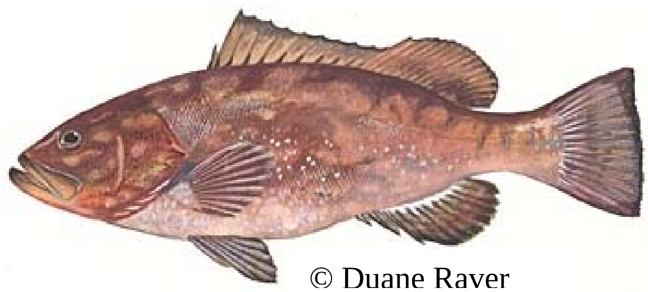
Huntsman *et al.* (1999) indicated gag are vulnerable to overfishing since they are long-lived, late to mature, change sex, and aggregate to spawn. The estimated natural mortality rate is 0.14 (SEDAR 10 2007). Maximum reported size for gag is 145 cm (57.5 inches) TL and 36.5 kg (81 pounds) (Heemstra and Randall 1993), and maximum reported age is 26 years (Harris and Collins 2000). Gag is a sequential hermaphrodite, changing sex from female to male with increased size and age (Coleman *et al.* 1996; McGovern *et al.* 1998; Coleman *et al.* 2000). All individuals less than 87.5 cm (34.7 inches) TL are females. At 105.0 cm (41.6 inches) TL, 50% of fishes are males. Almost all gag are males at sizes greater than 120.0 cm (47.5 inches) TL (McGovern *et al.* 1998).

Along the southeastern United States (1994-1995), size at first maturity is 50.8 cm (20.2 inches) TL, and 50% of gag females are sexually mature at 62.2 cm (24.7 inches) (McGovern *et al.* 1998). According to Harris and Collins (2000), age-at-first-maturity is 2 years, and 50% of gag are mature at 3 years. For data collected during 1978-1982 off the southeastern United States, McGovern *et al.* (1998) reported the smallest mature females were 58.0 cm (22.9 inches) TL and 3 years old. Hood and Schlieder (1992) indicated most females reach sexual maturity at ages 5-7 in the Gulf of Mexico. Off the southeastern United States, gag spawn from December through May, with a peak in March and April (McGovern *et al.* 1998). Duration of planktonic larvae is about 42 days (Keener *et al.* 1988; Koenig and Coleman 1998; Lindemen *et al.* 2000). McGovern *et al.* (1998) reported the percentage of male gag landed by commercial fishermen decreased from 20% during 1979-1981 to 6% during 1995-1996. This coincided with a decrease in the mean length of fish landed. A similar decrease in the percentage of males was reported in the Gulf of Mexico (Hood and Schleider 1992; Coleman *et al.* 1996).

Adults are sometimes solitary, and can occur in groups of 5 to 50 individuals. They feed primarily on fishes, crabs, shrimps, and cephalopods (Heemstra and Randall 1993), and often forage in small groups far from the reef ledge (Bullock and Smith 1991). Juveniles feed primarily on crustaceans, and begin to consume fishes when they reach about 25 mm (1 inch) in length (Bullock and Smith 1991; Mullaney 1994).

8.3.2 Red grouper, *Epinephelus morio*

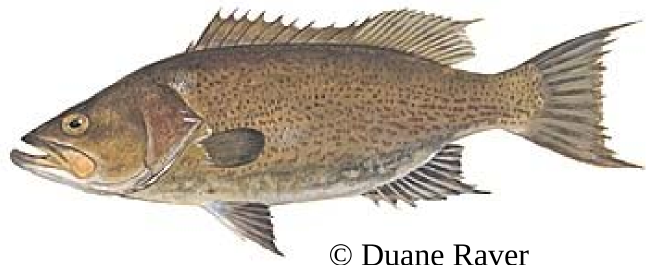
Red grouper occur in the Western Atlantic, ranging as far north as Massachusetts to southeastern Brazil, including the eastern Gulf of Mexico (Robins and Ray 1986). The red grouper is uncommon around coral reefs; it generally occurs over flat rock perforated with solution holes (Bullock and Smith 1991), and is commonly found in the caverns and crevices of limestone reef in the Gulf of Mexico (Moe 1969). It also occurs over rocky reef bottoms (Moe 1969).



Adult red grouper are sedentary fish that are usually found at depths of 5-300 m (16-984 ft). Fishermen off North Carolina commonly catch red grouper at depths of 27-76 m (88-249 ft) for an average of 34 m (111 ft). Fishermen off southeastern Florida also catch red grouper in depths ranging from 27-76 m (88-249 ft) with an average depth of 45 m (148 ft) (Burgos 2001; McGovern *et al.* 2002). Moe (1969) reported that juveniles live in shallow water nearshore reefs until they are 40.0 cm (16 inches) and 5 years of age, when they become sexually mature and move offshore. Spawning occurs during February-June, with a peak in April (Burgos 2001). In the eastern Gulf of Mexico, ripe females are found December through June, with a peak during April and May (Moe 1969). Based on the presence of ripe adults (Moe 1996) and larval red grouper (Johnson and Keener 1984) spawning probably occurs offshore. Coleman *et al*. (1996) found groups of spawning red grouper at depths between 21-110 m (70-360 feet). Red grouper do not appear to form spawning aggregation or spawn at specific sites (Coleman *et al.* 1996). They are reported to spawn in depths of 30-90 m (98-295 ft) off the Southeast Atlantic coast (Burgos 2001; McGovern *et al.* 2002).

Red grouper are protogynous, changing sex from female to male with increased size and age. Off North Carolina, red grouper first become males at 50.9 cm (20.1 inches) TL and males dominate size classes greater than 70.0 cm (27.8 inches) TL. Most females transform to males between ages 7 and 14. Burgos (2001) reported that 50% of the females caught off North Carolina are undergoing sexual transition at age 8. Maximum age reported by Heemstra and Randall (1993) was 25 years. Burgos (2001) and McGovern *et al.* (2002) indicated red grouper live for at least 20 years in the Southeast Atlantic and a maximum age of 26 years has been reported for red grouper in the Gulf of Mexico (L. Lombardi, NMFS Panama City, personal communication). Natural mortality rate is estimated to be 0.20 (Potts and Brennan 2001). Maximum reported size is 125.0 cm (49.2 inches) TL (male) and 23.0 kg (51.1 pounds). For fish collected off North Carolina during the late 1990s, age at 50% maturity of females is 2.4 years and size at 50% maturity is 48.7 cm (19.3 inches) TL. Off southeastern Florida, age at 50% maturity was 2.1 years and size at 50% maturity was 52.9 cm (21.0 inches) TL (Burgos 2001; McGovern *et al.* 2002). These fish eat a wide variety of fishes, octopuses, and crustaceans, including shrimp, lobsters, and stomatopods (Bullock and Smith 1991, Heemstra and Randall 1993).

8.3.3 Scamp, *Mycteroperca phenax*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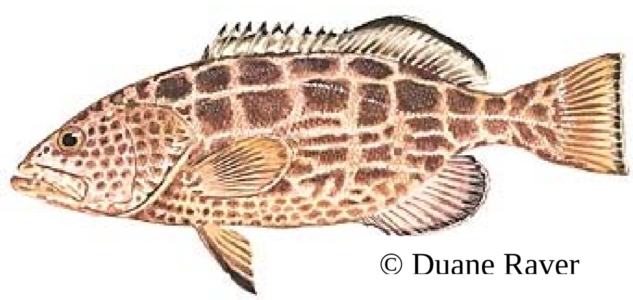
Scamp occur in the Western Atlantic, from North Carolina to Key West, in the Gulf of Mexico, and in the southern portion of the Caribbean Sea. Juveniles are sometimes encountered as far north as Massachusetts (Heemstra and Randall 1993). Its reported depth range is 30-100 m (98-328 ft) (Heemstra and Randall 1993). Juveniles are found in estuarine and shallow coastal waters (Bullock and Smith 1991; Heemstra and Randall 1993).

Scamp are protogynous, with females dominating sizes less than 70.0 cm (27.8 in) (Harris *et al.* 2002). Scamp live for at least 30 years (Harris *et al.* 2002), and attain sizes as great as 107.0 cm (42.4 inches) TL and 14.2 kg (31.3 pounds) (Heemstra and Randall 1993, in Froese and Pauly 2003). Natural mortality rate is estimated to be 0.15 (Potts and Brennan 2001). Harris *et al.* (2002) report that the length and age at first spawning of females off North Carolina to southeast Florida was 30.0-35.0 cm (11.9-13.8 inches) TL and age 1. Length and age at 50% maturity was 35.3 cm (13.9 in) TL and 1.28 years, respectively (Harris *et al.* 2002). In a study conducted in the eastern Gulf of Mexico, all fish larger than 35.0 cm TL were sexually mature (M. Godcharles and L. Bullock, unpublished data).

Spawning occurs from February through July in the South Atlantic Bight and in the Gulf of Mexico, with a peak in March to mid-May (Harris *et al.* 2002). Hydration of eggs occurs primarily during the morning and late afternoon, which indicates scamp spawn during late afternoon and evening. Spawning individuals have been captured off South Carolina and St. Augustine, Florida at depths of 33 to 93 m (108-305 ft). Scamp aggregate to spawn. Spawning locations and time of spawning overlaps with gag (Gilmore and Jones 1992). Fish are the primary prey of this species (Matheson *et al.* 1986).

8.3.4 Black grouper, *Mycteroperca bonaci*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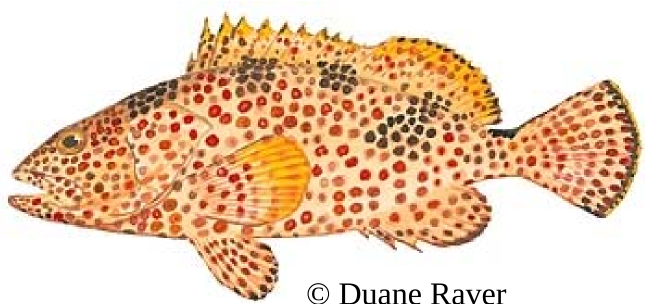
The black grouper occurs in the Western Atlantic, from North Carolina to Florida, Bermuda, the Gulf of Mexico, West Indies, and from Central America to Southern Brazil (Crabtree and Bullock 1998). Adults are found over hard bottom such as coral reefs and rocky ledges. Black grouper occur at depths of 9 to 30 m (30 to 98 ft). Juveniles sometimes occur in estuarine seagrass and oyster rubble habitat in North Carolina and South Carolina (Keener *et al.* 1988; Ross and Moser 1995). In the Florida Keys, juveniles settle on patch reefs (Sluka *et al.* 1994). Commercial landings of black grouper exceed landings of any other grouper in the Florida Keys.

Natural mortality (M) is estimated to be 0.15 (Potts and Brennan 2001). Crabtree and Bullock (1998) found black grouper live for at least 33 years and attain sizes as great as 151.8 cm (60.1 inches) TL. Females ranged in length from 15.5 to 131.0 cm (6.1-51.9 inches) TL and males range in length from 94.7 to 151.8 cm (38.3-60.1 in) TL. Black grouper are protogynous. Approximately 50% of females are sexually mature by 82.6 cm (32.7 inches) TL and 5.2 years of age. At a length of 121.4 cm (48.1 inches) TL and an age of 15.5 years, approximately 50% of the females have become males. Black grouper probably spawn throughout the year, however, peak spawning of females occurs from January to March.

Off Belize, black grouper are believed to spawn in aggregations at the same sites used by Nassau grouper (Carter and Perrine 1994). Eklund *et al.* (2000) describe a black grouper spawning aggregation discovered during winter 1997-1998, less than 100 m outside a newly designated marine reserve. Adults feed primarily on fishes.

8.3.5 Rock hind, *Epinephelus adscensionis*

Rock hind are found in the western Atlantic from Massachusetts to southern Brazil, Bermuda, the Gulf of Mexico, and the Caribbean, (Smith 1997). They also occur in the eastern Atlantic from Ascension Island and St. Helena Island (Smith 1997). The rock hind is a demersal species, inhabiting rocky reef habitat to depths of 120 m (394 ft). It is usually solitary.



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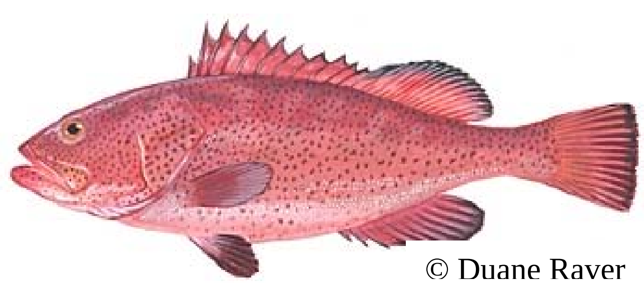
Maximum reported size is 61.0 cm (24.2 inches) TL (male) and 4.1 kg (9.1 pounds) (Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 28.0 cm (11.1 inches) TL and 6.1 years, respectively. Maximum reported age is 12 years (Potts and Manooch 1995). The natural mortality rate is estimated as 0.25 (Ault *et al*. 1998).

Heemstra and Randall (1993) indicated that rock hind in the Gulf of Mexico are protogynous. This fish has been observed to spawn in aggregations near the shelf edge off the southwest coast of Puerto Rico in January at depths of 20-30 m (66 – 98 ft) (Rielinger 1999). Off Cuba, rock hind spawn during January through March (García-Cagide *et al.* 1994). Off South Carolina, females in spawning condition (hydrated oocytes or postovulatory follicles) have been collected during May through August (Unpublished MARMAP data)**.** Crabs comprise the majority of their diet, but rock hind have also been observed to feed on fishes and young sea turtles (Heemstra and Randall 1994).

8.3.6 Red hind, *Epinephelus guttatus*

Red hind is found in the Western Atlantic from North Carolina to Venezuela and is the most common species of *Epinephelus* in Bermuda and the West Indies (Smith



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1997). The red hind is found in shallow reefs and rocky bottoms, at depths of 2-100 m (7 – 328 ft; Froese and Pauly 2003). It is usually solitary and territorial.

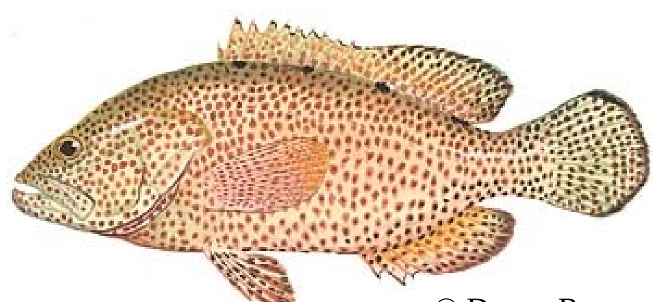
Maximum reported size is 76.0 cm (30.0 inches) TL (male) and 25.0 kg (55.5 pounds) (Heemstra and Randall 1993). Natural mortality rate is estimated to be 0.18 (Ault *et al.* 1998). Potts and Manooch (1995) examined 146 otoliths of red hind collected from North Carolina to the Dry Tortugas during 1980-1992 and report a maximum age of 11 years and maximum sizes of 49.0 cm (19.4 inches) TL. Sadovy *et al.* (1992) conducted an age and growth study of red hind from Puerto Rico (n = 624) and St. Thomas, USVI (n = 162) and report a maximum age of 18 and a maximum size of 47.5 cm (18.8 inches) TL. Luckhurst *et al.* (1992) captured a red hind off Bermuda that was 72.0 cm (28.5 in) TL and 22 years old.

Sadovy *et al.* (1994) found that red hind collected off Puerto Rico are protogynous. Females (n = 390) become sexually mature at 21.5 cm (9.7 in) TL, the size at 50% maturity is 28.5 cm (11.3 inches) TL, and they range in size from 11.0 to 48.0 cm (4.4 to 19.0 inches) TL. Males (n = 120) range in size from 27.3 to 51.0 cm (10.8 to 20.2 inches) TL and transitional individuals (n = 7) were from 27.5 to 34.5 cm (10.9 to 13.7 in) TL. Annual spawning aggregations occur during the full moon in January and February off the southwest coast of Puerto Rico, and during the summer in Bermuda with no relation to lunar periodicity (Shapiro *et al.* 1993; Sadovy *et al.* 1994). Spawning off Jamaica, Puerto Rico, and USVI occurs from December to February (Thompson and Munro 1978; Colin *et al.* 1987; Sadovy *et al.* 1992; Sadovy *et al.* 1994). Burnett-Herkes (1975) report that red hind spawn from April to July off Bermuda. Red hind spawn during the summer off the southeastern United States (MARMAP unpublished data).

This species aggregates in large numbers during the spawning season (Coleman *et al*. 2000; Sadovy *et al.* 1994). A number of spawning aggregation sites have been documented in the Caribbean. The timing of aggregations is somewhat variable. Aggregations off Puerto Rico generally occur from January through March in association with the full moon, while those off the USVI generally occur from December through March in association with the full moon (Rielinger 1999). The red hind feeds mainly on crabs and other crustaceans, fishes, such as labrids and haemulids, and octopus (Heemstra and Randall 1993).

8.3.7 Graysby, *Cephalopholis cruentata*

Graysby occurs from North Carolina to south Florida and in the Gulf of Mexico, Caribbean and Bermuda. The graysby inhabits seagrass (*Thalassia*) beds and coral reefs, and is found as deep as 170 m (557 ft). It is sedentary, solitary, and secretive, usually hiding during the day, and feeding at night. This small grouper is rare in landings off the southeast United States, and is more commonly seen in the Caribbean (Potts and Manooch 1999). Graysby are probably most often landed as unclassified grouper by commercial fishermen off the southeastern United States.



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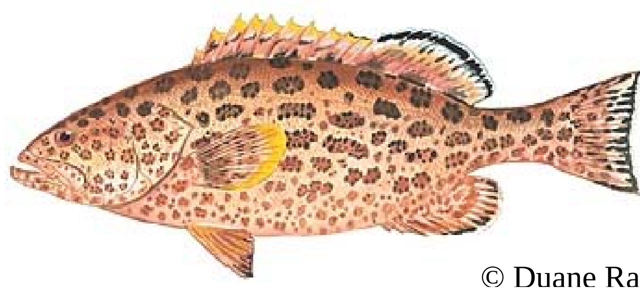
Maximum reported size is 42.6 cm (16.9 inches) TL (male) and 1.1 kg (2.4 pounds). In the northeastern Caribbean, individuals in spawning condition have been observed in March, and from May to July (Erdman 1976). Nagelkerken (1979) determined that graysby collected in the

Caribbean spawn from July through October. Graysby spawn during summer off the Southeastern United States (MARMAP unpublished data). Size at maturity and age at first maturity are estimated as 14.0 cm (5.5 inches) TL and 3.5 years (Nagelkerken 1979). The graysby is protogynous (Nagelkerken 1979). Sexual transition occurs at sizes ranging from 14.0 to 26.0 cm (5.5-10.3 inches) TL with most transitional individuals occurring between the sizes of 20.0-23.0 cm (7.9-9.1 inches) TL and ages 4-5.

Potts and Manooch (1999) examined otoliths from 118 graysby collected during 1979 to 1997. Maximum reported age is 13 years and maximum size is 40.5 cm (16.0 inches) TL. Juveniles feed on shrimp, while adults eat primarily fishes. Natural mortality rate is estimated as 0.20 (Ault *et al.* 1998). Adult graysby eat bony fish, shrimp, stomatopods, crabs, and gastropods (Randall 1967).

8.3.8 Yellowfin grouper, *Mycteroperca venenosa*



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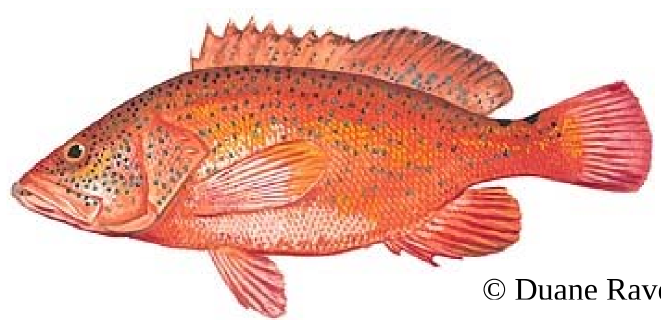
Yellowfin grouper occur in the Western Atlantic, ranging from Bermuda to Brazil and the Guianas, including the Gulf of Mexico and Caribbean Sea at depths of 2-137 m (7-449 ft). Juveniles are commonly found in shallow sea grass beds, while adults occur over rocky areas and coral reefs.

Maximum reported size is 100.0 cm (39.6 inches) TL (male) and 18.5 kg (41.1 pounds) (Heemstra and Randall 1993). Thompson and Munro (1978) reported that yellowfin grouper off Jamaica are 4 years old between 46.0 and 57.0 cm (18.1-22.4 inches) TL, and by 80.0 cm (31.5 inches) TL, they are 10 years of age. Manooch (1987) reported a maximum age of 15 years for yellowfin grouper. Natural mortality rate is estimated to be 0.18 (Ault *et al.* 1998). This fish is believed to be protogynous. Yellowfin grouper aggregate at some of the same sites utilized by tiger grouper, Nassau grouper, and black grouper (Sadovy *et al.* 1994). Spawning occurs during March in the Florida Keys (Taylor and McMichael 1983), and from March and May to August in the Gulf of Mexico (Bullock and Smith 1991). Most spawning occurs in Jamaican waters between February and April (Thompson and Munro 1978), and during July off Bermuda (Smith 1971). Yellowfin grouper feed mainly on fishes (especially coral reef species) and squids (Heemstra and Randall 1993).

8.3.9 Coney, *Cephalopholis fulva*



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Coney is a small grouper that occurs in the Western Atlantic, ranging from South Carolina (USA) and Bermuda to southern Brazil, including Atol das Rocas. The coney is a sedentary species. It prefers coral reefs and clear water, and can be found to depths as great as 150 m (492 ft). Coney are most commonly taken in the Caribbean, where they are found associated with patch reefs. Most commercial landings of coney are off southeast Florida and are often labeled as unclassified grouper.

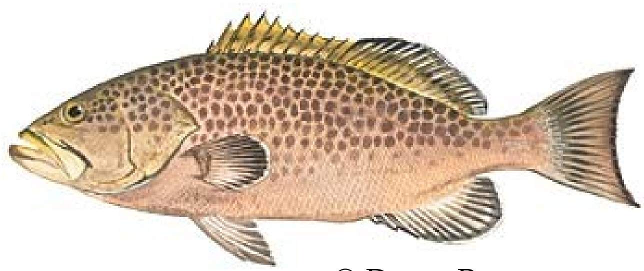
Maximum reported length is 41.0 cm (16.2 inches) TL (male). This species is protogynous (Heemstra and Randall 1993). Size at 50% maturity for females sampled off the west coast of Puerto Rico was 13.0 cm (5.1 inches) FL (Figuerola and Torrez Ruiz 2000). Heemstra and Randall (1993) report that females mature at 16.0 (6.3 inches) cm TL and transform to males at about 20.0 (7.9 inches) cm TL.

Potts and Manooch (1999) examined the otoliths from 55 coney collected during 1979-1997 from North Carolina to the Dry Tortugas, Florida. The maximum reported age is 11 years and maximum size is 39.7 cm (15.7 inches) TL. Natural mortality rate is estimated as 0.18 (Ault *et al.* 1998).

Spawning occurs in small groups composed of one male and multiple females. Although ripe ovaries are found from November to March off the west coast of Puerto Rico, spawning activity appears to be limited to several days around the last quarter and new moon phases during January and February (Figuerola *et al.* 1997). The diet is composed primarily of small fishes and crustaceans (Randall 1967).

8.3.10 Yellowmouth grouper, *Mycteroperca interstitialis*

Yellowmouth grouper occur along the eastern U.S. coast, Bermuda, Bahamas, Gulf of Mexico, and in the Caribbean south to Brazil (Smith 1971). Adults are found over rocky hard bottom and coral reefs near the shoreline as deep as 55 m (100 ft). Individuals have been found as deep as 150 m (275 ft). Young commonly occur in mangrove line lagoons.



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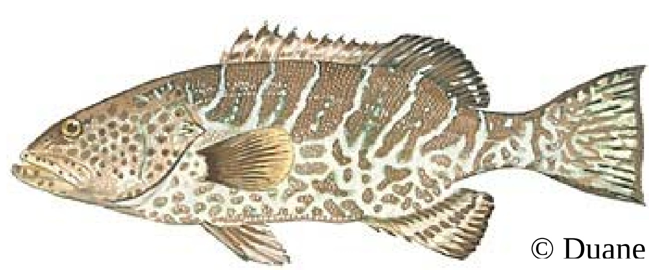
The maximum reported size of yellowmouth grouper is 84.0 cm (33.2 inches) TL (male) and 10.2 kg (22.6 pounds) (Froese and Pauly 2003). In the Gulf of Mexico, maximum reported age for yellowmouth grouper is 28 years (Bullock and Murphy 1994). Males (2-28 years) are generally older than females (2-17 years). Females become sexually mature between 40.0-45.0 cm (15.8-17.7 inches) TL and ages 2-4 years. Fifty percent are males at 60.0-64.9 cm (23.6-25.6 inches) TL. Fish undergo sexual transition from female to male at lengths from 50.3 to 64.3 cm (19.8-25.3 inches) TL, between the ages of 5 and 14 years. Yellowmouth grouper may spawn all year, but peak spawning of females in the Gulf of Mexico occurs during March to May (Bullock and Murphy 1994). Finfish constitute a large part of the diet of yellowmouth grouper (Randall 1967).

8.3.11 Tiger grouper, *Mycteroperca tigris*

Tiger grouper occur in the Western Atlantic, ranging from Bermuda and south Florida (USA) to Venezuela and, possibly Brazil, including the Gulf of Mexico and the Caribbean Sea. It inhabits coral reefs and rocky areas at depths of 10 to 40 m (33-131 ft). Approximate life span is 26 years, and M is estimated at 0.12 (Ault *et al.* 1998).



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The size-sex ratios described in a study conducted off Bermuda indicate this fish is probably protogynous (Heemstra and Randall 1993). It forms aggregations at specific times and locations each year, but only during the spawning season (Coleman *et al*. 2000; White *et al.* 2002). White *et al.* (2002) reported that spawning aggregations of tiger grouper occurred one week after the full moon during January through April off Puerto Rico. Tiger grouper spawn from December through April off southwest Cuba (García-Cagide *et al*. 1999). The tiger grouper preys on a variety of fishes, and frequents cleaning stations (Heemstra and Randall 1993).

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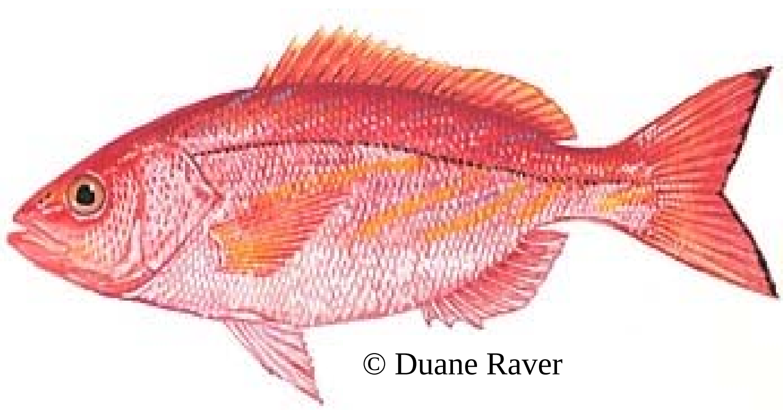
Appendix F
Potential Management Measures for Vermilion Snapper



May 19, 2008

Summary

An update to the vermilion snapper Southeast Data Assessment and Review (SEDAR) stock assessment indicates the stock is undergoing overfishing (SEDAR Update #3 2007). The Council's SSC did not have confidence in the calculated biomass reference points from the SEDAR assessment; however, they did have confidence in the fishing mortality rate estimates. The SSC indicated a 61% reduction in overall harvest (commercial and recreational sectors) would be needed to reduce fishing mortality to the yield associated with Foy. This is equivalent to a catch level of 566,179 pounds gutted weight (628,459 pounds whole weight). Based on allocation alternatives suggested thus far by the Council this would correspond to harvest reductions of 57-58% in the commercial sector and 67-68% in the recreational sector (Table 1).

Table 1. Commercial and recreational portions of catch (pounds gutted weight) associated with allocations suggested by Council thus far.

Vermilion Snapper		**Allocation Alternative 2. 68%C/32%R**	
	Annual	**Commercial**	**Recreational**
Year	**Catch Limit** (gutted weight)	**Proportion** (gutted weight)	**Proportion** (gutted weight)
2008	566,179	385,002	181,177

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1 Summary of life history information

Vermilion snapper occur in the Western Atlantic, from North Carolina to Rio de Janeiro. It is most abundant off the southeastern United States and in the Gulf of Campeche (Hood and Johnson 1999). The vermilion snapper is commonly found over rock, gravel, or sand bottoms near the edge of the continental and island shelves (Allen 1985). Vermilion snapper are not sedentary (like most snappers) but are found off the bottom and have morphological characteristics reflective of pelagic species (i.e., forked tail, streamlined body shape, long pectorals, pointed snout). It occurs at depths from 18 to 122 m (59 to 400 ft), but is most abundant at depths less than 76 m (250 ft). Individuals often form large schools. Vermilion snapper probably do not have extensive long range or local movement patterns (SEDAR 2 2003).

The maximum size of a male vermilion snapper, reported by Allen (1985), was 60.0 cm (23.8 in) TL and 3.2 kg (7.1 pounds). Maximum reported age in the South Atlantic Bight was 14 years (Zhao *et al.* 1997; Potts *et al.* 1998). SEDAR 2 (2003) recommends that M be defined as 0.25/yr, with a range of 0.2-0.3/yr.

This species spawns in aggregations (Lindeman *et al.* 2000) from April through late September in the southeastern United States (Cuellar *et al.* 1996). Zhao *et al.* (1997) indicated most spawning in the South Atlantic Bight occurs from June through August. Eggs and larvae are pelagic. Vermilion snapper have separate sexes throughout their life. All vermilion snapper are mature at 2 years of age and 20.0 cm (7.9 in) (SEDAR 2 2003). Cuellar *et al.* (1996) collected vermilion snapper off the southeastern United States and found all were mature. The smallest female was 16.5 cm (6.5 in) FL and the smallest male was 17.9 cm (7.1 in) FL (Cuellar *et al.* 1996). Zhao and McGovern (1997) reported that 100% of males that were collected after 1982 along the southeastern United States were mature at 14.0 cm (5.6 in) TL and age 1. All females collected after 1988 were mature at 18.0 cm (7.1 in) TL and age 1.

This species preys on fishes, shrimps, crabs, polychaetes, and other benthic invertebrates, as well as cephalopods and planktonic organisms (Allen 1985). Sedberry and Cuellar (1993) reported small crustaceans (especially copepods), sergestid decapods, barnacle larvae, stomatopods, and decapods dominated the diets of small (< 50 mm (2 in) SL) vermilion snapper off the Southeastern United States. Larger decapods, fishes, and cephalopods are more important in the diet of larger vermilion snapper.

2 Reduction in harvest needed to end overfishing and achieve OY

Reduction in harvest needed to end overfishing using the Baranov equation and natural mortality = 0.25. Fproj represents the geometric mean of fishing mortality during 2004-2006.

Table 2. Reduction in harvest needed to achieve Fmax.

Fmax	Fproj	**Reduction**
0.355	0.9098	0.51

Fproj/Fmax = 2.56

Reduction in harvest needed to achieve OY using the Baranov equation and natural mortality = 0.25. Fproj represents the geometric mean of fishing mortality during 2004-2006.

Table 3. Reduction in harvest needed to achieve Foy.

Foy	Fproj	**Reduction**
0.26625	0.9098	0.61

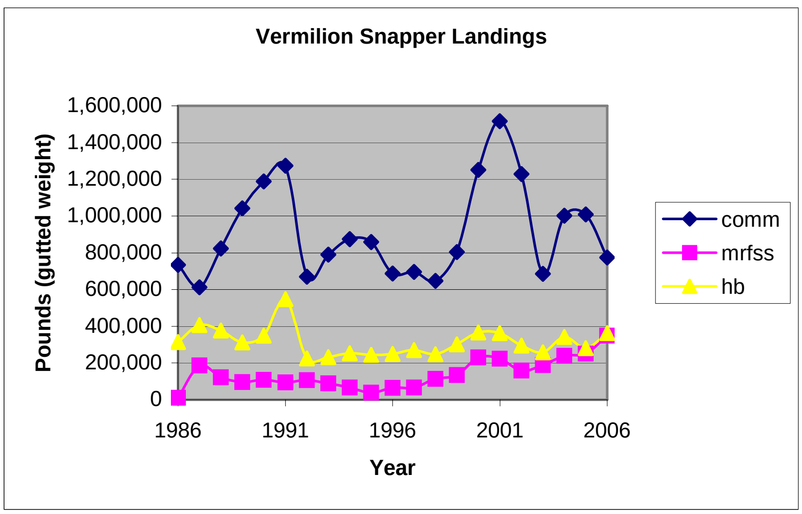
The SSC provided an estimate of this value based on the yield per recruit at the geometric mean of the 2004-2006 fishing mortality rates compared to that at 75% of Fmax (Foy). To lower the fishing mortality rate to 75% of Fmax, a 61% reduction in total catch is required. Using data from the SEDAR assessment (SEDAR Update #3 2007), this results in a total harvest (recreational and commercial) of 628,459 pounds whole weight (566,179 pounds gutted weight).

3 Vermilion Snapper Landings

3.1 Vermilion snapper landings

Table 4. Vermilion Snapper Landings – Pounds Gutted Weight. Source: ALS, MRFSS Web site; Headboat survey. Commercial data for 2006 are from logbook. Data do not include dead discards and MRFSS data are A+B1; weight not converted from numbers.

Year	comm	mrfss	headboat	% comm	% rec
1986	735,419	10,146	314,696	69.36%	30.64%
1987	611,652	186,783	407,152	50.73%	49.27%
1988	823,693	121,367	377,149	62.30%	37.70%
1989	1,040,863	95,466	312,196	71.86%	28.14%
1990	1,187,409	108,635	348,442	72.21%	27.79%
1991	1,274,161	94,495	547,554	66.49%	33.51%
1992	669,690	106,702	224,860	66.89%	33.11%
1993	790,162	88,468	231,710	71.16%	28.84%
1994	874,456	66,195	253,735	73.21%	26.79%
1995	859,165	38,212	244,916	75.21%	24.79%
1996	687,574	64,394	248,925	68.70%	31.30%
1997	695,448	66,448	270,190	67.38%	32.62%
1998	646,837	112,759	248,189	64.18%	35.82%
1999	804,086	133,651	302,459	64.84%	35.16%
2000	1,251,888	230,064	366,471	67.73%	32.27%
2001	1,515,535	222,690	362,718	72.14%	27.86%
2002	1,228,928	159,450	294,094	73.04%	26.96%
2003	686,586	187,733	258,957	60.58%	39.42%
2004	1,001,297	238,594	342,138	63.29%	36.71%
2005	1,009,300	251,560	281,059	65.46%	34.54%
2006	774,394	348,126	362,476	52.15%	47.85%



3.2 Vermilion Snapper Commercial Landings for 225 and Unlimited Permits

Table 2. Landings of vermilion snapper associated with 225 and unlimited permits.

Year	225 Permit	Unlimited Permit
1999	873	816,036
2000	1,510	1,240,938
2001	1,841	1,486,063
2002	802	1,180,863
2003	1,803	692,681
2004	980	958,730
2005	1,333	1,047,705

3.3 Vermilion Snapper Landings by State

3.3.1 Commercial

Table 3. Commercial landings by state for 1999-2005

State	99-05	Avg ww	Avg GW	Percent
GA/FL	2,323,759	331,965	299,068	27.92%
NC	2,895,712	413,673	372,679	34.79%
SC	3,102,888	443,270	399,342	37.28%

3.3.2 Headboat

Table 4. Headboat landings by state for 1999-2005

State	99-05	avg ww	avg gw	percent
GA AND NORTH FL	412,957	58,994	53,148	16.85%
NORTH CAROLINA	649,665	92,809	83,612	26.51%
SOUTH CAROLINA	1,215,785	173,684	156,472	49.61%
SOUTH FLORIDA	172,358	24,623	22,183	7.03%

3.3.3 MRFSS

Table 5. MRFSS landings by state for 1999-2005.

MRFSS	99-05	avg ww	avg gw	percent
FL	860,636	122,948	110,764	54.40%
GA	149,079	21,297	19,186	9.42%
SC	361,455	51,636	46,519	22.85%
NC	210,800	30,114	27,130	13.33%

Table 6. MRFSS landings (A+B1) in number by state for 1999-2005.

MRFSS	99-05	avg	percent
FL	828,441	118,349	59.45%
GA	133,826	19,118	2.40%
SC	280,320	40,046	4.70%
NC	150,916	21,559	28.26%

Table 7. MRFSS landings (B2) in number by state for 1999-2005.

MRFSS	99-05	avg	percent

FL	769,816	109,974	55.24%
GA	65,170	9,310	2.40%
SC	208,051	29,722	4.70%
NC	96,945	13,849	28.26%

3.4 Vermilion Snapper Landings by Month and State

3.4.1 Commercial

Table 8. Average vermilion snapper commercial landings 1999-2005 (lbs gutted weight) by state and month. Includes Monroe County.

Month	Total	FL/GA	SC	NC
1	57,040	18,213	21,497	17,330
2	50,318	16,126	19,737	14,455
3	80,618	27,765	35,208	17,646
4	87,076	24,545	40,222	22,309
5	87,454	22,169	28,858	36,426
6	99,185	29,669	33,142	36,374
7	82,181	25,439	27,212	29,530
8	108,711	26,767	36,165	45,780
9	110,836	28,461	41,037	41,338
10	124,303	33,815	45,573	44,915
11	113,050	26,457	42,397	44,196
12	70,317	19,643	28,295	22,379

Table 9. Average vermilion snapper commercial landings 1999-2005 (percentage) by state and month. Includes Monroe County.

Month	Total	FL/GA	SC	NC
1	5.33%	6.09%	5.38%	4.65%
2	4.70%	5.39%	4.94%	3.88%
3	7.53%	9.28%	8.82%	4.73%
4	8.13%	8.21%	10.07%	5.99%
5	8.16%	7.41%	7.23%	9.77%
6	9.26%	9.92%	8.30%	9.76%
7	7.67%	8.51%	6.81%	7.92%
8	10.15%	8.95%	9.06%	12.28%
9	10.35%	9.52%	10.28%	11.09%
10	11.61%	11.31%	11.41%	12.05%
11	10.55%	8.85%	10.62%	11.86%
12	6.57%	6.57%	7.09%	6.00%

3.4.2 Headboat

Table 10. Average vermilion snapper headboat landings 1999-2005 (lbs gutted weight) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	7,639	3,960	2,176	1,281	222
2	8,848	4,706	2,316	1,450	375
3	22,388	12,421	2,471	4,589	2,907
4	49,652	28,560	1,157	6,233	13,702
5	80,406	46,192	915	7,886	25,414
6	89,502	50,930	1,009	7,495	30,068
7	97,877	54,755	3,678	8,221	31,223
8	70,780	40,830	3,272	5,557	21,122
9	44,048	25,958	1,060	2,908	14,123
10	43,864	28,349	856	2,880	11,779
11	24,781	14,762	1,701	3,072	5,246
12	7,441	3,999	1,574	1,576	291

Table 11. Average vermilion snapper headboat landings 1999-2005 (percentage) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	1.40%	1.26%	9.81%	2.41%	0.14%
2	1.62%	1.49%	10.44%	2.73%	0.24%
3	4.09%	3.94%	11.14%	8.63%	1.86%
4	9.07%	9.05%	5.22%	11.73%	8.76%
5	14.69%	14.64%	4.12%	14.84%	16.24%
6	16.36%	16.15%	4.55%	14.10%	19.22%
7	17.89%	17.36%	16.58%	15.47%	19.95%
8	12.93%	12.94%	14.75%	10.46%	13.50%
9	8.05%	8.23%	4.78%	5.47%	9.03%
10	8.02%	8.99%	3.86%	5.42%	7.53%
11	4.53%	4.68%	7.67%	5.78%	3.35%
12	1.36%	1.27%	7.10%	2.97%	0.19%

3.4.3 MRFSS

Table 12. Average vermilion snapper MRFSS landings 1999-2005 (lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	23,776	23,776	0	0	0
2	30,986	20,675	2,716	6,661	934
3	46,351	16,730	6,139	17,695	5,788
4	43,963	25,690	3,384	7,072	7,816
5	41,963	13,403	6,332	14,473	7,755
6	16,559	10,488	616	618	4,837

Table 13. Average vermilion snapper MRFSS landings 1999-2005 (percent lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	11.68%	21.47%	0.00%	0.00%	0.00%
2	15.22%	18.67%	14.15%	14.32%	3.44%
3	22.77%	15.10%	32.00%	38.04%	21.33%
4	21.59%	23.19%	17.64%	15.20%	28.81%
5	20.61%	12.10%	33.00%	31.11%	28.59%
6	8.13%	9.47%	3.21%	1.33%	17.83%

Table 14. Average vermilion snapper MRFSS landings 1999-2005 (A+B1 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	25,014	25,014	0	0	0
2	28,718	20,116	2,311	5,429	862
3	37,110	15,271	5,416	11,711	4,713
4	38,269	23,059	3,081	6,164	5,965
5	35,966	12,877	5,733	12,001	5,355
6	14,472	10,284	682	771	2,734

Table 15. Average vermilion snapper MRFSS landings 1999-2005 (A+B1 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	13.93%	23.46%	0.00%	0.00%	0.00%
2	15.99%	18.87%	13.42%	15.05%	4.39%
3	20.67%	14.32%	31.44%	32.46%	24.01%
4	21.31%	21.63%	17.89%	17.09%	30.39%
5	20.03%	12.08%	33.29%	33.27%	27.28%
6	8.06%	9.65%	3.96%	2.14%	13.93%

Table 16. Average vermilion snapper MRFSS landings 1999-2005 (B2 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	12,332	12,332	0	0	0
2	35,099	27,053	1,190	4,059	2,797
3	27,070	10,869	1,952	9,310	4,938
4	39,322	27,893	2,366	6,599	2,464
5	19,435	8,083	2,701	6,429	2,222
6	13,459	12,847	177	379	56

Table 17. Average vermilion snapper MRFSS landings 1999-2005 (B2 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	8.41%	12.45%	0.00%	0.00%	0.00%
2	23.92%	27.31%	14.19%	15.16%	22.42%
3	18.45%	10.97%	23.28%	34.77%	39.58%
4	26.80%	28.15%	28.21%	24.64%	19.75%
5	13.25%	8.16%	32.21%	24.01%	17.81%
6	9.17%	12.97%	2.11%	1.42%	0.45%

Table 18. Harvested (A+B1) and discards (B2) catch of vermilion snapper for Waves 1-5 during 2005 and 2006.

	2006		
	A+B1	B2	%B2s
Wave 1	8,610	47	0.54%
Wave 2	32,271	53,517	62.38%
Wave 3	47,847	8,482	15.06%
Wave 4	107,442	15,258	12.44%
Wave 5	35,274	21,610	37.99%
Total	231,444	98,914	29.94%
	2007		
	A+B1	B2	%B2s
Wave 1	23,819	7,627	24.25%
Wave 2	33,187	13,543	28.98%
Wave 3	75,918	80,154	51.36%
Wave 4	103,079	99,631	49.15%
Wave 5	43,096	66,212	60.57%
Total	279,099	267,167	48.91%

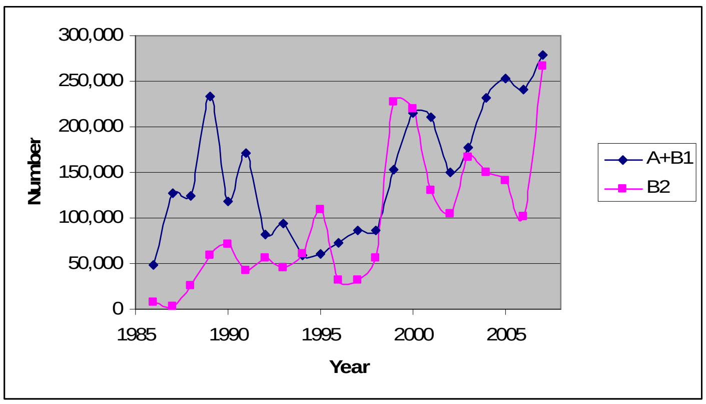


Figure 4-x. Annual number of vermilion snapper harvested (A+B1) and discarded (B2) during 1986 – 2007. Data for 2007 do not include Wave 6 (November – December) numbers.

3.5 *Vermilion Snapper Commercial Percentage*

Table 19. Vermilion Snapper % Commercial. Source ALS 1986-2006. Includes Monroe County.

% comm..

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1986	69.36%	59.45%	60.50%	63.77%	65.84%	65.99%	66.08%	66.61%	67.27%	67.97%	68.02%	67.98%	67.74%	67.53%	67.55%	68.00%	68.37%	68.01%	67.69%	67.58%	66.97%
1987		50.73%	56.78%	62.27%	65.18%	65.51%	65.67%	66.31%	67.07%	67.84%	67.91%	67.87%	67.62%	67.41%	67.44%	67.93%	68.32%	67.94%	67.62%	67.51%	66.88%
1988			62.30%	67.29%	69.12%	68.33%	68.13%	68.53%	69.11%	69.76%	69.67%	69.48%	69.10%	68.75%	68.63%	69.02%	69.35%	68.89%	68.49%	68.32%	67.62%
1989				71.86%	72.04%	69.92%	69.41%	69.69%	70.19%	70.80%	70.60%	70.31%	69.82%	69.37%	69.17%	69.52%	69.83%	69.32%	68.86%	68.66%	67.90%
1990					72.21%	69.13%	68.64%	69.13%	69.84%	70.61%	70.40%	70.09%	69.55%	69.07%	68.90%	69.32%	69.67%	69.13%	68.65%	68.45%	67.66%
1991						66.49%	66.63%	67.88%	69.10%	70.20%	69.99%	69.67%	69.08%	68.59%	68.46%	68.99%	69.41%	68.83%	68.34%	68.15%	67.32%
1992							66.89%	69.14%	70.61%	71.79%	71.22%	70.61%	69.75%	69.05%	68.82%	69.37%	69.80%	69.12%	68.55%	68.32%	67.40%
1993								71.16%	72.23%	73.22%	72.20%	71.29%	70.19%	69.33%	69.02%	69.58%	70.02%	69.28%	68.65%	68.40%	67.42%
1994									73.21%	74.19%	72.54%	71.32%	69.99%	69.02%	68.74%	69.41%	69.91%	69.12%	68.47%	68.22%	67.19%
1995										75.21%	72.17%	70.61%	69.06%	68.10%	68.00%	68.93%	69.56%	68.72%	68.06%	67.83%	66.76%
1996											68.70%	68.03%	66.75%	66.20%	66.66%	68.06%	68.90%	68.05%	67.41%	67.23%	66.14%
1997												67.38%	65.80%	65.44%	66.26%	67.97%	68.93%	67.99%	67.30%	67.12%	65.97%
1998													64.18%	64.54%	65.98%	68.07%	69.13%	68.05%	67.29%	67.10%	65.86%
1999														64.84%	66.57%	68.82%	69.85%	68.54%	67.62%	67.36%	65.99%
2000															67.73%	70.07%	70.96%	69.22%	68.03%	67.68%	66.12%
2001																72.14%	72.54%	69.78%	68.11%	67.66%	65.81%
2002																	73.04%	68.03%	66.19%	66.08%	63.99%
2003																		60.58%	61.96%	63.33%	61.30%
2004																			62.95%	64.33%	61.47%
2005																				65.76%	60.67%
2006																					55.05%

3.6 Vermilion Snapper Recreational Percentage

Table 20. Vermilion Snapper % Recreational. Source MRFSS Web site, NMFS Headboat survey.

% rec

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1986	30.64%	40.55%	39.50%	36.23%	34.16%	34.01%	33.92%	33.39%	32.73%	32.03%	31.98%	32.02%	32.26%	32.47%	32.45%	32.00%	31.63%	31.99%	32.31%	32.42%	33.03%
1987		49.27%	43.22%	37.73%	34.82%	34.49%	34.33%	33.69%	32.93%	32.16%	32.09%	32.13%	32.38%	32.59%	32.56%	32.07%	31.68%	32.06%	32.38%	32.49%	33.12%
1988			37.70%	32.71%	30.88%	31.67%	31.87%	31.47%	30.89%	30.24%	30.33%	30.52%	30.90%	31.25%	31.37%	30.98%	30.65%	31.11%	31.51%	31.68%	32.38%
1989				28.14%	27.96%	30.08%	30.59%	30.31%	29.81%	29.20%	29.40%	29.69%	30.18%	30.63%	30.83%	30.48%	30.17%	30.68%	31.14%	31.34%	32.10%
1990					27.79%	30.87%	31.36%	30.87%	30.16%	29.39%	29.60%	29.91%	30.45%	30.93%	31.10%	30.68%	30.33%	30.87%	31.35%	31.55%	32.34%
1991						33.51%	33.37%	32.12%	30.90%	29.80%	30.01%	30.33%	30.92%	31.41%	31.54%	31.01%	30.59%	31.17%	31.66%	31.85%	32.68%
1992							33.11%	30.86%	29.39%	28.21%	28.78%	29.39%	30.25%	30.95%	31.18%	30.63%	30.20%	30.88%	31.45%	31.68%	32.60%
1993								28.84%	27.77%	26.78%	27.80%	28.71%	29.81%	30.67%	30.98%	30.42%	29.98%	30.72%	31.35%	31.60%	32.58%
1994									26.79%	25.81%	27.46%	28.68%	30.01%	30.98%	31.26%	30.59%	30.09%	30.88%	31.53%	31.78%	32.81%
1995										24.79%	27.83%	29.39%	30.94%	31.90%	32.00%	31.07%	30.44%	31.28%	31.94%	32.17%	33.24%
1996											31.30%	31.97%	33.25%	33.80%	33.34%	31.94%	31.10%	31.95%	32.59%	32.77%	33.86%
1997												32.62%	34.20%	34.56%	33.74%	32.03%	31.07%	32.01%	32.70%	32.88%	34.03%
1998													35.82%	35.46%	34.02%	31.93%	30.87%	31.95%	32.71%	32.90%	34.14%
1999														35.16%	33.43%	31.18%	30.15%	31.46%	32.38%	32.64%	34.01%
2000															32.27%	29.93%	29.04%	30.78%	31.97%	32.32%	33.88%
2001																27.86%	27.46%	30.22%	31.89%	32.34%	34.19%
2002																	26.96%	31.97%	33.81%	33.92%	36.01%
2003																		39.42%	38.04%	36.67%	38.70%
2004																			37.05%	35.67%	38.53%
2005																				34.24%	39.33%
2006																					44.95%

3.7 Allocations and quota

Using the landings data (in pounds gutted weight) and the allocation the two time period shown below results in the commercial quotas and recreational allocations shown in Table 21:

Years 1986-2005 = 68% commercial & 32% recreational

Table 21. Commercial and recreational portions of the catch (pounds gutted weight) associated with allocations suggested by Council thus far.

Vermilion Snapper		**Allocation Alternative 2. 68%C/32%R**	
	Annual	**Commercial**	**Recreational**
Year	**Catch Limit** (gutted weight)	**Portion** (gutted weight)	**Portion** (gutted weight)
2008	566,179	385,002	181,177

4 Monthly catch and reduction provided by seasonal closure

4.1 Commercial

Table 22. Monthly catch (pounds gutted weight) of vermilion snapper during 1999-2005 (average), 2001, 2005, and 2006. Data are from ALS.

Month	1999-2005	2001	2005	2006
1	57,040	55,877	86,821	78,217
2	50,318	79,474	58,870	53,036
3	80,618	90,728	70,088	63,142
4	87,076	120,240	51,378	46,286
5	87,454	145,416	110,082	99,173
6	99,185	168,710	109,706	98,834
7	82,181	119,121	88,940	80,126
8	108,711	149,402	98,886	89,086
9	110,836	213,295	124,441	112,109
10	124,303	139,759	91,086	82,059
11	113,050	127,552	89,984	81,067
12	70,317	105,962	29,016	26,141
Total	1,071,089	1,515,535	1,009,300	911,283

To determine the effectiveness of a commercial seasonal closure five steps were taken. First, NMFS logbook data were examined to determine the most commonly taken species on trips with vermilion snapper. Second, trips were identified that caught at least 100 pounds of the most common species taken. Third, landings of vermilion snapper on trips identified in step 2 that targeted co-occurring species were determined. This would be considered to be incidental catch of vermilion snapper. Fourth, dead discards of vermilion snapper incidental catch was determined by applying a release mortality rate of 40% (SEDAR Update# 3 2007). Fifth, effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings.

Based on an examination of the NMFS logbook data, the species most commonly taken on commercial trips with vermilion snapper during 2003-2005 were gag, scamp, gray triggerfish, greater amberjack, red grouper, almaco jack, red snapper, or black sea bass. If fishermen were to target these species during a closure and release mortality of vermilion snapper is 40% (SEDAR Update# 3 2007), it is anticipated that a closure would be 67% effective. Tables 13 and 14 provide reduction from a seasonal closure considering 100% and 67% effectiveness of closure.

Table 23. Monthly reduction in take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	5.3%	10.0%	17.5%	25.7%	33.8%	43.1%	50.8%	60.9%	71.3%	82.9%	93.4%	100.0%
2		4.7%	12.2%	20.4%	28.5%	37.8%	45.5%	55.6%	65.9%	77.6%	88.1%	94.7%
3			7.5%	15.7%	23.8%	33.1%	40.8%	50.9%	61.3%	72.9%	83.4%	90.0%
4				8.1%	16.3%	25.6%	33.2%	43.4%	53.7%	65.3%	75.9%	82.5%
5					8.2%	17.4%	25.1%	35.2%	45.6%	57.2%	67.8%	74.3%
6						9.3%	16.9%	27.1%	37.4%	49.0%	59.6%	66.2%
7							7.7%	17.8%	28.2%	39.8%	50.3%	56.9%
8								10.1%	20.5%	32.1%	42.7%	49.2%
9									10.3%	22.0%	32.5%	39.1%
10										11.6%	22.2%	28.7%
11											10.6%	17.1%
12												6.6%

Table 24. Monthly reduction in take based on 1999-2005 data if seasonal closure is 93% effective

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	5.0%	9.3%	16.3%	23.9%	31.5%	40.1%	47.2%	56.7%	66.3%	77.1%	86.9%	93.0%
2		4.4%	11.4%	18.9%	26.5%	35.1%	42.3%	51.7%	61.3%	72.1%	81.9%	88.0%
3			7.0%	14.6%	22.2%	30.8%	37.9%	47.3%	57.0%	67.8%	77.6%	83.7%
4				7.6%	15.2%	23.8%	30.9%	40.3%	50.0%	60.8%	70.6%	76.7%
5					7.6%	16.2%	23.3%	32.8%	42.4%	53.2%	63.0%	69.1%
6						8.6%	15.7%	25.2%	34.8%	45.6%	55.4%	61.5%
7							7.1%	16.6%	26.2%	37.0%	46.8%	52.9%
8								9.4%	19.1%	29.9%	39.7%	45.8%
9									9.6%	20.4%	30.2%	36.3%
10										10.8%	20.6%	26.7%
11											9.8%	15.9%
12												6.1%

Peak spawning is during June-August. A spawning season closure would provide a reduction of 27% if closure was 100% effective and 25% reduction if closure was 93% effective.

4.2 Recreational

Table 25. Average landings (pounds gutted weight) of vermilion snapper taken by headboat and MRFSS during 1999-2005.

Month	Headboat	MRFSS	Rec ww	Rec gw
1	4,396	13,196	17,592	15,848
2	5,224	13,196	18,420	16,594
3	13,787	10,939	24,726	22,276
4	31,702	10,939	42,641	38,415
5	51,272	25,725	76,997	69,367
6	56,532	25,725	82,257	74,105
7	60,777	24,264	85,041	76,614
8	45,320	24,264	69,584	62,688
9	28,812	23,425	52,238	47,061
10	31,466	23,425	54,891	49,451
11	16,384	7,412	23,797	21,438
12	4,437	7,412	11,850	10,675
			560,033	504,534

To determine the effectiveness of a recreational seasonal closure seven steps were taken. First, MRFSS data were examined to determine the most commonly species taken on trips with vermilion snapper during the proposed September through October closure. Second, trips were identified that caught at least 1 individual of the most common species taken identified in step 1. Third, landings of vermilion snapper on trips identified in step 2 that targeted co-occurring species were determined. This would be considered to be incidental catch of vermilion snapper. Fourth, incidental catch was compared to actual catch to determine percentage that would still be caught during a closed season. Fifth, the portion of the vermilion snapper incidental catch that would die when no retention was allowed was determined by applying a release mortality rate of 25% (SEDAR 2 2003). Sixth, the magnitude of incidental catch was estimated if the number of trips was reduced and if fishermen were able to avoid vermilion snapper. Seven, determine effectiveness of closure by comparing the magnitude of dead discards to actual landings if a closure did not occur.

Table 26. Most common species taken on MRFSS trips during September – October that also caught vermilion snapper. Landings are totals in number (A + B1) for 1999-2005. Represents sample not total expanded landings.

common	Obs	Mean	Sum	Percent	Cum %
vermilion snapper	309	6.177994	1909	35.16%	35.16%
white grunt	84	8.75	735	13.54%	48.70%
black sea bass	137	4.817518	660	12.16%	60.86%
gray triggerfish	88	2.943182	259	4.77%	65.63%
red porgy	78	3.307692	258	4.75%	70.38%
dolphin	25	5.16	129	2.38%	72.76%
snowy grouper	6	20.66667	124	2.28%	75.04%
king mackerel	49	2.489796	122	2.25%	77.29%
red snapper	71	1.605634	114	2.10%	79.39%

scamp	39	2.641026	103	1.90%	81.29%

Table 27. Incidental catch of vermilion snapper during a seasonal closure (Average 1999-2005). Dead discards determined by applying 25% release mortality rate. Assumes some trips will not be made during a seasonal closure.

Trip reduction	0%	20%	40%	60%
Incidental catch	1,557	1,173	1,082	832
Dead Discards	389	293	271	208
Effectiveness	79.61%	84.64%	85.83%	89.10%

Table 28. Incidental catch of vermilion snapper assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid vermilion snapper (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	1,557	1,246	747	299	1,173	938	563	225	1,082	866	519	208	832	666	399	160
Dead Discards	389	311	187	75	293	235	141	56	271	216	130	52	208	166	100	40
Effectiveness	79.61%	83.69%	90.21%	96.09%	84.64%	87.71%	92.63%	97.05%	85.83%	88.66%	93.20%	97.28%	89.10%	91.28%	94.77%	97.91%

Examination of the MRFSS database indicated the species most commonly taken on recreational trips (MRFSS) during September – October with vermilion snapper during 1999-2005 were white grunt, black sea bass, gray triggerfish, and red porgy. If fishermen were to target these species during a closure and release mortality of vermilion snapper is 25% (SEDAR 2 2003), it is anticipated that a closure would be 80% effective if effort remained the same and fishermen were unable to avoid vermilion snapper. If 20% of the trips are not taken and fishermen can avoid 20% of vermilion snapper by changing fishing methods and locations then the effectiveness would be 88%.

Table 29. Most common species taken on Headboat trips during September - October that also caught vermilion snapper. Landings are for 1999-2005. Represents sample not total expanded landings.

species	specname	N	Mean	Sum
10	vermilion snapper	1994	166.5642	332129
33	black sea bass	2575	40.11456	103295
50	white grunt	1653	47.18935	78004
77	gray triggerfish	1940	29.10876	56471
51	tomtate	923	51.31203	47361
15	yellowtail snapper	1149	30.43603	34971
4	spottail pinfish	489	46.2229	22603
1	red porgy	809	24.57602	19882

Table 30. Incidental catch of vermilion snapper during a seasonal closure (Average 1999-2005). Dead discards determined by applying 25% release mortality rate. Assumes some trips will not be made during a seasonal closure.

Trip reduction	0%	20%	40%	60%
Incidental catch	323,149	189,241	148,112	99,580
Dead Discards	80,787	47,310	37,028	24,895
Effectiveness	75.68%	85.76%	88.85%	92.50%

Table 31. Incidental catch of gag on headboat trips assuming a range in trips (0 to 60%) during a seasonal closure and fishermen can avoid vermilion snapper (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	323,149	258,519	155,112	62,045	189,241	151,393	90,836	36,334	148,112	118,490	71,094	28,438	99,580	79,664	47,798	19,119
Dead Discards	80,787	64,630	38,778	15,511	47,310	37,848	22,709	9,084	37,028	29,622	17,773	7,109	24,895	19,916	11,950	4,780
Effectiveness	75.68%	80.54%	88.32%	95.33%	85.76%	88.60%	93.16%	97.27%	88.85%	91.08%	94.65%	97.86%	92.50%	94.00%	96.40%	98.56%

Examination of the Headboat database indicated the species most commonly taken on recreational trips during September - April with vermilion snapper during 1999-2005 were black sea bass, white grunt, gray triggerfish, and tomtate. If fishermen were to target these species during a closure and release mortality of vermilion snapper is 25% (SEDAR 2 2003), it is anticipated that a closure would be 76% effective if effort remained the same and fishermen were unable to avoid gag. If 20% of the trips are not taken and fishermen can avoid 20% of gag by changing fishing methods and locations then the effectiveness would be 89%.

4.2.1 Headboat

Table 32. Average landings (pounds gutted weight) of vermilion snapper taken by headboat during 1999-2005.

Month	Lbs gw	Percent
1	3,960	1.3%
2	4,706	1.5%
3	12,421	3.9%
4	28,560	9.1%
5	46,191	14.6%
6	50,929	16.1%
7	54,754	17.4%
8	40,829	12.9%
9	25,957	8.2%
10	28,347	9.0%
11	14,761	4.7%
12	3,998	1.3%
Total	315,414	

Table 32. Monthly reduction in Headboat take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	1.3%	2.7%	6.7%	15.7%	30.4%	46.5%	63.9%	76.8%	85.1%	94.1%	98.7%	100.0%
2		1.5%	5.4%	14.5%	29.1%	45.3%	62.6%	75.6%	83.8%	92.8%	97.5%	98.7%
3			3.9%	13.0%	27.6%	43.8%	61.1%	74.1%	82.3%	91.3%	96.0%	97.3%
4				9.1%	23.7%	39.8%	57.2%	70.2%	78.4%	87.4%	92.0%	93.3%
5					14.6%	30.8%	48.2%	61.1%	69.3%	78.3%	83.0%	84.3%
6						16.1%	33.5%	46.5%	54.7%	63.7%	68.3%	69.6%
7							17.4%	30.3%	38.5%	47.5%	52.2%	53.5%
8								12.9%	21.2%	30.2%	34.8%	36.1%
9									8.2%	17.2%	21.9%	23.2%
10										9.0%	13.7%	14.9%
11											4.7%	5.9%
12												1.3%

Table 34. Monthly reduction in Headboat take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	1.1%	2.4%	6.0%	14.0%	27.0%	41.4%	56.9%	68.4%	75.7%	83.7%	87.9%	89.0%
2		1.3%	4.8%	12.9%	25.9%	40.3%	55.7%	67.3%	74.6%	82.6%	86.8%	87.9%
3			3.5%	11.6%	24.6%	39.0%	54.4%	65.9%	73.3%	81.3%	85.4%	86.6%
4				8.1%	21.1%	35.5%	50.9%	62.4%	69.8%	77.8%	81.9%	83.0%
5					13.0%	27.4%	42.9%	54.4%	61.7%	69.7%	73.9%	75.0%
6						14.4%	29.8%	41.3%	48.7%	56.7%	60.8%	62.0%
7							15.5%	27.0%	34.3%	42.3%	46.5%	47.6%
8								11.5%	18.8%	26.8%	31.0%	32.1%
9									7.3%	15.3%	19.5%	20.6%
10										8.0%	12.2%	13.3%
11											4.2%	5.3%
12												1.1%

4.2.2 MRFSS All Modes

Table 35. Average landings (pounds gutted weight) of vermilion snapper taken by MRFSS (all modes) during 1999-2005.

Month	Lbs gw	Percent
1	11,888	5.8%
2	11,888	5.8%
3	15,493	7.6%
4	15,493	7.6%
5	23,176	11.4%
6	23,176	11.4%
7	21,860	10.7%
8	21,860	10.7%
9	21,104	10.4%
10	21,104	10.4%
11	8,279	4.1%
12	8,279	4.1%
Total	203,599	

Table 36. Monthly reduction in MRFSS (all modes) take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	5.8%	11.7%	19.3%	26.9%	38.3%	49.7%	60.4%	71.1%	81.5%	91.9%	95.9%	100.0%
2		5.8%	13.4%	21.1%	32.4%	43.8%	54.6%	65.3%	75.7%	86.0%	90.1%	94.2%
3			7.6%	15.2%	26.6%	38.0%	48.7%	59.5%	69.8%	80.2%	84.3%	88.3%
4				7.6%	19.0%	30.4%	41.1%	51.8%	62.2%	72.6%	76.6%	80.7%
5					11.4%	22.8%	33.5%	44.2%	54.6%	65.0%	69.0%	73.1%
6						11.4%	22.1%	32.9%	43.2%	53.6%	57.7%	61.7%
7							10.7%	21.5%	31.8%	42.2%	46.3%	50.3%
8								10.7%	21.1%	31.5%	35.5%	39.6%
9									10.4%	20.7%	24.8%	28.9%
10										10.4%	14.4%	18.5%
11											4.1%	8.1%
12												4.1%

Table 37. Monthly reduction in MRFSS (all modes) take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	5.2%	10.4%	17.2%	23.9%	34.1%	44.2%	53.8%	63.3%	72.5%	81.8%	85.4%	89.0%
2		5.2%	12.0%	18.7%	28.9%	39.0%	48.6%	58.1%	67.3%	76.6%	80.2%	83.8%
3			6.8%	13.5%	23.7%	33.8%	43.4%	52.9%	62.1%	71.4%	75.0%	78.6%
4				6.8%	16.9%	27.0%	36.6%	46.1%	55.4%	64.6%	68.2%	71.8%
5					10.1%	20.3%	29.8%	39.4%	48.6%	57.8%	61.4%	65.1%
6						10.1%	19.7%	29.2%	38.5%	47.7%	51.3%	54.9%
7							9.6%	19.1%	28.3%	37.6%	41.2%	44.8%
8								9.6%	18.8%	28.0%	31.6%	35.2%
9									9.2%	18.5%	22.1%	25.7%
10										9.2%	12.8%	16.5%
11											3.6%	7.2%
12												3.6%

4.2.3 MRFSS/Headboat Combined

Table 38. Average landings (pounds gutted weight) of vermilion snapper taken by MRFSS/Headboat during 1999-2005.

Month	Lbs gw	Percent
1	15,848	3.1%
2	16,594	3.2%
3	27,914	5.4%
4	44,053	8.5%
5	69,367	13.4%
6	74,105	14.3%
7	76,614	14.8%
8	62,688	12.1%
9	47,061	9.1%
10	49,451	9.5%
11	23,040	4.4%
12	12,277	2.4%
Total	519,013	

Table 39. Monthly reduction in MRFSS/Headboat take based on 1999-2005 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	3.1%	6.3%	11.6%	20.1%	33.5%	47.8%	62.5%	74.6%	83.7%	93.2%	97.6%	100.0%
2		3.2%	8.6%	17.1%	30.4%	44.7%	59.5%	71.5%	80.6%	90.1%	94.6%	96.9%
3			5.4%	13.9%	27.2%	41.5%	56.3%	68.3%	77.4%	86.9%	91.4%	93.7%
4				8.5%	21.9%	36.1%	50.9%	63.0%	72.0%	81.6%	86.0%	88.4%
5					13.4%	27.6%	42.4%	54.5%	63.6%	73.1%	77.5%	79.9%
6						14.3%	29.0%	41.1%	50.2%	59.7%	64.2%	66.5%
7							14.8%	26.8%	35.9%	45.4%	49.9%	52.2%
8								12.1%	21.1%	30.7%	35.1%	37.5%
9									9.1%	18.6%	23.0%	25.4%
10										9.5%	14.0%	16.3%
11											4.4%	6.8%
12												2.4%

Table 40. Monthly reduction in MRFSS/Headboat take based on 1999-2005 data if a seasonal closure is 89% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	2.7%	5.6%	10.3%	17.9%	29.8%	42.5%	55.6%	66.4%	74.5%	82.9%	86.9%	89.0%
2		2.8%	7.6%	15.2%	27.1%	39.8%	52.9%	63.7%	71.7%	80.2%	84.2%	86.3%
3			4.8%	12.3%	24.2%	36.9%	50.1%	60.8%	68.9%	77.4%	81.3%	83.4%
4				7.6%	19.4%	32.2%	45.3%	56.0%	64.1%	72.6%	76.5%	78.7%
5					11.9%	24.6%	37.7%	48.5%	56.6%	65.0%	69.0%	71.1%
6						12.7%	25.8%	36.6%	44.7%	53.1%	57.1%	59.2%
7							13.1%	23.9%	32.0%	40.4%	44.4%	46.5%
8								10.7%	18.8%	27.3%	31.3%	33.4%
9									8.1%	16.5%	20.5%	22.6%

10										8.5%	12.4%	14.5%
11											4.0%	6.1%
12												2.1%

5 Commercial Trip Limit Analysis

5.1 Trip limit Analysis, All Snapper Grouper Permits

Table 41. Trip limit analysis (all snapper grouper permits) for data from 1999-2005.

Trip Limit (pounds gutted weight)	Avg 1999-2005				
	Avg no. trips	Avg pounds gw over limit	Expected catch	% trips over limit	% reduction in catch from limit
0	2,593	1,061,737	0	100.0	100.0
225	1,132	710,176	351,561	43.7	66.9
270	1,034	661,394	400,343	39.9	62.3
450	751	502,465	559,272	29.0	47.3
541	640	439,923	621,814	24.7	41.4
631	550	386,363	675,373	21.2	36.4
721	471	340,450	721,287	18.2	32.1
811	408	301,002	760,735	15.7	28.3
901	355	266,784	794,953	13.7	25.1
991	312	236,900	824,837	12.0	22.3
1,081	270	210,659	851,078	10.4	19.8
1,171	239	187,723	874,014	9.2	17.7
1,261	213	167,413	894,324	8.2	15.8
1,351	188	149,290	912,447	7.3	14.1
1,441	166	133,302	928,435	6.4	12.6
1,532	149	119,127	942,610	5.7	11.2
1,622	133	106,443	955,294	5.1	10.0
1,712	116	95,256	966,481	4.5	9.0
1,802	103	85,451	976,286	4.0	8.0
2,027	76	65,433	996,304	2.9	6.2
2,252	58	50,379	1,011,358	2.2	4.7
2,477	43	38,998	1,022,739	1.7	3.7
2,703	33	30,540	1,031,197	1.3	2.9
2,928	25	24,092	1,037,645	0.9	2.3
3,153	19	19,167	1,042,570	0.7	1.8
3,378	15	15,322	1,046,415	0.6	1.4
3,604	11	12,468	1,049,269	0.4	1.2
3,829	9	10,255	1,051,482	0.3	1.0
4,054	6	8,617	1,053,120	0.2	0.8
4,279	4	7,393	1,054,344	0.2	0.7
4,505	4	6,482	1,055,255	0.1	0.6
4,730	3	5,691	1,056,046	0.1	0.5
4,955	2	5,118	1,056,619	0.1	0.5
5,180	2	4,623	1,057,114	0.1	0.4
5,405	2	4,205	1,057,532	0.1	0.4

Table 42. Trip limit analysis (all snapper grouper permits) for data from three time periods.

Trip Limit (pounds gutted weight)	1999-2005	2001	2006
	% reduction in catch	% reduction in catch	% reduction in catch
0	100.0	100.0	100.0
225	66.9	70.1	65.2
270	62.3	65.7	60.6
450	47.3	51.4	45.9
541	41.4	45.5	40.3
631	36.4	40.5	35.4
721	32.1	36.1	31.3
811	28.3	32.3	27.9
901	25.1	28.9	25.0
991	22.3	25.9	22.4
1,081	19.8	23.2	20.0
1,171	17.7	20.9	18.0
1,261	15.8	18.8	16.1
1,351	14.1	16.9	14.4
1,441	12.6	15.2	13.0
1,532	11.2	13.7	11.7
1,622	10.0	12.2	10.5
1,712	9.0	11.0	9.4
1,802	8.0	9.8	8.5
2,027	6.2	7.5	6.5
2,252	4.7	5.7	5.0
2,477	3.7	4.3	3.9
2,703	2.9	3.2	3.1
2,928	2.3	2.4	2.5
3,153	1.8	1.8	1.9
3,378	1.4	1.3	1.5
3,604	1.2	0.9	1.1
3,829	1.0	0.6	0.9
4,054	0.8	0.5	0.7
4,279	0.7	0.3	0.6
4,505	0.6	0.3	0.5
4,730	0.5	0.2	0.4
4,955	0.5	0.2	0.3
5,180	0.4	0.2	0.3
5,405	0.4	0.1	0.3

5.2 Trip Limit Analysis for 225 Permits

Table 43. Vermilion snapper trip limit analysis for 225 permit holders, 1999-2005.

Trip Limit (pounds whole weight)	Trip Limit (pounds gutted weight)	Avg 1999-2005			
		Avg no. trips	Avg pounds over limit	% trips over limit	% reduction in catch from limit
0	0	31	1,450	100.0	100.0
25	23	17	906	55.1	62.5
30	27	15	824	49.5	56.9
50	45	9	573	29.6	39.5
60	54	8	488	24.5	33.6
70	63	7	416	21.3	28.7
80	72	5	357	15.7	24.6
90	81	4	313	13.0	21.6
100	90	3	277	10.2	19.1
110	99	2	249	7.4	17.2
120	108	2	229	6.5	15.8
130	117	2	211	5.1	14.5
140	126	2	195	5.1	13.5
150	135	1	182	3.7	12.6
160	144	1	171	3.7	11.8
170	153	1	159	3.2	11.0
180	162	1	150	2.8	10.4
190	171	1	141	2.8	9.8
200	180	1	133	2.8	9.2
225	203	1	112	2.3	7.7

Table 44. Vermilion snapper trip limit analysis for 225 permit holders, three time periods.

Trip Limit (pounds whole weight)	Trip Limit (pounds gutted weight)	1999-2005	2001	2006
		% reduction in catch	% reduction in catch	% reduction in catch
0	0	100.0	100.0	100.0
25	23	62.5	58.9	60.1
30	27	56.9	52.4	53.2
50	45	39.5	31.6	28.5
60	54	33.6	24.9	18.1
70	63	28.7	19.0	11.0
80	72	24.6	14.3	7.7
90	81	21.6	11.9	6.5
100	90	19.1	9.9	5.4
110	99	17.2	8.6	4.2
120	108	15.8	7.6	3.0
130	117	14.5	6.6	1.9
140	126	13.5	5.6	0.7

Trip Limit (pounds whole weight)	Trip Limit (pounds gutted weight)	1999-2005	2001	2006
		% reduction in catch	% reduction in catch	% reduction in catch
150	**135**	12.6	4.7	0.0
160	**144**	11.8	3.7	0.0
170	**153**	11.0	2.7	0.0
180	**162**	10.4	1.9	0.0
190	**171**	9.8	1.5	0.0
200	**180**	9.2	1.0	0.0
225	**203**	7.7	0.0	0.0

5.3 Trip Limit Analysis for Unlimited Permits

Table 45. Trip limit analysis (unlimited snapper grouper permits) for data from three time periods.

Trip Limit (pounds gutted weight)	1999-2005 % reduction in catch	2001 % reduction in catch	2006 % reduction in catch
0	100.0	100.0	100.0
225	67.0	70.2	65.0
270	62.4	65.8	60.4
450	47.4	51.4	45.6
541	41.5	45.6	39.9
631	36.4	40.6	35.1
721	32.1	36.2	31.0
811	28.4	32.3	27.6
901	25.2	28.9	24.7
991	22.3	25.9	22.1
1,081	19.9	23.3	19.8
1,171	17.7	20.9	17.7
1,261	15.8	18.8	15.8
1,351	14.1	16.9	14.2
1,441	12.6	15.2	12.8
1,532	11.2	13.7	11.5
1,622	10.0	12.3	10.3
1,712	9.0	11.0	9.3
1,802	8.1	9.8	8.3
2,027	6.2	7.5	6.5
2,252	4.8	5.7	5.0
2,477	3.7	4.3	3.9
2,703	2.9	3.2	3.0
2,928	2.3	2.4	2.4
3,153	1.8	1.8	1.9
3,378	1.4	1.3	1.4
3,604	1.2	0.9	1.1
3,829	1.0	0.6	0.9
4,054	0.8	0.5	0.7
4,279	0.7	0.3	0.6
4,505	0.6	0.3	0.5
4,730	0.5	0.2	0.4
4,955	0.5	0.2	0.4
5,180	0.4	0.2	0.3
5,405	0.4	0.1	0.3

5.4 Trip Limit by State

Table 46. Trip limit analysis (all snapper grouper permits) by state for data from 1999-2005.

Trip Limit (pounds gutted weight)	FL	GA	SC	NC	All States
	% reduction in catch	% reduction in catch	% reduction in catch	% reduction in catch	% reduction in catch
0	100.0	100.0	100.0	100.0	100.0
225	59.9	82.8	70.6	55.0	66.9
270	55.3	79.7	66.3	49.7	62.3
450	40.5	68.4	52.0	33.2	47.3
541	34.7	63.3	46.2	27.2	41.4
631	29.7	58.5	41.1	22.3	36.4
721	25.6	54.0	36.6	18.4	32.1
811	22.1	49.7	32.6	15.4	28.3
901	19.1	45.8	29.0	12.9	25.1
991	16.6	42.2	25.8	10.9	22.3
1,081	14.4	38.8	23.0	9.3	19.8
1,171	12.6	35.5	20.4	8.0	17.7
1,261	10.9	32.5	18.2	6.9	15.8
1,351	9.5	29.8	16.1	6.0	14.1
1,441	8.2	27.1	14.3	5.3	12.6
1,532	7.1	24.7	12.6	4.8	11.2
1,622	6.2	22.4	11.1	4.3	10.0
1,712	5.5	20.4	9.8	3.9	9.0
1,802	4.8	18.6	8.7	3.6	8.0
2,027	3.5	14.7	6.3	2.9	6.2
2,252	2.5	11.6	4.6	2.4	4.7
2,477	1.8	9.0	3.4	2.1	3.7
2,703	1.4	7.0	2.5	1.8	2.9
2,928	1.2	5.3	1.9	1.5	2.3
3,153	1.0	4.0	1.5	1.3	1.8
3,378	0.8	2.8	1.3	1.2	1.4
3,604	0.7	2.0	1.1	1.0	1.2
3,829	0.6	1.4	0.9	0.9	1.0
4,054	0.6	1.0	0.8	0.8	0.8
4,279	0.5	0.7	0.8	0.7	0.7
4,505	0.4	0.5	0.7	0.6	0.6
4,730	0.4	0.3	0.7	0.5	0.5
4,955	0.3	0.2	0.7	0.4	0.5
5,180	0.3	0.1	0.7	0.4	0.4
5,405	0.2	0.1	0.6	0.3	0.4
Mean/Trip	275	1,305	579	354	454

6 Recreational Size Limit Analysis

Amendment 13C increased the recreational size limit to 12” TL. The management measure went into effect in October 2006. Analyses below assumes the effect of the 12” TL would be realized in the future.

Table 47. Estimate of harvest reduction associated with the size limit for (1) headboat, (2) private MRFSS, (3) charter MRFSS, (4) private/charter MRFSS combined, and (5) all recreational sectors combined. Assumes a release mortality of 25%. **Assumes compliance with size limit.**

Size Limit	Estimated Harvest Reductions				
	Headboat	Private	Charter	MRFSS	Combined
12 inch	34.3	37.1	18.7	27.5	31.7
13 inch	54.2	47.2	33.9	40.2	48.7
14 inch	63.8	55.7	50.8	53.1	59.6

Table 48. Estimate of harvest reduction associated with the size limit for (1) headboat, (2) private MRFSS, (3) charter MRFSS, (4) private/charter MRFSS combined, and (5) all recreational sectors combined. Assumes a release mortality of 25%. **Assumes non-compliance with size limit.**

Size Limit	Estimated Harvest Reductions				
	Headboat	Private	Charter	MRFSS	Combined
12 inch	23.3	19.6	14.2	16.8	20.8
13 inch	48.5	34.3	30.6	32.4	42.2
14 inch	60.7	46.8	48.9	47.9	55.7

7 Recreational Bag and Size Limit Analysis

Amendment 13C increased the recreational size limit to 12” TL. Analyses below assumes the effect of the 12” TL would be realized in the future. Combination % reduction = 1-(1-size limit % reduction)*(1-bag limit % reduction).

7.1 MRFSS

7.1.1 Charter

Table 49. Percent reductions in recreational harvest (MRFSS Charter) under different combinations of bag limits and size limits. Amendment 13C increased the size limit to 12” TL. Assumes compliance with size limit. Assumes 25% release mortality.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	20.3	22.2	24.5	27.2	30.3	34.1	38.6	44.3	52.8
13 inches	35.2	36.7	38.6	40.8	43.3	46.4	50.1	54.7	61.6
14 inches	51.8	52.9	54.3	56.0	57.9	60.1	62.9	66.3	71.4

Table 50. Percent reductions in recreational harvest (MRFSS Charter) under different combinations of bag limits and size limits. Amendment 13C increased the size limit to 12” TL. Assumes non-compliance with size limit. Assumes 25% release mortality.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish

12 inches	**15.9**	**17.9**	**20.3**	**23.2**	**26.5**	**30.4**	**35.2**	**41.2**	**50.2**
13 inches	**32.0**	**33.6**	**35.6**	**37.9**	**40.5**	**43.7**	**47.6**	**52.4**	**59.7**
14 inches	**49.9**	**51.1**	**52.5**	**54.2**	**56.2**	**58.6**	**61.4**	**65.0**	**70.3**

Table 51. Percent reductions in recreational harvest (MRFSS Charter) under different combinations of bag limits and size limits. Amendment 13C increased the size limit to 12” TL. Assumes non-compliance with size limit and excludes captain and crew. Assumes 25% release mortality.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	16.9	18.7	21.5	23.5	26.5	30.6	35.8	42.5	53.9
13 inches	32.8	34.2	36.5	38.1	40.5	43.8	48.1	53.5	62.8
14 inches	50.5	51.6	53.2	54.4	56.2	58.6	61.8	65.7	72.6

7.1.2 Private

Table 52. Percent reductions in recreational harvest (MRFSS Private) under different combinations of bag limits. Amendment 13C increased the size limit to 12” TL. Assumes compliance with size limit. Does not consider non-compliance with size limit.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	37.3	37.5	38.2	39.0	40.2	42.0	44.5	48.0	53.4
13 inches	47.3	47.5	48.0	48.8	49.8	51.2	53.4	56.3	60.8
14 inches	55.8	56.0	56.4	57.0	57.9	59.1	60.9	63.4	67.1

Table 53. Percent reductions in recreational harvest (MRFSS Private) under different combinations of bag limits. Amendment 13C increased the size limit to 12” TL. Assumes non-compliance with size limit. Takes into consideration non-compliance with size limit.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	19.8	20.1	20.9	22.1	23.6	25.9	29.1	33.6	40.4
13 inches	34.4	34.7	35.4	36.3	37.5	39.4	42.0	45.7	51.3
14 inches	46.9	47.1	47.6	48.4	49.4	50.9	53.0	56.0	60.5

7.1.3 Charter/Private Combined

Table 54. Estimate of MRFSS harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12” TL. Based on proportion of landings represented by Charter (52%) and Private (48%) sectors. Assumes compliance with size limit.

Min Size	**9 fish**	**8 fish**	**7 fish**	**6 fish**	**5 fish**	**4 fish**	**3 fish**	**2 fish**	**1 fish**
12 inches	**28.3**	**29.4**	**30.8**	**32.5**	**34.6**	**37.3**	**40.8**	**45.4**	**52.3**
13 inches	**40.9**	**41.8**	**42.9**	**44.4**	**46.1**	**48.3**	**51.2**	**55.0**	**60.7**
14 inches	**53.7**	**54.3**	**55.3**	**56.4**	**57.7**	**59.5**	**61.8**	**64.7**	**69.2**

Table 55. Estimate of MRFSS harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12” TL. Based on proportion of landings represented by Charter (52%) and Private (48%) sectors. Assumes non-compliance with size limit.

Min Size	**9 fish**	**8 fish**	**7 fish**	**6 fish**	**5 fish**	**4 fish**	**3 fish**	**2 fish**	**1 fish**
12 inches	**17.7**	**18.9**	**20.6**	**22.5**	**25.0**	**28.1**	**32.1**	**37.4**	**45.3**

13 inches	**33.1**	**34.1**	**35.4**	**37.0**	**39.0**	**41.5**	**44.8**	**49.1**	**55.5**
14 inches	**48.5**	**49.2**	**50.2**	**51.5**	**53.0**	**55.0**	**57.5**	**60.8**	**65.7**

Table 56. Estimate of MRFSS harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12" TL. Based on proportion of landings represented by Charter (52%) and Private (48%) sectors. Assumes non-compliance with size limit and excludes captain and crew.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	18.3	19.3	21.1	22.7	25.0	28.2	32.4	38.0	47.2
13 inches	33.6	34.4	35.9	37.2	39.0	41.6	45.1	49.6	57.1
14 inches	48.8	49.5	50.6	51.6	53.0	55.0	57.7	61.2	66.9

7.2 Headboat

Table 57. Estimate of Headboat harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12" TL. Assumes compliance with size limit.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	36.5	38.6	42.3	45.9	50.0	54.2	59.3	65.1	71.8
13 inches	55.7	57.2	59.7	62.2	65.1	68.0	71.6	75.7	80.3
14 inches	64.9	66.1	68.1	70.1	72.4	74.7	77.5	80.7	84.4

Table 58. Estimate of Headboat harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12" TL. Assumes non-compliance with size limit.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	25.8	28.3	32.6	36.8	41.6	46.5	52.5	59.3	67.1
13 inches	50.2	51.9	54.7	57.6	60.8	64.1	68.1	72.7	77.9
14 inches	62.0	63.3	65.5	67.6	70.1	72.6	75.7	79.1	83.1

Table 59. Estimate of Headboat harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12" TL. Assumes non-compliance with size limit, excludes captain and crew.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	26.8	30.3	32.5	37.4	41.6	46.3	50.6	56.4	62.9
13 inches	50.9	53.2	54.7	58.0	60.8	64.0	66.8	70.7	75.1
14 inches	62.5	64.3	65.4	67.9	70.1	72.5	74.7	77.6	81.0

7.3 Headboat/MRFSS Combined

Table 60. Estimate of Headboat/MRFSS harvest reduction (percent) under various catch limits using data from 1999-2005. Amendment 13C increased the size limit to 12" TL. Based on proportion of landings represented by Headboat (61%) and MRFSS (39%) sectors. Assumes compliance with size limit.

Min Size	**9 fish**	**8 fish**	**7 fish**	**6 fish**	**5 fish**	**4 fish**	**3 fish**	**2 fish**	**1 fish**
12 inches	**33.5**	**35.2**	**38.1**	**41.0**	**44.4**	**48.1**	**53.2**	**58.1**	**64.9**
13 inches	**50.2**	**51.5**	**53.7**	**55.9**	**58.4**	**61.2**	**65.0**	**68.6**	**73.7**
14 inches	**60.8**	**61.8**	**63.5**	**65.2**	**67.3**	**69.4**	**72.4**	**75.3**	**79.3**

Table 61. Estimate of Headboat/MRFSS harvest reduction (percent) under various catch limits using data from 1999-2005. Based on proportion of landings represented by Headboat (61%) and MRFSS (39%) sectors. Includes effect of increasing size limit to 12" TL. Takes into consideration non-compliance with size limit.

Min Size	**9 fish**	**8 fish**	**7 fish**	**6 fish**	**5 fish**	**4 fish**	**3 fish**	**2 fish**	**1 fish**
12 inches	**29.2**	**31.1**	**34.2**	**37.3**	**40.9**	**44.8**	**50.2**	**55.4**	**62.7**
13 inches	**47.0**	**48.4**	**50.6**	**53.0**	**55.7**	**58.7**	**62.7**	**66.6**	**72.0**
14 inches	**58.6**	**59.7**	**61.5**	**63.3**	**65.4**	**67.7**	**70.9**	**73.9**	**78.1**

Table 62. Estimate of Headboat/MRFSS harvest reduction (percent) under various catch limits using data from 1999-2005. Based on proportion of landings represented by Headboat (61%) and MRFSS (39%) sectors. Includes effect of increasing size limit to 12" TL. Takes into consideration non-compliance with size limit, excludes captain and crew.

Min Size	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
12 inches	29.4	31.2	34.3	37.4	40.9	44.9	49.8	55.7	63.3
13 inches	47.1	48.5	50.8	53.1	55.7	58.7	62.4	66.8	72.5
14 inches	58.7	59.7	61.6	63.3	65.4	67.7	70.6	74.0	78.5

8 Combined Effects of Size Limit, Bag Limit, and Seasonal Closure

Amendment 13C increased the recreational size limit to 12” TL. Analyses below assumes the effect of the 12” TL would be realized in the future. Combination % reduction for bag limit and seasonal closure = 1-(1-bag limit % reduction)*(1-closure % reduction). Combination % reduction for bag limit/seasonal closure and size limit = 1-(1-bag limit, closure % reduction)*(1-size limit % reduction).

Table 63. Reduction from size limit, bag limit, and seasonal closure. Assumes 25% release mortality, non compliance with size limit, and excludes captain and crew. Vermilion Snapper 12” TL size limit; 89% effectiveness of seasonal closure

closure	open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	66.40%	67.27%	68.75%	70.19%	71.89%	73.76%	76.11%	78.89%	82.52%
sept-april	May-Aug	58.01%	59.09%	60.94%	62.74%	64.86%	67.20%	70.14%	73.62%	78.16%
oct-april	May-Sept	52.31%	53.54%	55.65%	57.69%	60.09%	62.75%	66.09%	70.04%	75.19%
oct-may 15	May 16 - Sept	56.51%	57.63%	59.55%	61.41%	63.61%	66.03%	69.08%	72.68%	77.38%
oct-may 22	May 23-Sept	58.61%	59.68%	61.50%	63.28%	65.36%	67.67%	70.57%	74.00%	78.47%
oct-may	June -Sept	60.71%	61.72%	63.46%	65.14%	67.12%	69.31%	72.06%	75.31%	79.56%
nov-april	May-Oct	46.33%	47.71%	50.08%	52.38%	55.08%	58.08%	61.84%	66.28%	72.08%
nov-mar	April-Oct	40.99%	42.52%	45.12%	47.65%	50.62%	53.91%	58.05%	62.93%	69.30%
dec-mar	April-Nov	38.21%	39.80%	42.53%	45.17%	48.29%	51.73%	56.07%	61.18%	67.85%
dec-feb	Mar-Nov	34.83%	36.51%	39.38%	42.17%	45.46%	49.10%	53.66%	59.05%	66.10%
jan-feb	Mar-Dec	33.34%	35.06%	38.00%	40.86%	44.22%	47.93%	52.61%	58.12%	65.32%
jan-mar	Apr-Dec	36.72%	38.35%	41.14%	43.85%	47.05%	50.57%	55.01%	60.24%	67.08%
jan-apr	May-Dec	42.05%	43.55%	46.10%	48.58%	51.51%	54.74%	58.80%	63.59%	69.85%
sept-oct	nov-aug	41.10%	42.62%	45.21%	47.74%	50.71%	53.99%	58.12%	62.99%	69.36%
no closure	All year	29.41%	31.23%	34.35%	37.37%	40.93%	44.87%	49.81%	55.65%	63.28%

Table 64. Reduction from size limit, bag limit, and seasonal closure. Assumes 25% release mortality, non compliance with size limit, and excludes captain and crew. Vermilion Snapper 13” TL size limit; 89% effectiveness of seasonal closure.

closure	open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	74.82%	75.47%	75.47%	77.66%	78.93%	80.33%	82.10%	84.18%	86.90%
sept-april	May-Aug	68.52%	69.34%	69.34%	72.07%	73.66%	75.41%	77.62%	80.22%	83.63%
oct-april	May-Sept	64.25%	65.18%	65.18%	68.28%	70.09%	72.08%	74.58%	77.54%	81.40%
oct-may 15	May 16 - Sept	67.17%	68.02%	68.02%	70.87%	72.53%	74.36%	76.66%	79.38%	82.92%
oct-may 22	May 23-Sept	67.40%	68.24%	68.24%	71.08%	72.72%	74.54%	76.82%	79.52%	83.04%
oct-may	June -Sept	68.97%	69.77%	69.77%	72.47%	74.04%	75.77%	77.94%	80.51%	83.86%
nov-april	May-Oct	59.77%	60.80%	68.02%	64.30%	66.33%	68.58%	71.39%	74.72%	79.07%
nov-mar	April-Oct	55.77%	56.91%	56.91%	60.76%	62.99%	65.45%	68.55%	72.21%	76.99%
dec-mar	April-Nov	53.68%	54.87%	54.87%	58.90%	61.24%	63.82%	67.07%	70.90%	75.90%
dec-feb	Mar-Nov	51.15%	52.41%	52.41%	56.65%	59.12%	61.84%	65.27%	69.31%	74.59%
jan-feb	Mar-Dec	50.03%	51.32%	51.32%	55.67%	58.19%	60.97%	64.47%	68.61%	74.01%
jan-mar	Apr-Dec	52.57%	53.79%	53.79%	57.91%	60.31%	62.95%	66.27%	70.20%	75.32%
jan-apr	May-Dec	56.56%	57.68%	57.68%	61.46%	63.65%	66.07%	69.12%	72.71%	77.40%
sept-oct	nov-aug	55.85%	56.99%	56.99%	60.82%	63.05%	65.51%	68.61%	72.26%	77.03%
no closure	All year	47.09%	48.45%	48.45%	53.05%	55.72%	58.67%	62.38%	66.76%	72.47%

Table 65. Reduction from size limit, bag limit, and seasonal closure. Assumes 25% release mortality, non compliance with size limit, and excludes captain and crew. Vermilion Snapper 14" TL size limit; 88% effectiveness of seasonal closure.

closure	open	9 fish	8 fish	7 fish	6 fish	5 fish	4 fish	3 fish	2 fish	1 fish
sept-may	June-Aug	80.09%	80.60%	80.60%	82.33%	83.34%	84.45%	85.84%	87.49%	89.64%
sept-april	May-Aug	75.23%	75.87%	75.87%	78.02%	79.27%	80.65%	82.39%	84.44%	87.11%
oct-april	May-Sept	71.93%	72.65%	72.65%	75.09%	76.51%	78.08%	80.04%	82.36%	85.40%
oct-may 15	May 16 - Sept	74.36%	75.02%	75.02%	77.25%	78.54%	79.97%	81.77%	83.89%	86.66%
oct-may 22	May 23-Sept	75.58%	76.21%	76.21%	78.33%	79.56%	80.92%	82.63%	84.66%	87.29%
nov-april	May-Oct	68.47%	69.28%	69.28%	72.02%	73.61%	75.37%	77.58%	80.19%	83.60%
nov-mar	April-Oct	65.38%	66.27%	66.27%	69.28%	71.03%	72.96%	75.39%	78.25%	81.99%
dec-mar	April-Nov	63.77%	64.70%	64.70%	67.85%	69.68%	71.70%	74.24%	77.23%	81.15%
dec-feb	Mar-Nov	61.81%	62.79%	62.79%	66.11%	68.04%	70.17%	72.85%	76.01%	80.13%
jan-feb	Mar-Dec	60.95%	61.96%	61.96%	65.35%	67.32%	69.50%	72.24%	75.47%	79.68%
jan-mar	Apr-Dec	62.90%	63.86%	63.86%	67.09%	68.96%	71.03%	73.63%	76.69%	80.70%
jan-apr	May-Dec	65.99%	66.87%	66.87%	69.83%	71.54%	73.44%	75.82%	78.63%	82.31%
sept-oct	nov-aug	65.44%	66.33%	66.33%	69.33%	71.08%	73.00%	75.43%	78.29%	82.02%
no closure	All year	58.68%	59.74%	59.74%	63.33%	65.42%	67.72%	70.62%	74.04%	78.50%

9 Recreational Boat Limits

9.1 Headboat

Table 66. Reduction in harvest of vermilion snapper caught based on boat limit (number) for headboats using data from 1999-2005. Includes reduction from 12" size limit. Assumes 25% release mortality.

Vessel Limit Number	Reduction Compliance	Reduction Non Compliance
100	63.9	57.9
95	63.5	58.8
90	61.8	59.7
85	48.6	60.6
80	49.8	61.5
70	52.3	63.5
65	53.7	64.5
60	55.0	65.5
55	56.4	66.6
50	57.8	67.7
45	59.4	68.8
40	60.9	70.0
35	62.5	71.2
30	64.1	72.4
25	65.8	73.8
20	67.6	75.1
15	69.5	76.6
10	71.5	78.2
9	72.0	78.5
8	72.4	78.8

7	72.9	79.2
6	73.3	79.5
5	73.8	79.9
4	74.3	80.3
3	74.8	80.7
2	75.3	81.1
1	75.8	81.5

9.2 Charter

Table 67. Reduction in harvest of vermilion snapper caught based on boat limit (number) for charter boats (MRFSS) using data from 1999-2005. Includes reduction from 12" size limit. Assumes 25% release mortality.

Vessel Limit Number	Reduction Compliance	Reduction Non Compliance
50	24.7	20.5
45	26.9	22.9
40	28.7	24.7
35	31.2	27.4
30	33.8	30.1
25	37.1	33.7
20	40.6	37.3
15	45.2	42.2
10	51.0	48.3
9	52.5	49.9
8	54.2	51.6
7	56.0	53.5
6	57.9	55.6
5	60.0	57.8
4	62.3	60.2
3	64.7	62.8
2	67.4	65.6
1	70.4	68.8

9.3 Private

Table 68. Reduction in harvest of vermilion snapper caught based on boat limit (number) for private boats (MRFSS) using data from 1999-2005. Includes reduction from 12" size limit. Assumes 25% release mortality.

Vessel Limit Number	Reduction Compliance	Reduction Non Compliance
25	37.4	14.6
20	38.0	15.4
15	39.9	18.0
10	43.3	22.6

9	44.8	24.6
8	46.1	26.5
7	47.6	28.5
6	49.3	30.7
5	51.3	33.5
4	53.6	36.7
3	56.3	40.4
2	59.7	45.0
1	64.2	51.1

10 Post Quota Bycatch Mortality

Regulations in Amendment 16 will initially decrease the allowable commercial catch of gag from 18 to 37%, depending on the allocation alternative selected. In addition, a 61% reduction in commercial harvest could occur for vermilion snapper based on a recent assessment update; however, this value could change since a new age based assessment is being conducted. A variety of management measures are available to end overfishing of these species, including a commercial quota. If a commercial quota is met for gag or vermilion snapper, it is expected there would still be some catch when fishermen target co-occurring species. These species would have to be released and a percentage of the incidentally caught gag and vermilion snapper would die, depending on depth of capture. The magnitude of incidentally caught gag and vermilion snapper that die after a quota is met is referred to as post quota bycatch mortality (PQBM). The range of management measures used, how fishermen will behave in response to reduced harvest levels, and ability to avoid a species after the quota is met will affect PQBM.

Assumptions

- Trip based logbook data are used to estimate incidental catch of vermilion snapper and gag when fishermen target co-occurring species.
- Vermilion snapper and gag are taken by many fishermen on the same trip.
- If a fisherman cannot net at least $50.00/day, the trip is not included in analyses.
- In determining incidental catch of gag or vermilion snapper, a co-occurring species is targeted if at least 100 lbs whole weight is taken on a trip.
- If vermilion snapper or gag make up greater than 75% of the catch on a trip, it is not included in analyses.
- Fishermen will not use diving gear to target gag after a quota is met or during a seasonal closure.
- There will not be an increase in fishing effort before or after a seasonal closure.
- Some trips that target co-occurring species will not be taken after a quota is met. A range of 20 to 60% is used.
- Fishermen can avoid vermilion snapper and gag to some degree by changing hook size, method of fishing, and location. A range of 20 to 60% in reduction of catch is used.
- Dead discards are determined by applying release mortality rate of 40% for commercially caught vermilion snapper and gag.

Estimate of PQBM with Quota

<u>50% of quota Jan-June and 50% of quota July-Dec</u>

Table 69. Incidental catch of vermilion snapper after a January-June quota is met assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid vermilion snapper (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	136,426	109,141	65,485	26,194	74,794	59,835	35,901	14,361	74,794	59,835	35,901	14,361	46,584	37,267	22,360	8,944
Dead Discards	54,571	43,656	26,194	10,478	29,918	23,934	14,361	5,744	29,918	23,934	14,361	5,744	18,634	14,907	8,944	3,578

Table 70. Incidental catch of vermilion snapper after a July-December quota is met assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	202,108	161,686	97,012	38,805	114,338	91,470	54,882	21,953	114,338	91,470	54,882	21,953	71,264	57,011	34,207	13,683
Dead Discards	80,843	64,675	38,805	15,522	45,735	36,588	21,953	8,781	45,735	36,588	21,953	8,781	28,506	22,805	13,683	5,473

<u>40% of quota Jan-June and 60% of quota July-Dec</u>

Table 71. Incidental catch of vermilion snapper after a January-June quota is met assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid vermilion snapper (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	148,833	119,067	71,440	28,576	82,833	66,267	39,760	15,904	72,146	57,717	34,630	13,852	53,402	42,722	25,633	10,253
Dead Discards	59,533	47,627	28,576	11,430	33,133	26,507	15,904	6,362	28,858	23,087	13,852	5,541	21,361	17,089	10,253	4,101

Table 72. Incidental catch of vermilion snapper after a July-December quota is met assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	190,917	152,734	91,640	36,656	108,677	86,942	52,165	20,866	84,602	67,682	40,609	16,244	63,545	50,836	30,502	12,201
Dead Discards	76,367	61,094	36,656	14,662	43,471	34,777	20,866	8,346	33,841	27,073	16,244	6,497	25,418	20,334	12,201	4,880

50% of quota Jan-Aug and 50% of quota Sept-Dec

Table 73. Incidental catch of vermilion snapper after a January-August quota is met assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid vermilion snapper (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	237,776	190,221	114,133	45,653	134,180	107,344	64,406	25,763	107,590	86,072	51,643	20,657	76,287	61,029	36,618	14,647
Dead Discards	95,111	76,088	45,653	18,261	53,672	42,938	25,763	10,305	43,036	34,429	20,657	8,263	30,515	24,412	14,647	5,859

Table 74. Incidental catch of vermilion snapper after a September-December quota is met assuming a range in trips (0 to 60%) are not taken after quota is met and fishermen can avoid gag (range 0 to 60%) by changing fishing methods.

Trip reduction after quota	0%				20%				40%				60%			
Percent of discards avoided	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%	0%	20%	40%	60%
Discards	122,189	97,751	58,651	23,460	67,003	53,602	32,161	12,865	39,544	31,635	18,981	7,592	41,728	33,383	20,030	8,012
Dead Discards	48,876	39,101	23,460	9,384	26,801	21,441	12,865	5,146	15,817	12,654	7,592	3,037	16,691	13,353	8,012	3,205

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Effects of minimum size limits in the recreational fishery for vermilion snapper in the U.S. South Atlantic: a yield-per-recruit analysis

February 15, 2008

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Introduction

An update stock assessment of vermilion snapper (*Rhomboplites aurorubens*) in the South Atlantic Fisheries Management Council management area was completed and reviewed in July, 2007, using data through 2006. The primary model used in that assessment was a catch-at-length model, the same model used for vermilion snapper in in the 2003 SEDAR-2 benchmark assessment.

In January, 2008, the NMFS Southeast Regional Office (SERO) requested "data analyses for South Atlantic vermilion snapper based on the vermilion snapper assessment update. Management measures are being developed in Amendment 16 to the South Atlantic Snapper Grouper Fishery Management Plan to end overfishing of vermilion snapper. One management action the South Atlantic Fishery Management Council (Council) could consider is a modification of the minimum size limit in the recreational sector. To aid the Council in their decision on this action, I am requesting the Southeast Fisheries Science Center calculate yield per recruit for vermilion snapper as a function of a recreational minimum size limit (ranging from 8 to 16 inches total length) and fishing mortality assuming the Southeast Data Assessment and Review accepted values for natural mortality = 0.25 and release mortality = 25 percent. If possible, I request completion of the task by February 15, 2008, to enable its inclusion in the March 2008 briefing book."

This report answers that request.

Methods

The base model used for the 2007 vermilion snapper update stock assessment included a natural mortality estimate of $M = 0.25$ and a recreational fishery release mortality rate of 25%. From this base model the estimate of $F_{\mathrm{MAX}} = 0.355$ was used as the proxy rate for F_{MSY}. The best estimate of current F is $F_{2006} = 0.73$, from the last year of the assessment.

In the 2007 base model, fishery-specific selectivity was estimated by regulation period. In the case of the recreational fishery, a logistic function of length was estimated in the assessment model and applied to the entire recreational fishery (i.e. both headboat and MRFSS). It should be noted that both the benchmark and update assessments estimated a size at 50% selection of 253 mm (≈10 inches) for the latest regulation period (1999-2006) (Figure 1). This is one inch smaller than the 11 inch TL minimum size limit for the recreational sector in that period, suggesting some noncompliance in the recreational fishery. It should be further noted that the update stock assessment does not address the October 23, 2006 increase in minimum size limit (to 12 inches TL) for the recreational fishery.

Discard selectivity in the base model was computed as the re-scaled difference between selectivity pre-1992 and post-1999. The length at 50% selection for the pre-1992 regulation period was estimated to be 210 mm (≈8.3 inches). In this analysis the pre-1992 selectivity remained unchanged, resulting in some level of discards for all minimum sizes greater than 210 mm.

For the yield-per-recruit calculations in the assessment model a single selectivity function was applied. This overall selectivity function was computed as the catch weighted average selectivity from the last three years in the assessment. In this report, the average selectivity calculation was affected only through the changes in recreational selectivity. The proportion of catch in each of the fisheries in the last three years was not changed.

The base assessment model was modified to calculate yield-per-recruit as a function of recreational minimum size limits from 8 to 16 inches TL. Specifically, the logistic selectivity parameter for length at 50% selection was modified from 200 to 410 mm (Figure 1). The slope of the logistic selectivity function was not modified and no other changes were made to the assessment model.

Results

Yield-per-recruit (kg) for various levels of total fishing mortality rate (F) and recreational minimum size limit (inches TL) are shown in Figure 2. Slices through the F-plane of the three dimensional relationship are shown in Figure 3 for various values of management interest.

From Figure 3 it is clear that changes in the recreational minimum size limit offer very little changes in yield-per-recruit at F_{MAX}, 65% F_{MAX}, 75% F_{MAX}, and 85% F_{MAX}. The bigger gains in yield-per-recruit are best achieved through changes in F, as Figure 2 illustrates.

These results are not surprising, especially given that this analysis is only manipulating the recreational sector of fishing, which in recent years only accounts for ≈30% of the total fishery landings.

Figure 1. Range of recreational selectivity curves (solid lines) applied to the vermilion snapper yield-per-recruit analysis. The base assessment model estimated selectivity curve from the 1999-2006 minimum size limit regulation period is indicated by the dashed line.

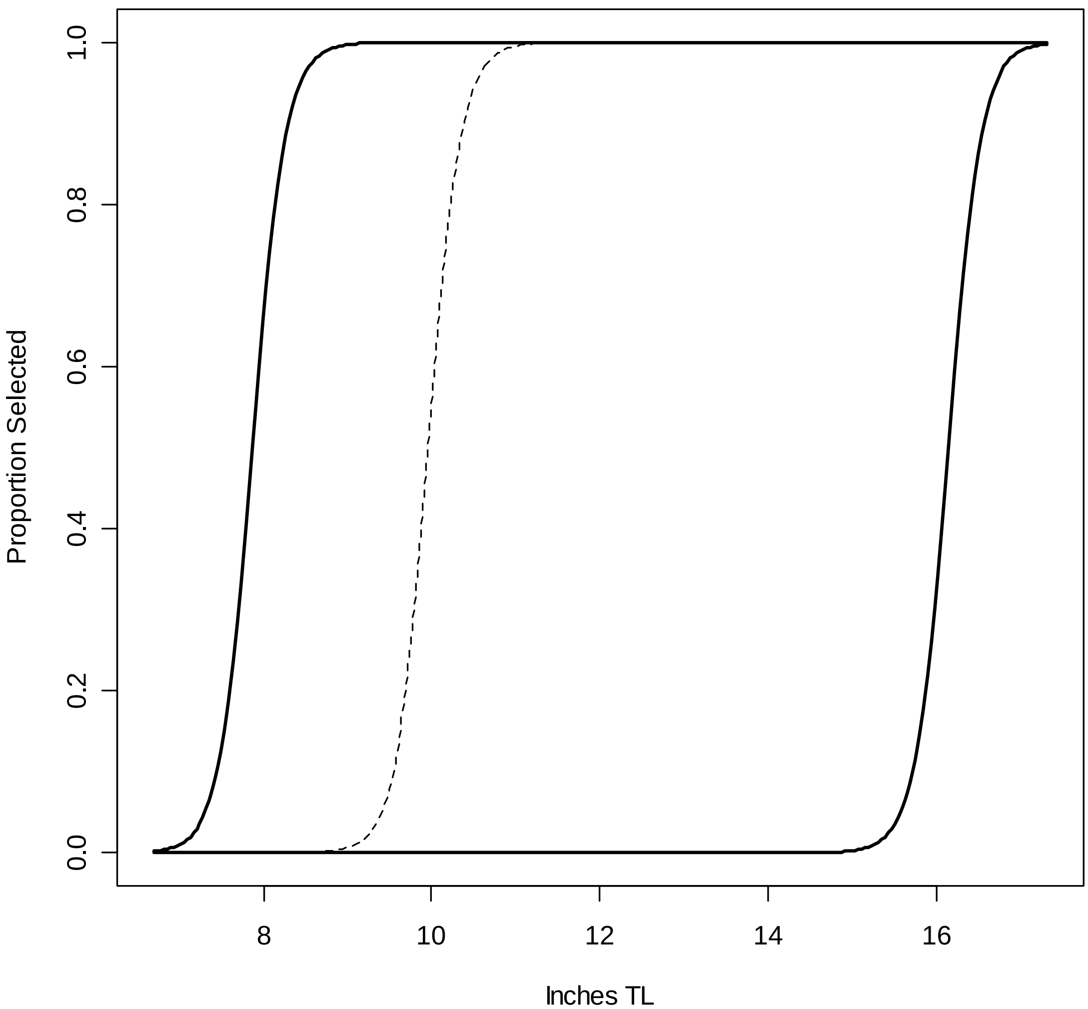


Figure 2. Yield-per-recruit (kg) isopleths for values of total fishing mortality rate (F) and recreational minimum size limits (inches TL). Vertical dashed line represents the F value for F_{MAX} (0.355). The horizontal dashed line represents the size at 50% selection estimated in the 1999-2006 time period in the base stock assessment model.

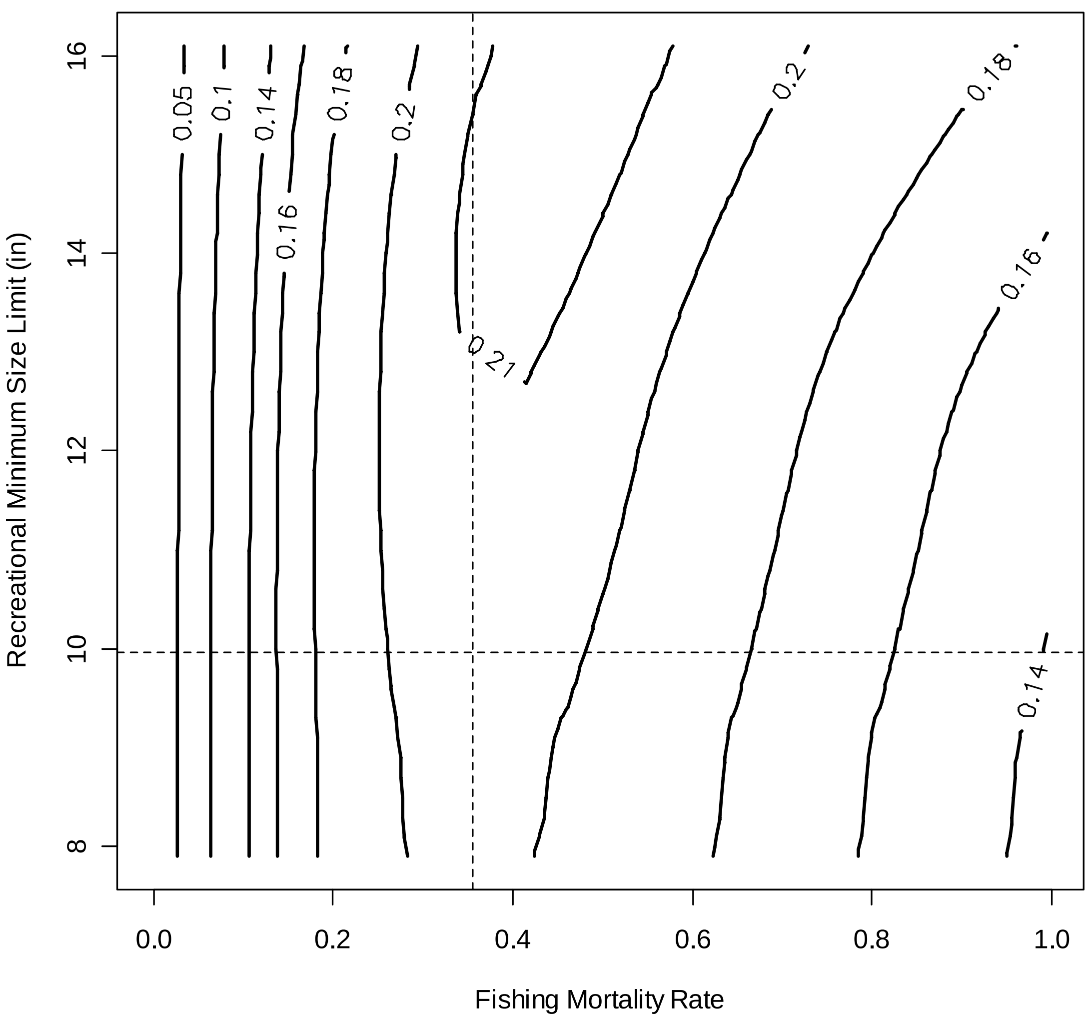
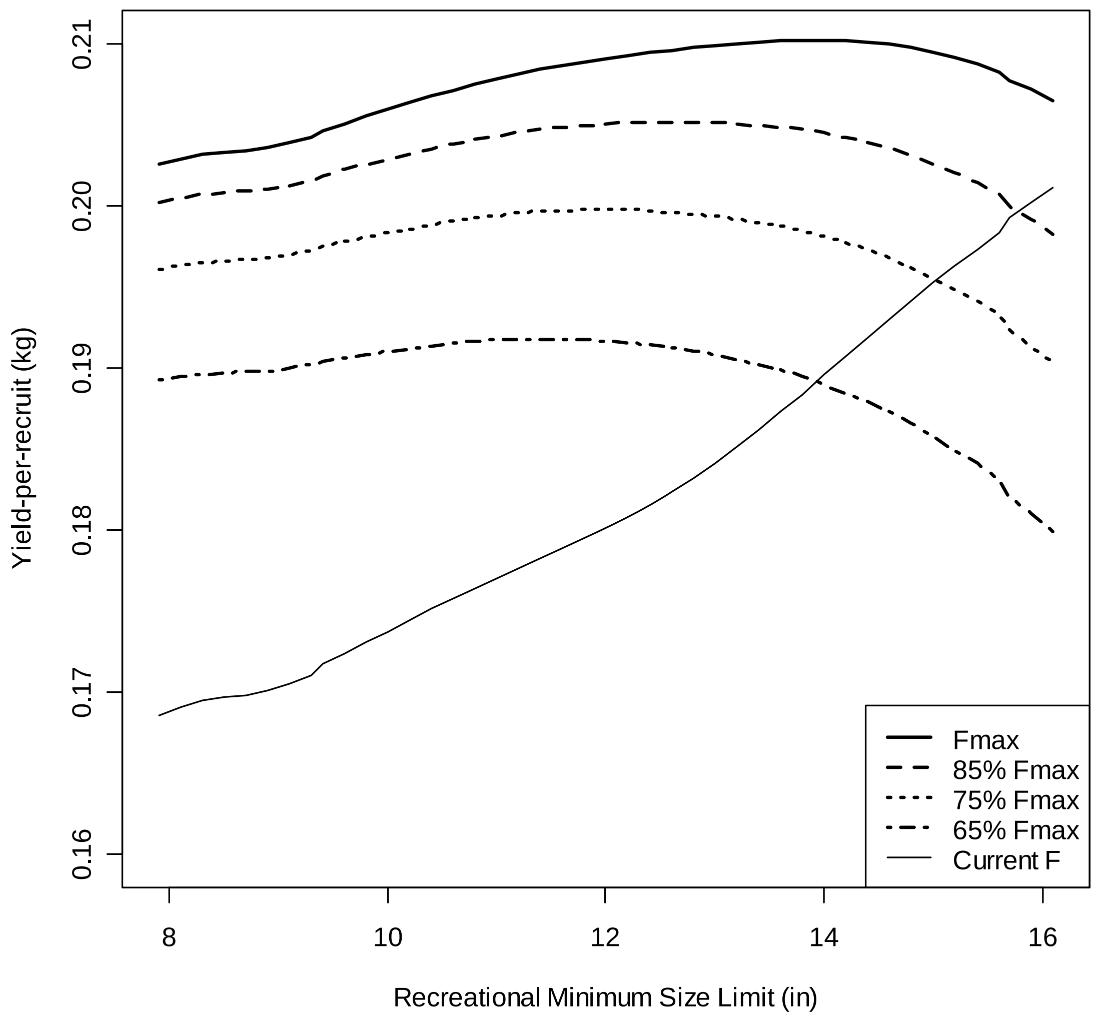


Figure 3. Plot of yield-per-recruit (kg) as a function of recreational size limit (inches TL) for various fishing mortality rates (F).



Appendix H. Commercial model description.

An Economic Model to Analyze Management Alternatives Proposed for the Commercial Fishery in Amendment 16 to the Atlantic Snapper-Grouper Fishery Management Plan

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An Economic Model to Analyze Management Alternatives Proposed for the Commercial Fishery in Amendment 16 to the Atlantic Snapper-Grouper Fishery Management Plan

Abstract: *This report documents the economic model developed to analyze management alternatives proposed in Amendment 16 for the commercial snapper-grouper fishery in federal waters from North Carolina through the Florida Keys. The model uses trip-level data to simulate the effects of proposed management alternatives for vermilion snapper* (*Rhomboplites aurorubens) and gag* (*Mycteroperca microlepis*).

Introduction

The National Marine Fisheries Service found that the gag *(Mycteroperca microlepis)* resource along the U.S. south Atlantic coast is overfished and that additional management is required to rebuild the population to biologically acceptable levels. In addition, overfishing was found for the vermilion snapper (*Rhomboplites aurorubens*) resource and that reductions in fishing mortality are required to prevent the resource from declining below biologically acceptable levels. As a result, the South Atlantic Fishery Management Council prepared Amendment 16 to its Snapper-Grouper Fishery Management Plan to specify biological benchmarks and rebuilding plans for the management of gag, and to reduce fishing mortality for vermilion snapper to end overfishing. Amendment 16 considers a wide range of management alternatives for the commercial and recreational fisheries. This report describes the economic model developed to analyze management alternatives proposed in Amendment 16 for the commercial snapper-grouper fishery in federal waters from North Carolina through the Florida Keys.

Method o f Analysis

Commercial fishermen in the Atlantic snapper-grouper fishery are required to submit logbook trip reports within 7 days of the completion of each trip. The general method of analysis in the model was to hypothetically impose proposed regulations on individual fishing trips as reported to the logbook database. Each reported trip was examined with regard to a combination of rules proposed in Amendment 16, and the effects of the rules on trip catches, revenues and costs were calculated. A six-year average was used to estimate the expected effects of proposed regulations so that anomalies that may have affected fishing success in any one year would be averaged out. Logbook data for the six year period, 2001-2006, were used to simulate the fishery with the proposed management alternatives for Amendment 16.

Logbook trip reports include information about landings by species, but do not include information about trip revenues. Therefore, average monthly prices were calculated from the NMFS Accumulated Landings System and merged with logbook trip reports by year, month, species and state. Trip revenues for each species were calculated as the product of average monthly prices and reported pounds per trip.

Information about trip costs was obtained from a sample of snapper-grouper boats that was required to report trip costs in 2002-2003 in conjunction with their normal logbook reporting requirements. Data that were collected included their costs per trip for major variable inputs such as fuel, bait, ice, food and other disposable supplies. Trip costs were estimated for each major gear type as a function of pounds landed, days per trip away from port, crew size and other trip characteristics, with the explanatory variables chosen to match the types of information reported for each trip in the logbook database (Perruso and Waters 2005).[1] Then, the estimated

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[1] Perruso, Lawrence A., and James R. Waters. 2005. Trip level cost function estimation for the south Atlantic

coefficients from the trip cost equations were used to calculate expected trip costs for each trip in the logbook database for 2001-2006. The expected trip costs were adjusted to constant 2005 dollars with the producer price index for #2 diesel fuel.[2]

Net operating revenues for trip *j* in year *t* were calculated as trip revenues from all species *s*, $TR_{j,t} = \sum R_{s,j,t}$, minus predicted trip costs, $TC_{j,t}$, which include fuel, oil, bait, ice, and other supplies, and exclude fixed costs and labor costs. Fixed costs were not deducted because data are not available with which to determine the fraction of each boat's fixed costs that should be allocated to species in Amendment 16 relative to its other fishing activities. Therefore, net operating revenues represent the return to fixed factors of production, labor and boat owner. Net operating revenues were adjusted to constant 2005 dollars with the consumer price index for all items and all urban consumers.[3]

Fishermen were presumed willing to embark on a trip if net operating revenues exceeded an opportunity cost of labor defined as $50 per person per day fished in 2005. Opportunity cost does not measure actual payments to labor. Rather, it is used in the model as a proxy for the unknown minimum amount that fishermen would be willing to accept for each trip, and is used in the model to determine if trips are still worth taking after accounting for the effects of regulation. The proxy value of $50 per person per day fished is slightly more than the current minimum wage rate of $5.85 per hour for an 8-hour work day, which is the minimum that could be earned in less risky land-based employments. Opportunity cost was adjusted annually for

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snapper-grouper commercial fishery. Social Science Research Group Working Paper SEFSC SSRG 9, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami FL 33149.

[2] The producer price index for #2 diesel fuel can be found at http://data.bls.gov. See series WPU057303.

[3] The consumer price index for all urban consumers can be found at http://data.bls.gov. See series CUUR0000SAO, which was adjusted to a 2005 base period for this study.

changes in the cost of living between 2001 and 2006 with the consumer price index for all items and all urban consumers and a base year of 2005.

If trip revenues exceeded trip costs plus opportunity cost after accounting for the likely effects of proposed restrictions on trip-level harvests, then short-term economic losses were measured as the resulting reduction in trip revenues. Conversely, if the combination of proposed alternatives would cause trip revenues to fall below the sum of trip costs and opportunity cost, then the trip was recorded as not taken, and losses were measured as a reduction in net operating revenues, which included the loss in revenues from all species minus the savings of trip costs not incurred.

Net operating revenues for the combination of proposed rules denoted by *a* in rebuilding year *t*, $NOR_{a,t}$, were totaled for all trips within each logbook year, *k*, from 2001-2006, with annual totals averaged across all six years.

$$NOR_{a,t} = \frac{\sum_{k=2001}^{k=2006} \sum_{j=trips} (TR_{a,j,k} - TC_{a,j,k})}{6}$$

The six-year average is interpreted as the expected annual economic effect of the proposed combination of rules on industry net operating revenues in rebuilding year *t*, $NOR_{a,t}$. Each analysis was conducted for a single rebuilding year, $t = 2009$.

This approach is interpreted as follows. If 2009 is similar to fishing conditions that existed in 2006, then the analysis of proposed regulations with logbook data from 2006 would represent the predicted outcome of proposed regulations for 2009. However, if 2009 turns out to be similar to fishing conditions that existed in 2001, then the analysis of proposed regulations with data from 2001 would represent the predicted outcome for 2009. We do not know exactly what conditions will prevail in 2009; therefore we construct an average predicted outcome based on the six most recent years for which data are available.

The predicted outcome for rule-combination *a* is compared to the predicted outcome for no-action (*i.e.*, no additional management) to determine if the proposed alternatives are expected to generate net benefits or losses to commercial fishermen. The fishery without additional management was evaluated by simulating the effects of rules recently implemented by Snapper-Grouper Amendment 13C and rules to be implemented by Snapper-Grouper Amendment 15A with the historical logbook data from 2001-2006. Net benefits are expected to accrue to the fishery if the predicted outcome for rule combination *a* exceeds the predicted outcome without additional regulation. A net loss would accrue if the predicted outcome for rule combination *a* is less than the predicted outcome for no additional management. Because the analysis is short-term for rebuilding year 2009 only, we expect it to estimate the short-term losses associated with implementation of rules proposed in Amendment 16.

Method of Modeling Management Alternatives

This section describes the method of modeling the effects of management actions on the commercial snapper-grouper fishery. Management alternatives proposed in Amendment 16 or that have been implemented or proposed by Amendments 13C and 15A include minimum size limits, limits on catch per trip, seasonal closures, quotas, and limits on the numbers of black sea bass pots fished per trip. Each type of regulation was modeled by restricting the ability to catch and/or keep fish that were reported on logbook trip reports.

Minimum size limits:

Larger minimum size limits were modeled by assuming that an additional (when compared to the status quo) percentage, ρ_s^{msl}, of species s on each trip are undersized and must be culled from the catch and discarded.

$$q_{s,j,t} = h_{s,j,t}(1-\rho_s^{msl})$$

Variable $h_{s,j,t}$ represents quantity of species s caught on trip j in year t, and $q_{s,j,t}$ denotes quantity kept after accounting for the effects of the larger minimum size limit. Each trip is assumed to catch the same quantity of species s as without the size limit, but that undersized fish would be discarded and subject to release mortality. Revenues for species s on trip j, $R_{s,j,t} = p_{s,j,t}\, q_{s,j,t}$, are based on quantities kept, $q_{s,j,t}$, and price per pound, $p_{s,j,t}$. The harvest of other species on trip j, $h_{sp,j,t}$ for $sp \neq s$, is assumed not to be affected by the proposed minimum size limit for species s. If trip revenues exceeded trip costs after accounting for the proposed minimum size limit and other jointly-proposed rules, then the expected losses for trip j due to a minimum size limit were calculated as a reduction in trip revenues for species s, $p_{s,j,t}\,(q_{s,j,t} - h_{s,j,t})$. However, if the trip became unprofitable with the proposed combination of rules, then losses were measured as a reduction in net operating revenues, which included the loss in revenues from all species minus the savings of trip costs not incurred because the trip would not be taken, $\sum_s p_{s,j,t}\, h_{s,j,t} - TC_{j,t}$.

In the simulation model, trip costs are a function of total catch, including discards, and are not changed by the minimum size limit. Data were not available with which to estimate the potential additional costs of culling and discarding undersized fish.

The percentages that define the additional undersized fish associated with each proposed minimum size limit were held constant throughout the analysis and regardless of the alternatives proposed for other species in the fishery. When effective biologically, minimum size limits gradually change the age and size distribution of the resource and the percentage of undersized fish landed. However, this analysis does not include a biological component with which to endogenously determine changes in the proportion of undersized fish that would be landed each year.

These percentages refer to numbers of fish smaller than the proposed minimum size limits. However, the simulation model works with quantities of each species landed as reported on logbook trips rather than numbers of fish. Hence, this method of simulating the effect of minimum size limits is an approximation for the preferred method that would use numbers of fish, and is likely to overestimate the effect of the minimum size limit when the average weight per fish for species *s* exceeds 1 pound.

Mesh regulations for black sea bass pots:

Mesh regulations were implemented in Amendment 13C and affect the proportion of small fish that would be retained by fish pots. Hence, they were modeled in a similar way as minimum size limits by specifying the additional percentage, ρ^{mesh}, of fish on each trip that would be too small to be retained in fish pots. The primary difference between mesh regulations and minimum size limits is that mesh regulations affect catches and revenues from all species caught in pots, whereas the effects of minimum size limits are specific to species *s*. Although black sea bass constitute the bulk of catches in fish pots, mesh regulations are modeled to reduce the catch of all species that were landed with fish pots.

$$q_{s,j,t} = h_{s,j,t}(1-\rho^{mesh}) \qquad \textit{for all } s$$

If trip revenues exceeded trip costs after accounting for larger mesh and other jointly-proposed rules, then losses were measured as a reduction in trip revenues for all species caught on trip *j* in year t, $\sum p_{s,j,t} (q_{s,j,t} - h_{s,j,t})$. Fish that would not be retained due to the larger mesh were assumed to have never been caught, and hence would not be subject to release mortality. Therefore, trip costs could change due to implementation of mesh regulations if empirical evidence suggests that trip costs are a function of total quantity harvested.

Some combinations of management alternatives would implement larger mesh regulations and larger minimum size limits. Since mesh regulations and minimum size limits both act to reduce the catch of smaller fish, the combined percentage, ρ_s^C, of species *s* that would be lost due to mesh and size limit regulations would be the greater of the two effects.

$$\rho_s^C = \max[\rho_s^{msl},\ \rho^{mesh}]$$

where ρ^{mesh} pertains to all species caught with pot gear on trip *j* and ρ_s^{msl} pertains only to species *s* for which the minimum size limit applies. The combined effects of mesh regulations and minimum size limits were modeled as:

$$q_{s,j,t} = h_{s,j,t}\,(1 - \rho_s^C)$$

Variable $\rho^{mesh} > 0$ only for pot gear. Otherwise, $\rho^{mesh} = 0$, and $\rho_s^C = \rho_s^{msl}$. If neither minimum size limits nor mesh regulations are proposed, then $\rho_s^C = 0$.

Limit on number of pots fished per trip:

A limit on the number of pots that may be fished per trip is modeled by restricting the number of pots to the pot limit, and reducing catch per trip proportionally. If $P_{j,t}$ denotes the number of pots reported for trip *j* in year *t*, and *PL* represents the pot limit, then

$$q_{s,j,t} = h_{s,j,t} \frac{PL}{P_{j,t}} \qquad \textit{for } P_{j,t} > PL$$

$$q_{s,j,t} = h_{s,j,t} \qquad \textit{for } P_{j,t} \leq PL$$

Pot limits affect the ability to catch fish of all species on trips using pots. Hence, potential reductions in catch due to pot limits are considered in the model to occur prior to the effects of other kinds of management rules, such as minimum size limits and trip limits, that restrict the ability of fishermen to keep their catches.

Trip limits:

Trip limits for species *s* impose a maximum allowable catch per trip, and trips with catches of species *s* in excess of the trip limit, TL_s, were modeled by restricting their catches to the trip limit. Some management actions combine trip limits and minimum size limits and/or mesh regulations. In this event, the simulation model reduced catches according to the percentage, ρ_s^C, of undersized fish on trip *j* before determining if the trip limit would be restrictive.

$$q_{s,j,t} = TL_s \qquad \textit{when } h_{s,j,t}(1-\rho_s^C) \geq TL_s$$

Losses attributable to the trip limit were measured as the value of the difference between catches for species *s* that would have occurred with and without the trip limit, $p_{s,j,t}\ [TL_s - h_{s,j,t}\ (1 - \rho_s^C)]$. Please note that losses due to the trip limit would be equal to the difference between the trip limit and reported catches, $p_{s,j,t}\ [TL_s - h_{s,j,t}]$, only when there were no proposed minimum size limits or mesh regulations. The portion of the overall loss measured by $[p_{s,j,t}\ h_{s,j,t}\ \rho_s^C]$ is attributable to the minimum size limit and/or mesh regulation rather than the trip limit. The quantity of species *s* in excess of the trip limit, after accounting for the effects of minimum size limits and mesh regulations, is assumed to have been caught, discarded, and subject to release mortality because the trip would continue in search of other species. In this event, trip costs would not change due to implementation of trip limits.

Trips with catches less than the trip limit, after accounting for the effects of minimum size limits and mesh regulations, would not incur additional losses due to the trip limit.

$$q_{s,j,t} = h_{s,j,t}(1-\rho_s^C) \qquad \textit{when } h_{s,j,t}(1-\rho_s^C) < TL_s$$

The simulation model includes a behavioral assumption about the effect of trip limits on the duration of trips and the cost of fishing. Trips are modeled to terminate after the trip limit is filled if the regulated species is the primary source of revenue on the trip. In this event, trip costs are reduced due to the shorter trip duration and smaller quantity harvested. However, if the regulated species is not the primary source of revenue, then the trip is modeled to continue even if the trip limit is filled. In this event, fish caught in excess of the trip limit are presumed to be caught and discarded. Trip costs would not change.

Trip limits create an incentive for fishermen to take shorter, but more frequent fishing trips. However, this behavioral response has not been modeled for this analysis.

Seasonal closures:

Seasonal closures for species *s* were modeled by defining variable $open_s = 0$ when the season is closed for species *s* and $open_s = 1$ when it is open, and then multiplying by the reported catch of species *s* on trip *j*. Therefore, catch of species *s* would be affected by a seasonal closure policy only during the closed season; *i.e.*, $q_{s,j,t} = 0$ only when $open_s = 0$.

$$q_{s,j,t} = h_{s,j,t}(1-\rho_s^C)\ open_s \qquad \textit{when } h_{s,j,t}(1-\rho_s^C) < TL_s$$
$$q_{s,j,t} = TL_s\ open_s \qquad \textit{when } h_{s,j,t}(1-\rho_s^C) \geq TL_s$$

Seasonal closures create an incentive for boats to re-schedule trips to minimize the likely effect of the closure. However, the model does not accommodate this type of behavioral adaptation to regulation. Logbook data record the month and day landed for each reported trip, and the duration of each trip so that start dates could be calculated. The model uses landed date to identify the trips that would be subject to the closure.

Quotas:

Fishery-wide quotas were modeled in a similar way as seasonal closures. The primary difference between seasonal closures and quotas is that seasonal closures have fixed beginning and ending dates, whereas quotas may or may not result in fishery closures. When quotas are filled, the closure dates vary annually depending on the speed at which the fishery lands its quota for species s. The closure extends through the end of the fishing year once the quota is filled.

The equations that describe the short-term economic effects of quotas are the same as already presented for seasonal closures. The model sets variable $open_s = 0$ to reflect a no-harvest rule resulting from seasonal closures or fishery closures after the quota is filled. Otherwise, it sets $open_s = 1$ to indicate that the fishery for species s is open and that trips are unaffected by either quota or seasonal closure.

The model compares the accumulated fishery landings of species s with its quota to determine if and when the fishery would be closed. This is accomplished by sorting logbook trip reports by year, month and day landed, and then performing a chronological trip-by-trip accumulation of landings that likely would occur given the selected combination of proposed management alternatives. The model sets $open_s = 1$ at the beginning of each fishing year, and sets $open_s = 0$ as soon as accumulated landings exceed the quota for species s.

Quotas tend to promote a race for fish as fishermen compete to maximize their shares of the overall catch before the fishery is closed. The model does not include the possibility that fishermen might accelerate their trips in anticipation of a fishery closure, or that dockside prices might fall if market gluts occur due to the accelerated harvesting activity. More work is needed on these issues since they are two of the primary outcomes of quota management.

Discussion of Model Strengths and Weaknesses

The logbook data used in this analysis reflect the full range of harvesting activities and outcomes for trips in the commercial snapper-grouper fishery, from targeted to incidental capture of various species, and included differences in species composition and fishing activities by area, gear, duration of trip, crew size, good luck and bad luck, and so forth. In this sense, this analysis is more realistic than conventional bioeconomic models, which specify homogeneous fishing activity within a few discrete fishing classes defined by vessel size, gear type, area fished, or scale of operation.

The use of logbook data to simulate the effects of proposed management actions is most appropriate in the short-term because logbooks report actual fishing behavior during a recent period of time. This type of simulation analysis assumes that fishing conditions in the near-future will be similar to conditions in the recent past, and that annual variations in model outcomes are associated with short-term anomalies rather than long-term trends in economic, biological, or environmental conditions.

The use of logbook data becomes less reliable for longer-term analyses because fishing effort and catch rates may change in response to changes in economic, regulatory and environmental conditions. Dockside fish prices, fuel prices and other input costs, the abundance of fish, regulation and other factors may change over time, and all interact to determine the profitability of fishing. Regulation tends to reduce the profitability of fishing, at least initially when first implemented, and fishing effort in the snapper-grouper fishery may decline if some trips switch to other species such as king mackerel. This analysis accounts for behavioral response by eliminating the currently observed trips that likely would become unprofitable given the proposed restrictions on the harvest and retention of vermilion snapper, gag snowy grouper, tilefish, black sea bass and red porgy. However, the simulation model does not account for more complex behavioral responses such as a redirection of fishing effort among different types of fishing as fishermen react to minimize the adverse effects of management. Conversely, fishing effort in the snapper-grouper fishery may increase over time if proposed regulations are successful in increasing the long-term abundance of economically important species. This analysis does not account for potential changes in fishing effort over time, and additional econometric analysis is needed to model this type of behavioral response to changes in resource abundance and regulation.

The outlook for future economic conditions in the commercial fishery has deteriorated, which may lead to reductions in fishing effort, landings and net revenues to boat owners, captains and crews that are independent of regulations proposed in Amendment 16. Fuel prices have increased since 2001, which makes fishing trips more costly and less profitable. In addition, increased commercial and residential development along the coast have increased land prices, reduced the availability of docking space and increased the costs of dockage. Higher ownership and operating costs for vessel owners and dockside fish buyers could lead to a long-term decline in commercial fishery landings with or without regulations proposed in Amendment 16. These declines would not be attributable to the implementation of Amendment 16.

Appendix I. Recreational model description.

Methodology and Assumptions in Calculating Producer and Consumer Surplus for South Atlantic Snapper Grouper Amendment 16 Recreational Sector Fishery
Antonio Lamberte, NMFS SERO
June 2008

1.0 Introduction

The procedure for calculating the changes in producer and consumer surplus due to management changes introduced in Snapper-Grouper Amendment 16 is a simplified version of the one used in Snapper-Grouper Amendment 15A. This simplification is motivated by the lack of certain information for the current amendment. In addition, the calculated results are for one year, so no discounting is applied.

2.0 Parameters, Values, and Source

The following parameters are used in the estimation of the change in consumer surplus expected to occur as a result of the alternative rebuilding strategy alternatives.

Producer surplus (for-hire) – net revenue per angler per trip to captain and crew
Value:
Charterboat – $150 (2005$)
Headboat - $67 (2005$)
Source – SEFSC (David Carter and Christopher Liese, personal communication; values are from survey information, updated to 2005$, on the Gulf of Mexico for-hire fishery and are used as a proxy for South Atlantic values)

Consumer surplus – value of a one fish change in the harvest per target trip.
Value: $3.03 (2005$)
Source: Haab et al. (2001), updated by SEFSC (David Carter, NOAA Fisheries)

Keep elasticity – percent change in target trip demand relative to the percent change in the keep rate.
Value: 1.46
Source: Gillig et al. (2000) via SEFSC (David Carter, NOAA Fisheries)

Average catch (lbs gutted weight)
Value:

	Gag	Vermilion	Others*
Charter	92,743	46,048	86,743
Headboat	56,046	316,907	140,820
Private	351,141	174,345	290,226

*Others include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

	Gag	Vermilion	Others*
Florida	334,480	128,467	236,172
Georgia	19,295	94,616	13,450
South Carolina	26,850	191,379	89,454
North Carolina	119,305	122,838	178,713

*Others include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Source: 2001-06 MRFSS+Headboat data via SERO (Jack McGovern and Stephen Holiman, NOAA Fisheries).

Average weight (lbs gutted weight) per harvested fish

Value:

	Gag	Vermilion	Others*
Charter	12.51	1.07	1.97
Headboat	11.10	0.92	0.92
Private	12.63	1.01	1.97

*Others include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Source: 2001-06 MRFSS+Headboat data via SERO (Jack McGovern and Stephen Holiman, NOAA Fisheries).

Average target trips – average number of individual angler snapper-grouper target trips

Value:

	Gag	Vermilion	Others*
Charter	3,155	250	177
Headboat**	1,660	640	287
Private	44,175	1,131	6,597

*Others include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

**Headboat angler days are taken as proxy for headboat target trips.

	Gag	Vermilion	Others*
Florida	81,200	52,713	99,275
Georgia	1,607	5,784	879
South Carolina	3,358	10,831	3,564

North Carolina	10,636	12,486	13,260

*Others include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Source: 2001-2005 MRFSS+HB data (Jack McGovern and Stephen Holiman, NOAA Fisheries).

3.0 Calculation of Consumer and Producer Surplus

To estimate a change in producer surplus, the projected percent change in catch rate due to the various alternatives is first translated into a percent change in target trip demand via the keep rate elasticity. The percent change in target trip demand is then applied to baseline target trips to arrive at the change in target trips. This latter value is subsequently multiplied by the corresponding producer surplus for charterboat and headboat to arrive at the change in charterboat and headboat producer surplus. Changes in producer surplus are distributed to the various states using the proportion of each state's target trips to total target trips for each species/species group. This is done separately for charterboats and headboats and then aggregated across modes to arrive at each state's changes in producer surplus.

Estimating the change in consumer surplus follows a slightly different procedure. It proceeds by calculating the change in demand for fish under the assumption that changes due to the various alternatives directly translate to changes in demand for fish. To do this, catches in pounds are converted to catches in number of fish using average weights for each species/species group. Changes in the demand for fish are then multiplied by consumer surplus per fish to arrive at the changes in consumer surplus. Changes in consumer surplus are distributed to the various states using the proportion of each state's catch to total catch for each species/species group. This is done separately for charterboats, headboats, and private mode and then aggregated across modes to arrive at each state's changes in consumer surplus.

4.0 Discussion and Caveats

There are several issues/problems with respect to the estimation of economic effects on the recreational fishery. First, alternatives designed to affect gag are considered to have no effects on vermilion snapper and other species, except in the case of gag closure where effects on other species (but not vermilion snapper) are also included. A similar scenario occurs with respect to the effects of alternatives affecting vermilion snapper.

Second, the estimated changes in landings due to the various alternatives are assumed to affect each angler/for-hire operator in the same way they affect the entire population of anglers/operators. These changes are considered to elicit no behavioral changes among anglers/operators. In the case, for example, of spawning/seasonal closures, anglers are assumed not to shift their effort to the open season or to fish for other species.

Third, the values used for producer surplus are taken from a survey of charterboats and headboats conducted in the Gulf, so they do not take into account, among others, particular operational practices of for-hire vessels in the South Atlantic. Also, these values are considered fixed at whatever level of trips taken by the for-hire vessels and whether trips target gag, vermilion, or other species. In addition, no allowance is granted to the possibility of lower for-hire profits due to increases in costs, such as fuel costs, or to changes in general economic conditions that would affect angler and for-hire operator behavior.

Fourth, the value of one fish is fixed at whatever level of fish caught/kept by anglers, whatever the cost of fishing, or whatever species is involved. The last one has particular relevance to the present calculation of consumer surplus. For example, the value of one gag is assumed to be identical to that of one vermilion snapper or one other species, although gag generally weighs more that these other species. Estimation of gag consumer surplus would then tend to be understated or that of other species overstated, assuming that weight is an important factor to an angler's valuation of fish.

Fifth, the value for keep elasticity is based on a study conducted for another species in the Gulf, and thus does not take into account peculiarities in fishing for the same or different species in the South Atlantic. This value is also fixed at whatever level of effort or catch changes. This fixity has particular bearing in the calculation of producer surplus, with a catch reduction of 69 percent or over resulting in total loss of producer surplus. This loss in total producer surplus may be true for some for-hire vessels, but there are potentially others that may still generate positive levels of producer surplus when continuing their fishing operation for the subject species.

Sixth, the calculation of changes in producer and consumer surplus focuses solely on gag or vermilion when the management measures are other than spawning/seasonal closures. For this latter set of alternatives, changes in producer/consumer surplus also include the effects on the "other species." This consideration of other species provides part of the rationale for determining the baseline values as the producer/consumer surplus derived from the gag, vermilion snapper, and other species fisheries.

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