

**REGULATORY AMENDMENT TO THE
REEF FISH FISHERY MANAGEMENT PLAN
TO SET 1999 GAG/BLACK GROUPER
MANAGEMENT MEASURES (REVISED)**

*(Includes Environmental Assessment,
Regulatory Impact Review, and Initial Regulatory Flexibility Analysis)*

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ABC	Acceptable Biological Catch
EEZ	Exclusive Economic Zone
F	Rate of Instantaneous Fishing Mortality
FMFC	Florida Marine Fisheries Commission
FMP	Fishery Management Plan
GMFMC	Gulf of Mexico Fishery Management Council
M	Rate of Instantaneous Natural Mortality
MSY	Maximum Sustainable Yield
NMFS	National Marine Fisheries Service
OY	Optimum Yield
Plan	Reef Fish FMP for the Gulf of Mexico
RA	Regional Administrator (NMFS Southeast Regional Office)
RFA	Regulatory Flexibility Act of 1980
RFSAP	Reef Fish Stock Assessment Panel
RIR	Regulatory Impact Review
RSAP	Red Snapper Advisory Panel
SEAMAP	Southeast Area Monitoring and Assessment Program (fishery-independent data program)
SEFSC	Southeast Fisheries Science Center, Miami, Florida (NMFS Southeast Regional Office)
SEP	Socioeconomic Panel
SPR	Spawning Potential Ratio
SSBR	Spawning Stock Biomass Ratio (an older term for SPR)
TAC	Total Allowable Catch
VPA	Virtual Population Analysis (a method for estimating mortality rates and number of fish at age from catch-at-age data)

YPR Yield Per Recruit

1.0 INTRODUCTION

Groupers, excluding protected species, are managed as a single unit for recreational harvest and as two units, shallow-water grouper and deep-water grouper, for commercial harvest. These units are as follows:

<u>Shallow-water Groupers</u>	<u>Deep-water Groupers</u>	<u>Protected Groupers</u>
red grouper gag black grouper yellowfin grouper yellowmouth grouper rock hind red hind scamp	misty grouper snowy grouper yellowedge grouper warsaw grouper speckled hind scamp (after shallow-water quota is filled)	jewfish Nassau grouper

Although groupers are managed as aggregate units, specific management measures may be applied to individual species within the aggregates. Thus, a 20-inch total length (TL) minimum size limit exists for red grouper, gag, black grouper, and yellowfin grouper, but not for other grouper species (a 16-inch minimum size limit has been proposed for scamp under Reef Fish Amendment 16B).

This regulatory amendment proposes changes to the management measures applied to gag, red, and black grouper. These changes would be implemented under the Reef Fish Fishery management Plan's (FMP) framework procedure for setting total allowable catch (TAC). The existing TAC consists of a commercial 9.8 million pound shallow-water grouper quota, 1.6 million pound deep-water grouper quota, and 6.1 million pound recreational allocation for all groupers combined.

The reasons why changes are being proposed are discussed in the section titled "Purpose and Need for Action". Proposed Alternatives are summarized under "Proposed Actions". A brief overview of the current stock assessment and findings of the Reef Fish Stock Assessment Panel (RFSAP) is in "Status of the Gag Stock" followed by a synopsis of spawning potential ratio (SPR). A detailed discussion of the rationale, biological impacts, socioeconomic impacts, and regulatory impacts of both the alternatives presented is in "Management Alternatives and Regulatory Impact Review". The "History of Management" provides a summary of all changes to the management of groupers since the Reef Fish Fishery Management Plan was implemented.

2.0 HISTORY OF GROUPER MANAGEMENT

The Reef Fish Fishery Management Plan (FMP) was implemented in November 1984. The regulations which affected groupers included: (1) prohibitions on the use of fish traps, roller trawls, and powerhead-equipped spear guns within an inshore stressed area; and, (2) data reporting requirements.

In November, 1989, NMFS announced that anyone entering the commercial reef fish fishery in the Gulf of Mexico after a control date of November 1, 1989 may not be assured of future access to the reef fish fishery if a management regime is developed and implemented that limits the number of participants in the fishery. The purpose of this announcement was to establish a public awareness of potential eligibility criteria for future access to the reef fish resource, and does not prevent any other date for eligibility or other method for controlling fishing effort from being proposed and implemented.

Amendment 1 to the Reef Fish FMP, implemented in 1990, set as a primary objective of the FMP the stabilization of long-term population levels of all reef fish species by establishing a survival rate of biomass into the stock of spawning age to achieve at least 20 percent spawning stock biomass per recruit (SSBR), relative to the SSBR that would occur with no fishing. This amendment established minimum size limits of 20 inches TL for red, Nassau, yellowfin, black, and gag groupers and 50 inches TL for jewfish. It also set a 5-grouper recreational bag limit and 11.0 million pound commercial quota¹ for groupers, with the commercial quota subdivided into a 9.2 million pound shallow-water quota and a 1.8 million pound deep-water quota. A framework procedure for specification of TAC was created to allow for annual management changes, and a target date for achieving the 20 percent SSBR goal was set at January 1, 2000. This amendment also established a longline and buoy gear boundary inshore of which the directed harvest of reef fish with longlines and buoy gear was prohibited and the retention of reef fish captured incidentally in other longline operations (e.g. shark) was limited to the recreational bag limit. Subsequent changes to the longline/buoy boundary could be made through the framework procedure for specification of TAC.

Amendment 2, implemented in 1990, prohibited the harvest of jewfish to provide complete protection for this species in federal waters in response to indications that the population abundance throughout its range was greatly depressed. This amendment was initially implemented by emergency rule.

Amendment 3, implemented in July 1991, provided additional flexibility in the annual framework procedure for specifying TAC by allowing the target date for rebuilding an overfished stock to be changed depending on changes in scientific advice, except that the rebuilding period cannot exceed 1.5 times the generation time of the species under consideration. It revised the FMP's primary objective, definitions of optimum yield (OY) and overfishing and the framework procedure for TAC by replacing the 20 percent SSBR target with 20 percent SPR. The amendment also transferred speckled hind from the shallow-water grouper quota category to the deep-water grouper quota category.

A July, 1991 regulatory amendment raised the 1991 quota for shallow-water groupers to 9.9² million pounds. This action was taken to provide the commercial fishery an opportunity to harvest 0.7 million

¹ These values have been subsequently modified to correct for revisions adopted in the gutted to whole weight ratio. Historically, the conversion ratio used was 1.18, subsequently, the ratio has been corrected and 1.05 is used. This results in these values being 9.8, 8.2 and 1.6 million pounds respectively, for total, shallow-water and deep-water grouper quotas (e.g., $11.0 \div 1.18 \times 1.05 = 9.8$). There is no impact on the commercial fishery from the revision as fish have always been reported in gutted weight and that data is transformed to whole weight for NMFS records.

² The corrected 1991 quota, using the revised conversion factor, was 8.8 million pounds. The corrected 1990 actual harvest was 7.6 million pounds.

pounds that went unharvested in 1990 due to an early closure of the fishery in 1990. The NMFS had projected the 9.2 million pound quota to be reached on November 7, but subsequent data showed that the actual harvest was 8.5 million pounds.

A November, 1991 regulatory amendment set the 1992 commercial quota for shallow-water groupers at 9.8 million pounds.

Amendment 4, implemented in May 1992, established a moratorium on the issuance of new reef fish permits for three years.

Amendment 5, implemented in February 1994, froze the level of fish trap use at current levels for three years by creating a fish trap endorsement and issuing the endorsement only to fishers who had submitted logbook records of reef fish landings from fish traps between January 1, 1991 and November 19, 1992. It also required that all finfish except for oceanic migratory species be landed with head and fins attached.

A 1993 Regulatory Amendment evaluated shallow-water groupers using red grouper as an indicator species for the shallow-water grouper aggregate, but determined that red grouper were not being overfished and made no changes to the commercial quotas (9.8 million pounds for shallow-water groupers and 1.6 million pounds for deep-water groupers), recreational 5-grouper bag limit, and 20-inch TL minimum size limit for gag, red, Nassau, yellowfin, and black grouper.

Amendment 14, implemented in March and April, 1997, provided for a ten-year phase-out for the fish trap fishery and prohibited the use of fish traps west of Cape San Blas, Florida. This amendment also prohibited harvest of Nassau grouper.

Amendment 15, implemented in January, 1998, restricted commercial harvest of reef fish by trap-fishing vessels to the legal fish trap fishery and traditional, supplemental reef fish fishery by vessels fishing stone crab and spiny lobster traps by prohibiting the possession of reef fish in excess of the recreational bag limit, and sale of such fish, on a vessel that has on board, or is tending, a trap other than a fish, stone crab, or spiny lobster trap.

Amendment 16A, partially approved by NMFS in March 1999 and awaiting publication of the final rule, prohibits the possession of reef fish exhibiting the condition of trap rash aboard any vessel other than one with a valid fish trap endorsement; implements additional reporting and inspection requirements for fish trap vessels; and recommends that NMFS establish an electronic vessel monitoring program for the fish trap fishery, subject to Council review and approval.

Proposed Amendment 16B, currently under review by NMFS, contains a proposal to set the minimum size limit for scamp at 16 inches TL. This amendment also proposes establishing recreational bag limits of 1 warsaw grouper and 1 speckled hind per vessel.

3.0 PURPOSE AND NEED FOR ACTION

In August, 1998, the Reef Fish Stock Assessment Panel (RFSAP) reviewed a gag stock assessment prepared by NMFS in October 1997 (Schirripa and Legault 1997, GMFMC 1998). Based on this assessment and an overfishing and overfished threshold of 20 SPR, the RFSAP concluded that gag were

not considered to be overfished (transitional SPR of 21 percent as an estimate of current biomass level). However, based on the static SPR estimate, which is a proxy for fishing mortality rate, the RFSAP warned that the fishery may be undergoing overfishing, i.e., fishing is occurring at a rate that could eventually result in an overfished state. The estimates of static SPR for gag ranged from 18 percent (overfishing occurring) to 23 percent (overfishing not occurring).

Some biologists have also expressed concern about a substantial reduction in the proportion of males that has occurred in the Gulf population of gag since the late 1970's. Historically, males comprised 17 percent of the commercial harvest, but today they comprise from 2-10 percent of the harvest. Although there has been no indication of declining recruitment, it is possible that current recruitment levels are lower than in years prior to the period covered by the stock assessment. Particularly if the proportion of males has been reduced to the point that females in the population are unable to find a mate (GMFMC 1998).

If the gag stock is undergoing overfishing or reduced recruitment levels, then action is needed to stop the overfishing from occurring or to restore the recruitment levels. Since the stock is not currently overfished, a recovery plan with a specified timetable is not needed. However, action at this time to reduce fishing mortality and protect spawning aggregations can help assure that a recovery plan with more restrictive regulations will not be needed in the future.

The NMFS, in its October 1998 *Report to Congress on the Status of Fisheries of the United States*, designated gag as a stock that is approaching an overfished state. That designation is used when NMFS estimates a stock will become overfished within two years. Because of that designation the Council must, within one year, take action to implement rules to prevent overfishing from occurring, or the Secretary will take such action.

In 1998, the Florida Marine Fisheries Commission (FMFC), for state waters on the Atlantic side of Florida, proposed establishing a 2-gag recreational bag limit (within the 5-fish daily limit for all groupers), increasing the minimum size limit from 20 to 24 inches TL, and prohibiting the sale or harvest and possession in excess of the recreational bag limit of black grouper and gag during March and April. The FMFC delayed making these regulations standard throughout their state waters until the Council implemented compatible regulations. Florida landings since 1990 have accounted for 97 percent of recreational gag landings and 94 percent of commercial gag landings in the Gulf of Mexico (Schirripa and Legault 1997).

Based on the recommendations of an Ad Hoc Finfish Stock Assessment Panel, convened by the Council to recommend appropriate levels for maximum sustainable yield (MSY) (GMFMC 1998b), the Council proposed in its Generic Sustainable Fisheries Act Amendment (GMFMC 1999) that the MSY proxy and overfishing threshold (maximum fishing mortality threshold) be set at 30 percent static SPR assuming action would be taken to increase the minimum size limit to a level where at least 50 percent of the female gag are mature (24 inches TL) and/or action taken to protect the gag spawning aggregations through a seasonal or area closure. Gag, which are currently at about 21 percent SPR, will most likely be designated as an overfished stock when the Generic Sustainable Fisheries Act Amendment (GMFMC 1999) is implemented in 1999. That will require the Council, within one year, to establish a rebuilding plan to restore the stock to the MSY level within 10 years, or the Secretary will take such action. The alternatives in this amendment may alleviate the need for additional actions for gag.

4.0 PROPOSED ACTIONS

- Increase the minimum size limit of gag for the commercial fishery from 20 inches TL to 24 inches TL, effective immediately upon implementation. Increase the minimum size limit for gag for the recreational fishery from 20 inches TL to 22 inches TL effective upon implementation; then increase the minimum size limit for the recreational fishery at a rate of 1 inch per year until the minimum size limit reaches 24 inches TL.
- Increase the minimum size limit for black grouper in accordance with the same schedule as for gag.
- Implement a seasonal closure on commercial harvest and a prohibition on sale of gag, black, and red grouper from February 15th to March 15th.
- Close areas 5 and 9 (as described in Appendix 1 as 219 square nautical miles total) year-round to all fishing under the jurisdiction of the Gulf Council with a 4-year sunset clause.

boundaries area 5: NW= 29° 17'N, 85° 50'W NE= 29° 17'N, 85° 38' W,
SW= 29° 06'N, 85° 50'W SE= 29° 06'N, 85° 38'W;

boundaries area 9: NW= 28° 14'N, 84° 48'W NE= 28° 14'N, 84° 37'W,
SW= 28° 03'N, 84° 48'W SE= 28° 03'N, 84° 37'W;

5.0 MANAGEMENT OBJECTIVE AND OPTIMUM YIELD

Optimum Yield

The primary objective and definition of OY for the Reef Fish Fishery Management Plan is any harvest level which maintains, or is expected to maintain, over time a survival rate of biomass into the stock of spawning age to achieve at least a 20 percent SPR.

The Council has developed new definitions of Optimum Yield (OY) to comply with new requirements of the Sustainable Fisheries Act of 1996. The new proposed definitions will apply on a species-by-species basis, whereas the old definition was a single parameter that applied to all reef fish. Under the Sustainable Fisheries Act Generic Amendment, the Council has proposed that the OY for gag and black grouper be set at 40 percent static SPR. The proposed redefinitions of OY have been submitted to NMFS for implementation. Until these new definitions are approved and implemented by NMFS, the following is the existing definition of OY.

Definition of Overfishing

The following is the definition of overfishing contained in Amendment 1 of the Reef Fish FMP.

1. A reef fish stock or stock complex is overfished when it is below the level of 20 percent SPR.

2. When a reef fish stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 20 percent SPR level.
3. When a reef fish stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of optimum yield on a continuing basis.

The Council has developed new definitions of overfishing and is developing new definitions of overfished thresholds to comply with new requirements of the Sustainable Fisheries Act of 1996. The new proposed definitions will apply on a species by species basis, whereas the old definition was a single set of parameters that applied to all reef fish. Under the Sustainable Fisheries Act Generic Amendment, the Council has proposed that the “overfishing” threshold for gag and black grouper be set at a fishing mortality rate equivalent to 30 percent static SPR. The “overfished” biomass (or biomass proxy) threshold has not yet been determined and will be implemented for each stock by framework measure as estimates of the biomass corresponding to MSY and the minimum stock size threshold are developed by NMFS, the RFSAP, and Council. The proposed redefinitions of overfishing have been submitted to NMFS. Until these new definitions are approved and implemented by NMFS, the following is the existing definition of overfishing and overfished.

6.0 REEF FISH FRAMEWORK PROCEDURE AS SPECIFIED IN THE FMP

The following is the existing framework procedure for specification of TAC, as established in Amendment 1 and modified in Amendments 11 and 14, and as modified in 1997 by regulatory amendment to comply with the requirement that the recreational red snapper fishery be managed as a quota. The specified recovery date for red snapper reflects the current recovery criteria that overfished stocks be recovered to 20 percent SPR within 1.5 generation times. This framework procedure will be modified by the Sustainable Fishery Act Generic Amendment when it is approved.

Procedure for Specification of TAC:

1. Prior to October 1 each year, or such other time as agreed upon by the Council and NMFS Regional Administrator (RA), the NMFS Southeast Fisheries Science Center (SEFSC) and Economics and Trade Division (ETD), Southeast Regional Office (SERO) will: a) update or complete biological and economic assessments and analyses of the present and future condition of the stocks and fisheries for red snapper and other reef fish stocks or stock complexes; b) assess to the extent possible the current SPR levels for each stock; c) estimate fishing mortality (F) in relation to $F_{20 \text{ percent SPR}}$ and F_{OY} ; d) estimate annual surplus production, F_{\max} or other population parameters deemed appropriate; e) summarize statistics on the fishery for each stock or stock complex; f) specify the geographical variations in stock abundance, mortality, recruitment, and age of entry into the fishery for each stock or stock complex; and g) provide information for analyzing social and economic impacts of any specification demanding adjustments of allocations, quotas, bag limits or other fishing restrictions.
2. The Council will convene a Reef Fish Stock Assessment Panel (RFSAP), and a Socioeconomic Panel (SEP) appointed by the Council, that will, as working groups, review the SEFSC and

ETD assessments, current harvest statistics, economic, social, and other relevant data. The RFSAP will prepare a written report to the Council specifying a range of acceptable biological catch (ABC) for each stock or stock complex which is in need of catch restrictions for attaining or maintaining OY. The ABCs are catch ranges that will be calculated for those species in the management unit that have been identified by the Council, NMFS, or the working panels as in need of catch restrictions for attaining or maintaining OY. For overfished stocks, the range of ABCs shall be calculated so as to achieve reef fish population levels at or above the 20 percent SPR goal by January 1, 2000, for all reef fish except red snapper which has a January 2019 target date, or by a time period (target date), or set of time periods (target dates) specified by the RFSAP. Any time period specified by the stock assessment panel for consideration by the Council under this framework procedure cannot exceed a period equal to 1.5 times the potential generation time of the stock or such other time period as specified by plan amendment. Generation times are to be specified by the stock assessment panel based on the biological characteristics of the individual stocks. For stock or stock complexes where data in the SEFSC reports are inadequate to compute an ABC based on the spawning stock biomass per recruit or SPR models, the RFSAP will use other available information as a guide in providing their best estimate of an ABC range that should result in at least a 20 percent SPR level. The ABC ranges will be established to prevent an overfished stock from further decline. To the extent possible, a risk analysis should be conducted indicating the probabilities of attaining or exceeding the stock goal of 20 percent SPR, the annual transitional yields (i.e., catch streams) calculated for each level of fishing mortality within the ABC range. The SEP will examine the economic and social impacts associated with fishing restrictions required to attain those levels. The working groups reports may include recommendations on bag limits, size limits, specific gear limits, season closures, and other restrictions required to attain management goals, along with the economic and social impacts of such restrictions, and the research and data collection necessary to improve the assessments. The RFSAP may also recommend additional species for future analyses.

3. The Council will conduct a public hearing on the RFSAP and SEP reports at, or prior, to the time it is considered by the Council for action. Other public hearings may be held also. The Council will request review of the reports by its Reef Fish Advisory Panel and Scientific and Statistical Committees and may convene these groups before taking action.
4. The Council in selecting a TAC level, and a stock restoration time period (target date), if necessary, for each stock or stock complex for which an ABC range has been identified will, in addition to taking into consideration the recommendations and information provided for in (1), (2), and (3), utilize the following criteria:
 - a. Set TAC within or below the first ABC range or set a series of annual TACs to obtain the ABC level within the first three years or less.
 - b. Subdivide the TACs into commercial and recreational allocations which maximize the net benefits of the fishery to the nation. The allocations will be based on historical percentages harvested by each user group during the base period of 1979-1987. However, if for an overfished stock the harvest in any year exceeds the TAC due to either the recreational or commercial user group exceeding its allocation, subsequent allocations pertaining to the

respective user group will be adjusted to assure meeting the specified target date for achieving the spawning potential ratio (SPR) goal.

5. The Council will provide its recommendations to the RA for any specifications in TACs and stock restoration target dates for each stock or stock complex, and the quotas, bag limits, trip limits, size limits, closed seasons, and gear restrictions necessary to attain the TAC, along with the reports, a regulatory impact review and environmental assessment of impacts, and the proposed regulations before October 15, or such other time as agreed upon by the Council and RA.
6. Prior to each fishing year, or other such time as agreed upon by the RA and Council, the RA will review the Council's recommendations and supporting information; and, if he concurs that the recommendations are consistent with the objectives of the FMP, the Magnuson Act National Standards, and other applicable law, he shall forward for publication notice of proposed rules for TACs and associated harvest restrictions by November 1, or such other time as agreed upon by the Council and RA (providing up to 30 days for additional public comment). The RA will take into consideration all public comment and information received and will forward for publication in the *Federal Register* the notice of final rule by December 1, or such other time as agreed upon by the Council and RA.
7. Appropriate regulatory changes that may be implemented by proposed rule in the *Federal Register* include:
 - a. The TACs for each stock or stock complex that are designed to achieve a specific level of ABC within the first year, or annual levels of TAC designed to achieve the ABC level within three years.
 - b. Bag limits, size limits, vessel trip limits, closed seasons or areas, gear restrictions, and quotas designed to achieve the TAC level.
 - c. The time period (target date) specified for rebuilding an overfished stock with the restriction that a time period specified under this framework procedure cannot exceed a period equal to 1.5 times the generation time of the stock under consideration.
8. If the NMFS decides not to publish the proposed rule of the recommended management measures, or to otherwise hold the measures in abeyance, then the Regional Administrator must notify the Council of his intended action within 30 days of receipt of the Council's proposal and the reasons for NMFS concern along with suggested changes to the proposed management measures that would alleviate the concerns. Such notice shall specify: 1) the applicable law with which the amendment is inconsistent, 2) the nature of such inconsistencies, and 3) recommendations concerning the actions that could be taken by the Council to conform the amendment to the requirements of applicable law.

7.0 WHAT IS SPAWNING POTENTIAL RATIO (SPR)?

Spawning potential ratio is an index of a population's health as measured by the biological ability of the adult fish to produce spawn or eggs. A particular level of SPR is directly dependent on the estimated number of living adult fish (or females) and their longevity, or number at age, which is controlled by the prevailing fishing mortality exerted on the population. Spawning potential can be measured as the

average number of female fish alive times the average number of eggs spawned (or proxy such as gonad weight or total female fish biomass). The spawning potential thus measured, when divided by the spawning potential of a population in the absence of fishing mortality, produces the SPR estimate. An alternative way of measuring SPR is on a per-recruit basis, where a recruit is defined as a young-of-the-year fish that has grown large enough to be sampled by juvenile sampling devices. The life expectancy of that recruit is determined by a combination of natural mortality, fishing mortality, and bycatch mortality. The average lifetime egg production is calculated based on that life expectancy and fecundity (or weight) at age, and is divided by the average lifetime egg production of a recruit that is subject only to natural mortality to determine the SPR.

Various measures of optimal fishing have been defined whereby fishing greater than the optimal level results in overfishing. For reasons set forth in Amendment 1, the measure of optimal fishing for reef fish was chosen to be a fishing mortality rate corresponding to 20 percent SPR, which was deemed to be the minimum SPR level at which stocks could safely maintain themselves under equilibrium conditions. Under the Sustainable Fisheries Act of 1996, future overfishing thresholds and optimum yield targets must be determined on the more conservative basis of maintaining stocks at levels capable of producing maximum sustainable yield (MSY). This does not mean that the MSY yield levels must actually be harvested, but that the stocks be at levels capable of producing that yield on a continuing basis. For most stocks, these new levels are expected to occur when stocks are fished at fishing mortality rates corresponding to SPR levels of 30 to 40 percent (although for some species, SPR levels above or below that range may be more appropriate). The Council submitted new overfishing thresholds and optimum yield targets to NMFS in February 1999. Until these new levels are approved and implemented by NMFS, management will continue to be based on the 20 percent SPR level.

The SPR estimate can be calculated two ways:

Transitional SPR provides information about the current status of the stock. It does not provide any indication of whether a stock is declining, recovering, or remaining stable. Under constant ecological conditions, transitional SPR is related to the stock size or spawning stock biomass. However, losses or gains in habitat, immigration or emigration of fish to or from the stock, or changes in predator-prey relationships can change the relationship between transitional SPR and spawning stock biomass thus reducing its usefulness as a long-term proxy for stock biomass.

Static SPR is the equilibrium level at which a stock will eventually stabilize if fishing mortality remains at its current level. When static SPR is higher than transitional SPR, stock levels are increasing, and when static SPR is lower than transitional SPR, stock levels are declining. A given level of static SPR corresponds to a level of fishing mortality, and it can be used as a proxy for fishing mortality rate.

8.0 MANAGEMENT ALTERNATIVES AND REGULATORY IMPACT REVIEW

Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action, (2)

it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem, and (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 and whether the proposed regulations will have a "significant economic impact on a substantial number of small entities" in compliance with the Regulatory Flexibility Act of 1980 (RFA). The primary purpose of the RFA is to relieve small businesses, small organizations, and small governmental jurisdictions (collectively: "small entities") of burdensome regulatory and record keeping requirements. The RFA requires that if regulatory and record keeping requirements are not burdensome, then the head of a Federal agency must certify that the requirement, if promulgated, will not have a significant effect on a substantial number of small entities.

This RIR analyzes the probable impacts that the proposed alternatives for the Reef Fish Fishery Management Plan (FMP) would have on the commercial and recreational directed gag fisheries.

In this document, the "Economic Impacts" statements under each of the management options comprise the bulk of the RIR. The problems and objectives are described in previous sections of this regulatory document as a part of the RIR by reference.

8.1 Alternatives for Gag Total Allowable Catch

8.1.1 Gag Total Allowable Catch

Proposed Alternative: Status Quo - No gag total allowable catch. Any gag management measures implemented through this regulatory amendment will be treated as an optimization of the shallow-water grouper TAC.

Rejected Alternative 1: Set a gag total allowable catch of 2.49 million pounds.

Rejected Alternative 2: Set a gag total allowable catch of 4.03 million pounds.

Rejected Alternative 3: Set a gag total allowable catch at a level between 2.49 and 4.03 million pounds.

Rationale: Management measures to reduce gag harvest to levels consistent with achieving 20 percent or 30 percent SPR can be implemented as an adjustment to the aggregate grouper TAC. Although there is no gag-specific TAC, there is a target gag ABC range and an overall aggregate grouper TAC of which gag is a part. If a gag TAC were set, the appropriate allocation between the commercial and recreational sectors could become an issue due to incomplete recording of gag catches down to the species level during the 1979-1987 base period on which allocations are currently based (see next section). The proposed alternative makes the issue of allocating a gag TAC unnecessary.

Discussion: The RFSAP concluded, based on the 1998 gag stock assessment (Schirripa and Legault 1997), that gag are not considered to be in an overfished state at this time (transitional SPR of 21 percent), but that the fishery may be undergoing overfishing based upon the static SPR values (18 to 23 percent static SPR). Although annual gag landings have been fairly stable (Table 1), a reduction in landings is necessary to assure that overfishing does not occur. In October 1998, the NMFS *Report to*

Congress on the Status of Fisheries of the United States listed gag as a stock that was approaching an overfished condition. As a result of this classification, the Council is required to take action within one year to prevent the gag stock from becoming overfished. Since gag are not currently overfished, this can be accomplished by keeping the fishing mortality rate below the 20 percent target static SPR level for overfishing ($F_{20\% \text{ SPR}}$). An ABC based on a constant $F_{20\% \text{ SPR}}$ will vary from year to year due to fluctuations in year-class strength. Consequently, the RFSAP recommended an ABC of 1.77 - 3.37 million pounds in 1999, and 1.48 - 3.32 million pounds in 2000. At the more conservative level of 30 percent static SPR (proposed as the new overfishing threshold in the Generic Sustainable Fisheries Act Amendment), the ABC ranges would be 1.33 - 2.49 million pounds in 1999, and 1.18 - 2.59 million pounds in 2000.

ABC recommendations for gag from the RFSAP.

VPA Model	Year	$F_{20\% \text{ SPR}}$	$F_{30\% \text{ SPR}}$	$F_{40\% \text{ SPR}}$
2	1999	1.77	1.33	1.02
	2000	1.48	1.18	0.94
5	1999	3.37	2.49	1.88
	2000	3.22	2.59	2.06

Gag are included in the aggregate grouper TAC, consisting of a commercial 9.8 million pound shallow-water grouper quota, 1.6 million pound deep-water grouper quota, and 6.1 million pound recreational allocation for all groupers combined. It is, therefore, possible to implement changes to gag management as an optimization of the aggregate grouper TAC. However, the shallow-water grouper portion of the aggregate TAC is based on the red grouper stock assessment and TAC, and an assumption that red grouper comprise about 69 percent of the shallow-water grouper harvest (GMFMC 1991). That leaves 31 percent, or about 3.0 million pounds of commercial harvest and 1.9 million pounds of recreational harvest for gag and other shallow-water grouper species. There is no requirement that species stay within these allocations as long as the overall shallow-water grouper harvest remains within its quota and recreational allocation. These potential harvest levels are above the ABC range recommended by the RFSAP to prevent overfishing of gag and achieve optimum yield. Furthermore, minimum size limit changes proposed for gag in this regulatory amendment may change selectivities and alter the proportions of gag in the aggregate grouper catch from the historical levels.

In each of the alternatives to set a gag TAC, it was assumed that the gag TAC would be a subset of the aggregate grouper TAC, shallow-water grouper quota, and recreational grouper allocation.

Rejected Alternative 1 (2.49 million pound TAC) is within all of the ABC ranges discussed above, for both 20 percent and 30 percent SPR, and for both 1999 and 2000. This TAC would accommodate both the current and proposed (in the Generic Sustainable Fisheries Act Amendment, GMFMC 1999) future management targets. However, this TAC would require a reduction from current harvest levels. Total catch has been at about 3.3 million pounds for most years since 1990, although there have been increased landings in 1997 (4.35 million pounds) and 1998 (5.56 million pounds; Figure 1), apparently due to the entrance of NMFS)

strong year classes into the fishery (

Table 1). This alternative would likely result in commercial quota closures along with the associated economic disruption and possible derby fishery. In addition, a quota closure for gag while the fishing for other grouper species remains open would result in increased discard mortality of incidentally caught gag in the commercial fishery. Discard mortality in the commercial fishery is currently almost negligible (Figure 2). For these reasons and because of the previously stated problems with determining an appropriate allocation of TAC, the Council rejected this alternative, and they proposed instead a set of harvest restrictions that are intended to reduce the gag harvest within the shallow-water grouper quota without triggering a quota closure.

Rejected Alternative 2 (4.03 million pound TAC) is the highest level of gag harvest observed between 1990 (when the 20-inch TL minimum size limit was implemented) and 1996. Because of recent increases in gag harvest in 1997 and 1998, it is possible that this TAC may also trigger a commercial quota closure. However, it is well above even the most lenient ABC, and would fail to maintain an $F_{20\% SPR}$ rate of fishing. For these reasons and because of the previously stated problems with determining an appropriate allocation of TAC, the Council rejected this alternative.

Rejected Alternative 3 allows the Council to specify an alternative TAC within the range of 2.49 to 4.03 million pounds. The highest TAC consistent with $F_{20\% SPR}$ is 3.37 million pounds in 1999, and 3.22 million pounds in 2000. These levels

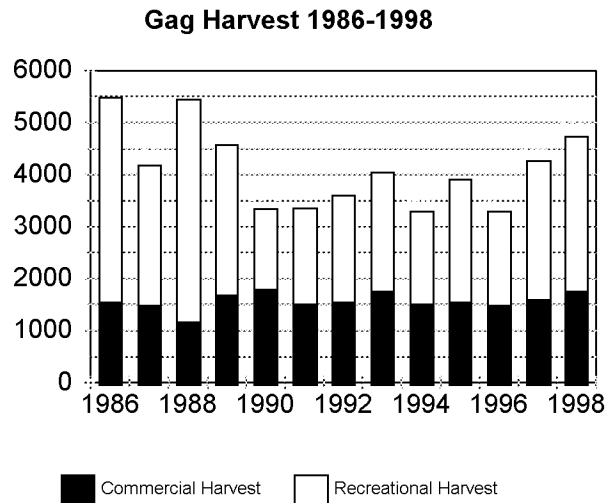


Figure 1. Gag harvest 1986-1998, 1998 data is preliminary (Source: 1), apparently due to the entrance of NMFS)

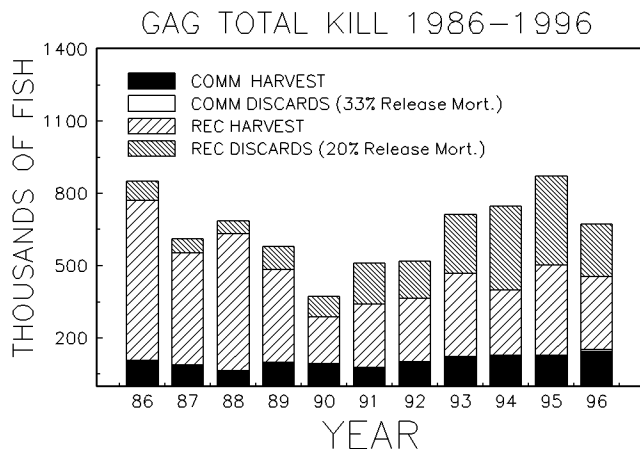


Figure 2. Gag Estimated total kill of gag from U.S. waters of the Gulf of Mexico. (Source: Schirripa and Legault 1997)

are near or only slightly below gag harvest in the years 1990-1996. This Alternative would require less restrictive management measures than Rejected Alternative 1. However, the problems and issues discussed under Rejected Alternative 1 are also applicable to this alternative. Therefore, it was rejected by the Council.

Economic Impacts: The general economic issue accompanying the setting of TAC is the comparison of short-term costs with long-term benefits. Analysis of this issue involves, at its minimum, the stream of TACs over time. In the absence of this information and the economic functions translating landings into economic values, the major focus of the succeeding analysis will be on short-term impacts.

There are at least two major short-term economic issues accompanying the setting of TAC for gag. The first relates to the potential reaction of fishers to the chosen TAC, and the second pertains to the allocation of TAC between competing user groups, namely, commercial and recreational sectors. Due to the problems of setting allocation ratios, as discussed in the next section, only the first issue will be dealt with here. The major assumption under this limited analysis is that a TAC that would likely constrain overall landings would also constrain commercial and recreational landings.

The potential reaction of fishers to TAC setting is strongly related to the likelihood that total landings would exceed the TAC. The commercial sector's experience in the grouper fishery is that a commercial quota set at a relatively high level has negligible effects on the behavior of fishers. While the potential exists for the fishery to be closed once the quota is reached, there has arisen no necessity for the fishers to catch as many fish as can be taken within a short period of time, mainly because of the absence of closures in the fishery. The moratorium on the issuance of new commercial permits coupled with the income requirement when securing a commercial permit may have contributed to forestalling a substantial increase in fishing effort. In contrast, the experience with the red snapper fishery has demonstrated that a limiting TAC (i.e., TAC that is likely to be exceeded) would likely bring about a derby-like fishery, at least in the commercial fishery. Also, to the extent that the recreational red snapper fishery has been exceeding its allocation and contributing to TAC overruns, the pressure to impose more restrictions on the fishery mounted, culminating in the provision for a fishery closure when its allocation is projected to be reached at some point in time.

Table 1 provides commercial and recreational landings of gag for the period 1986-1998. The highest total landings of about 5.5 million pounds were made in 1986 and 1998, while the lowest, at about 3.3 million pounds, were recorded in 1994 and 1996. The average landings were about 4.9 million pounds for the period 1986-1989, and declined to about 3.9 million pounds for 1990-1998. One of the main factors explaining the decline in landings is the set of regulations imposed in 1990 under Amendment 1. Foremost of these regulations is the 20-inch TL minimum size limit. The decline in landings is even more apparent by calculating a 3-year moving average. For example, the moving average for 1988 (average landings for 1986-1988) was 5.0 million pounds while that for 1996 (average landings for 1994-1996) was about 3.3 million pounds. From 1990 through 1996, the moving average fluctuated around a narrow band of 3.4 and 3.76 million pounds. Landings increases in subsequent years raised the moving averages to 3.9 in 1997 and 4.4 in 1998.

What the historical landings appear to indicate is that any TAC below 3.4 million pounds would start to act as an effective constraint on gag landings. Among the alternatives considered, Rejected Alternatives 1 and 3 would fall within such category. While the impacts on the commercial and

recreational sectors can be determined only after an allocation ratio is applied on a chosen TAC, there are some general implications brought about by setting a TAC on gag.

The SEP (1998) noted that a limiting TAC would inspire among commercial fishers a competitive race for fish as each boat strives to maximize its share of the overall catch before the quota is filled and the season is closed. Derby-like fishing conditions would concentrate catches in an ever-shorter season, resulting in temporary market gluts and depressed dockside prices. In his analysis of the derby effects on red snapper prices, Waters (1997) determined that the derby reduced ex-vessel price by about \$0.85 per pound. Bell (1997) further noted that when converted to 1996 prices, the derby effect amounted to a \$1.35 per pound reduction in red snapper price. At the commercial quota of 4.65 million pounds, the red snapper price reduction corresponds to a staggering loss of approximately \$6.3 million in vessel revenues. Another effect of a limiting TAC on gag is that fishing effort during the closed seasons likely would be redirected to red grouper, and to a lesser extent, snappers, greater amberjack, and king mackerel.

A limiting TAC would also have adverse repercussions on the recreational sector. In the absence of closure management of the recreational fishery, a limiting TAC would require adjustments in the existing bag and minimum size limits. The SEP (1998) noted that restrictive bag or minimum size limit adjustments could be severe due to the apparent stronger popularity of gag as a game and/or food fish as evidenced by the surge in target effort coupled with the low keep rate relative to total catch. Losses, however, from more restrictive bag and/or minimum size limits could be mitigated through a shift in target behavior to alternative species. If the recreational fishery consistently exceeds its allocation under a limiting TAC, a similar pressure to impose more restrictive actions as experienced in the red snapper fishery would eventually call for some type of closure in the fishery in order to control recreational harvests within the sector's allocation. This would only bring in more short-term negative economic impacts on the fishery.

The long-term effects of a limiting TAC crucially hinge on the level of TAC that may be allowed at some future date and the management approach adopted. It is generally expected that restrictive management would be relaxed at some future time when the stock has fully recovered. In fact, under a constant F strategy, the ABC range and TAC for gag can change from year to year. It would appear that under this strategy, a low TAC in the short-run, such as provided under Rejected Alternative 1, would likely be followed by increasing TAC over time. A TAC that is adjusted to correspond to the level of stock recovery is likely to bring about a relaxation of some regulatory measures, but an increasing TAC over time may only be considered a necessary condition for increasing the economic benefits derivable from the fishery. The sufficient condition would be defined by a management approach that would tend to preserve whatever economic rent is created by the stock rebuilding process. While there is some expectation that a derby-like fishery may be alleviated by a higher TAC, that would happen only if fishing effort does not keep pace with increasing TAC. Otherwise, a derby-like fishery may still occur, albeit at relatively higher levels of overall landings.

Environmental Consequences

Physical Environment: The alternatives in this section are anticipated to have no impact on the physical environment or essential fish habitat (EFH).

Human Environment: A TAC by itself would not affect the human environment, but the allocation and management measures to implement a TAC could have short-term impacts that constrain harvest rates and negatively impact those who are financially dependent on the resource. In particular, the setting of a commercial quota that is likely to be reached could trigger economic disruptions and a derby fishery.

The status quo Proposed Alternative avoids the negative human impacts of a potential quota closure. Gag are not currently overfished, but may be undergoing fishing at a rate that, if unchecked, could lead to an overfished condition. Management measures to prevent the stock from becoming overfished need not be as severe as for stocks that are overfished and in need of a rebuilding schedule. Thus, short-term negative impacts will not be as great as for overfished stocks, and maintaining the stocks above the overfishing threshold should result in long-term stability that benefits both the resource and the resource users.

Fishery Resources: If management measures proposed elsewhere in this amendment are sufficient to reduce gag harvest to the target ABC level, then the presence or absence of a TAC will have no impact on the gag resources. Generally, a TAC is used to set a quota for the commercial sector and a target harvest level for the recreational sector. Since gag are part of a multi-species grouper fishery, setting a commercial gag quota and closing only that portion of the grouper fishery when the quota is met could result in an increase in gag discard mortality during the closed season. For this reason, avoiding a quota closure has a beneficial impact on the gag resource provided that other regulatory measures are sufficient to constrain total harvest to within the ABC range. Under the federal guidelines for National Standard 1 (50 CFR 600.310(d)(6)), harvest of a mixed stock complex at its optimum level can result in overfishing of a single species. This type of overfishing may be allowed provided that such action will result in long-term net benefits to the Nation, and similar benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic; and the resulting level of fishing mortality will not result in the species being listed under the Endangered Species Act.

Impact on Other Fisheries: A restrictive gag TAC could transfer some fishing effort to other groupers, with the degree of impact dependent upon the level of restrictions that accompany the TAC. Red grouper is the dominant species in the grouper fishery and is the most likely species to be affected. The Proposed Alternative for status quo will result in no effort shifting and will thus have no impact of other fisheries.

Effect on Wetlands: The alternatives have no effect on wetlands.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. Not setting a TAC for gag is not anticipated to have a negative affect on EFH.

8.1.2 Allocation of Gag TAC

The method for determining an allocation of a gag TAC is described in the TAC framework procedure. This section is a discussion of the implications of a gag allocation if the Council had chosen to set a TAC, and alternative actions that the Council could consider outside of the scope of this regulatory amendment.

Discussion: The framework procedure for setting TAC specifies that a TAC be subdivided into recreational and commercial allocations based on the historical percentages harvested by each user group during the base period of 1979-1987. However, grouper landings were not separated by species for the commercial fishery until 1986. Table 1 lists the commercial and recreational harvest of gag from 1986 to 1996, along with some historical allocations for various combinations of years.

Since the only years for which both recreational and commercial landings of gag are available during the base period are 1986 and 1987, using these years, the gag TAC allocation would be:

32% commercial, 68% recreational (years 1986-1987)

This is the only allocation that could be adopted under the current provisions of the framework procedure if a TAC was set. However, the limited subset of only two years may be too short to be representative of the true historical trend. Furthermore, this historical allocation differs substantially from the current proportions of commercial and recreational gag landings, and would likely create substantial disruption in the fishery if implemented immediately. At the very least it would have a disproportionately greater impact on commercial harvest than on recreational harvest. For the years since the current management regulations were implemented (1990-1998), the ratio has been:

42 % commercial, 58% recreational (years 1990-1998)

This allocation reflects current harvest trends and would be less disruptive to the gag fishery. This is not an unregulated allocation, but rather could be a reflection of the effects of minimum size limits and gear restrictions implemented in 1990, or changes in gag population structure in response to fishing pressure.

If the Council decided to set a gag TAC using an allocation that does not conform to the framework procedure, it would require a full plan amendment. In this situation, the Council could request that the allocation initially be implemented by NMFS as an “Interim Rule to Prevent Overfishing”, in order to implement the non-conforming allocation in a timely manner. An interim rule could be implemented for up to 180 days, with a 180 day extension possible following public comment. This would allow enough time to implement a full plan amendment to make the allocation permanent.

Since the Council did not set a gag TAC, gag is managed as part of the shallow-water grouper TAC, and a separate allocation for gag is not needed. It is only necessary that the aggregate grouper TAC and allocations are not exceeded. However, this approach provides less control over preventing gag from becoming overfished. Under this approach, management measures would be intended to keep the overall gag fishing mortality rate below the overfishing level without regard to single-species allocation.

8.2 Gag and Black Grouper Management Measures

8.2.1 Gag and Black Grouper Minimum Size Limits

Proposed Alternative 1: Increase the minimum size limit for gag for the commercial fishery from 20 inches total length (TL) to 24 inches TL length, effective immediately upon implementation. Increase the minimum size limit for gag for the recreational fishery from 20 inches TL to 22 inches TL effective upon implementation; then increase the minimum size limit for the recreational fishery at a rate of 1 inch per year until the minimum size limit reaches 24 inches TL.

Proposed Alternative 2: Increase the minimum size limit for black grouper in accordance with the same schedule as for gag.

Rejected Alternative 1: Increase the minimum size limit for gag from 20 inches total length to 24 inches total length, effective immediately upon implementation.

Rejected Alternative 2: Increase the minimum size limit for gag from 20 inches total length at the rate of a 1 inch increase per year until the minimum size limit reaches 24 inches total length.

Rejected Alternative 3: Increase the minimum size limit for gag from 20 inches total length at the rate of a 1 inch increase every two years until the minimum size limit reaches 24 inches total length.

Rejected Alternative 4: Status Quo - Retain the 20 inch total length minimum size limit for gag and black grouper.

Rationale: Twenty-four inches TL is the size of 50 percent female maturity (Figure 3). This minimum size limit was recommended by the RFSAP (GMFMC 1998a). In addition, the second Ad Hoc Finfish Stock Assessment Panel (GMFMC 1998b) stated that this minimum size limit and/or protection of gag spawning aggregations was a condition for their recommendation to set the gag overfishing threshold at 30 percent SPR rather than 35 percent SPR. (A measure that will protect a portion of the spawning aggregation is proposed later in this regulatory amendment.) During public hearings, the majority of those who testified indicated that they would support, or at least not oppose, a 24-inch TL minimum size limit provided the recreational increase was done in a gradual manner to reduce negative economic impacts. However, in order to achieve a reduction in the fishing mortality rate toward $F_{30\% \text{ SPR}}$ in the current year, a more rapid schedule of increases is needed. The NMFS estimated that a 32 percent to 39 percent reduction in fishing mortality would be needed to attain $F_{30\% \text{ SPR}}$ ³. An immediate increase to 22 inches TL is expected to reduce recreational gag harvest in pounds by about 16.35 percent in the initial year. Applying the 24-inch TL minimum size limit immediately to the commercial sector will reduce harvest in the initial year by about 7.6 percent for handlines and 1.1 percent for longlines.

The NMFS analyses that were presented at the March Council meeting indicated that to achieve a fishing mortality rate consistent with the current overfishing threshold of $F_{20\% \text{ SPR}}$, a reduction in fishing mortality of between 7.5 and 17 percent would be needed in 1999 (ABC range of 1.77-3.37 million pounds). The Proposed Alternative is expected to produce an overall reduction in combined commercial and recreational landings of up to 12 percent (see following discussion) and is, therefore, consistent with current management objectives.

An alternative to implement minimum size limit increases on black grouper as well as gag is proposed because of frequent misidentification or colloquial naming of gag as black grouper.

Discussion: The current minimum size limit for gag, 20 inches TL, is below the

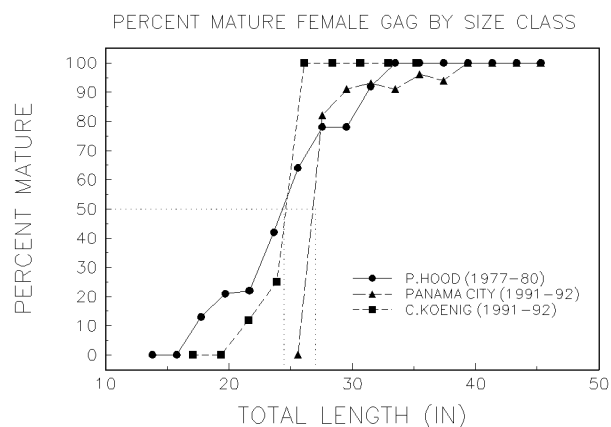


Figure 3. Gag sexual maturity ogive for females estimated from three different studies (1977-1993). The 50 percent level is usually chosen to indicate average size of maturity in a population. (Source: Schirripa and Goodyear 1994b)

³ Analyses presented by NMFS at the March 1999 Council meeting.

size at 50 percent maturity. Gag in the Gulf of Mexico reach 50 percent female maturity at about 24 inches TL (Figure 3). A recent study of gag in the south Atlantic found a similar size of maturity (McGovern et al. 1998). However, evidence suggests that in recent years, both the size of female maturity and the size of transition to males may have decreased, possibly in response to increased fishing pressure (McGovern et al. 1998, Schirripa and Goodyear 1994a). It takes approximately 1 year for a gag to grow from 20 inches TL to 24 inches TL. The schedule of mean size at age is presented in Table 2.

Increasing the minimum size limit to at least the size at 50 percent maturity would provide increased protection for juvenile gag. The size limit also plays a role in the selection of an SPR proxy for the MSY fishing mortality rate. One of the biological reference points used as a conservative estimate of F_{MSY} is $F_{0.1}$. Mace (1994) states that when the age of 50 percent maturity is less than the age of 50 percent recruitment into the fishery, $F_{35\% SPR}$ will generally exceed $F_{0.1}$; when the opposite is true, $F_{35\% SPR}$ will be less than $F_{0.1}$. Thus, at a 20-inch TL minimum size limit, the best MSY proxy is likely to be at or above 35 percent SPR, while at a 24-inch TL or greater minimum size limit, the MSY proxy will be expected to be less than 35 percent SPR.

The commercial and recreational sectors are believed to have different levels of release mortality due to the different depths in which each sector fishes. The commercial sector, which generally fishes offshore and in deeper waters, is assumed to have a release mortality of 33 percent. Very few undersized gag are killed in the commercial fishery (see Figure 2) because the commercial sector tends to catch gag of sizes larger than 20 inches TL. The recreational fishery occurs in a shallower range of depths than the commercial fishery, and consequently is assumed to have a lower release mortality, estimated at 20 percent. Smaller gag are generally associated with shallower water; however, and at 20 percent release mortality, the number of gag killed in the recreational fishery from regulatory discards is close to the number of gag harvested (Figure 2).

These release mortalities were incorporated into the size limit analyses presented in the 1994 gag stock assessment (Schirripa and Goodyear 1994a). At a 33 percent release mortality, maximum yield per recruit (YPR) occurs close to the existing minimum size limit of 20 inches TL (Figure 4). The minimum size that produces maximum YPR increases at lower release mortalities. At 20 percent release mortality, YPR is maximized at 24 inches TL (Figure 5). If release mortality could be completely avoided, then YPR could be maximized at a minimum size limit of 32 inches TL (Schirripa and Goodyear 1994a).

Black grouper are predominately caught south of 25° north latitude (Florida Keys), but some are caught northward to the Florida Panhandle in depths of 121 to 328 feet (Crabtree and Bullock 1998). Gag are predominately caught west and north of Tampa/St. Petersburg, Florida, but catches also occur as far south as the Florida Keys and as far west as Alabama, with occasional catches reported from throughout the Gulf coast (Schirripa and Legault 1997). In a recent study of black grouper off Florida, Crabtree and Bullock (1998) found the size of 50 percent female maturity for black grouper to be 33 inches TL. Thus, both the current 20-inch TL minimum size limit and the proposed 24-inch TL minimum size limit will result in juvenile black grouper being caught, although the 24-inch TL minimum size limit will provide some increased protection for juveniles. As with gag, black grouper take about a year to grow from 20 to 24 inches TL (Table 2).

The expected reductions in pounds of gag harvested by each sector as a result of the minimum size limit increase were estimated by NMFS and provided to the Council at its March 1999 meeting. These

estimates are shown below. Recreational harvesters are estimated to have an initial reduction of between 0 and 16.35 percent (see table, page 19) in the first year when the minimum size limit increases to 22 inches TL. These estimates are in terms of pounds, not numbers, of fish caught. Since the fish contributing to the harvest reduction are the smallest in the catch distribution, the percent reduction in terms of numbers will be higher than in terms of pounds. In the second year, when the minimum size limit is increased to 23 inches TL, there could be an additional reduction in pounds caught of up to 13 percent, and in the third year, when the minimum size limit increases to 24 inches TL, an additional reduction of up to 11 percent. Larger gag tend to be found further offshore, which reduces the availability of larger gag to near-shore fishers, but such reductions may be partly a function of increased fishing pressure near-shore as well as gag behavior. Since it takes only a year on average for a gag to grow from 20 to 24 inches TL (Table 2), the reductions in subsequent years will be moderated by the increasing availability of gag that grow into the new minimum size limits and remain near shore.

For the commercial sector, the reduction in gag harvest from a 24-inch TL minimum size limit will be much less. The longline fishery, which is constrained to deeper water by the longline boundary and subsequently catches larger gag, is expected to have only a 1.1 percent reduction in harvest. The handline fishery, which has no such constraint, is expected to have a 7.6 percent reduction.

Estimated recreational gag harvest reduction (percent pounds of fish). Harvest projections based on 1994-97 catch frequencies, size frequencies, catch effort, and status quo bag limit. Source: NMFS				
	Base Comparison Period			
Min. Size (Inches)	1990-98	1990-97	1994-98	1994-97
22 TL	6.97	0	16.35	3.32
23 TL	19.12	11.25	27.27	15.94
24 TL	29.11	22.21	36.25	26.32

Estimated commercial gag harvest reduction (percent pounds of fish) resulting from a 24-inch TL size limit. Source: NMFS	
Segment	% Reduction
Hand/power lines	7.6
Longlines	1.1

From 1990 to 1996, longlines averaged 25 percent of the commercial gag harvest, handlines 73 percent, and fish traps 2 percent. Recreational landings have averaged between 56 and 61 percent of the total gag harvest since 1990. Based on these allocations and the expected harvest reductions by gear and sector, the Proposed Alternative can be expected to produce a reduction in harvest in the first year for the

commercial sector (all gears combined) of about 6 percent⁴, for the recreational sector of up to 16⁵ percent, and an overall reduction in gag harvest in the first year of between 3 and 12 percent⁶.

The NMFS (personal communication from Brad Brown, February 17, 1999, and from James Weaver, April 8, 1999) provided length-frequency analyses of commercial gag catch by gear types, that indicate a trend in the harvest of increased numbers of smaller fish. The following table presents the cumulative percentage of gag less than 24 inches TL over that time period.

Year	Cumulative Percentage of Gag Caught Less Than 24 Inches TL	
	Hand/Powerlines	Longlines
1992	14.1	1.3
1993	15.2	3.0
1994	15.0	3.9
1995	21.3	4.2
1996	38.2	10.8
1997	40.8	6.2
1998	23.2	3.9

sources: Memo from Brad Brown to Andrew Kemmerer dated February 17, 1999, and e-mail from James Weaver to Wayne Swingle dated April 8, 1999.

Considering that the hand/powerline harvest has averaged 73 percent of total landings in pounds for 1990-1996 (and probably a greater percentage on numbers of fish), a minimum size limit of 24 inches TL should result in a significant reduction in fishing mortality of gag. An observer study of limited scope indicated that power/handline vessels fished in depths of between 8 and 56 fathoms (23 fathoms average depth) (personal communication from Elizabeth Scott-Denton, NMFS). Therefore, the average release mortality is likely much less than the 33 percent assumed in stock assessments. An in situ study (Wilson and Burns 1996) indicated a 92.5 percent potential survival rate for all grouper caught from 24 fathoms. The NMFS (1995) observer study indicated that the monitored longline vessels fished in depths of 18 to 129 fathoms (average depth 34.1 fathoms). The in situ study by Wilson and Burns (1996) concluded that the survival of grouper caught from 30 to 41 fathoms was too low for a size limit to be

⁴ Weighted average: $[1.1\% * .25 \text{ (longlines)}] + [7.6\% * .73 \text{ (handlines)}] = 5.8\%$

⁵ From table above - 22 inch size limit recreational reduction based on 1994-98 = 16.35%

⁶ Weighted by sector:

low end scenario: $[0\% \text{ (22 inch recreational reduction based on 1990-97)} * .56 \text{ (lowest recreational proportion)}] + [5.8\% * .44 \text{ (highest commercial proportion)}] = 2.6\%$
high end scenario: $[16.35\% \text{ (22 inch recreational reduction based on 1994-98)} * .61 \text{ (highest recreational proportion)}] + [5.8\% * .39 \text{ (lowest commercial proportion)}] = 12.2\%$

effective. Therefore, it can be inferred that because there has been an increase of fish less than 24 inches TL in the longline fishery (table above) coupled with the proposed minimum size limit of 24 inches TL that more gag would be discarded dead from this fleet with a 24-inch minimum size limit than a 20-inch TL minimum size limit. However, because the longline fleet contributes less to the total landings than the hand/powerline fleet, a cumulative reduction in fishing mortality should occur from the proposed minimum size limit.

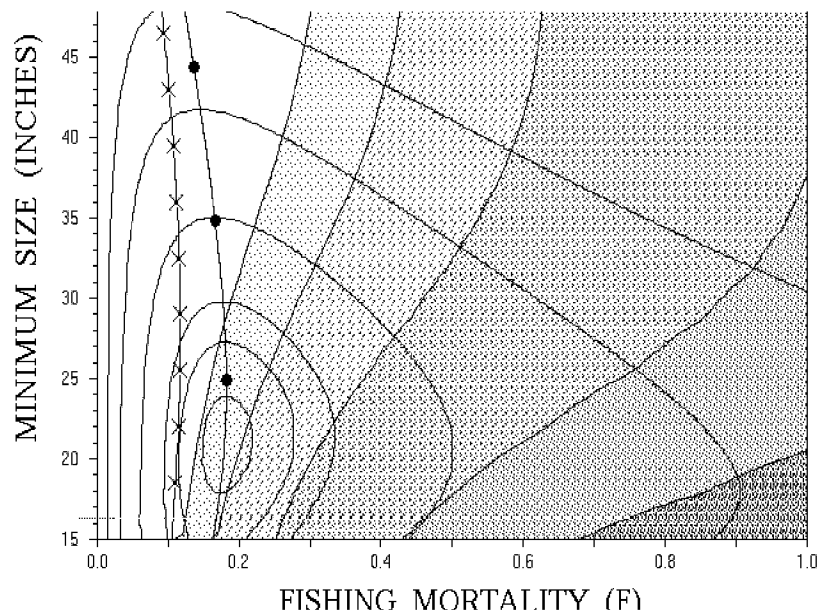


Figure 4. Yield and SPR for gag as a function of minimum size and fishing mortality (F) assuming current estimated growth and a release mortality of 33 percent. (Source: Schirripa and Goodyear 1994a)

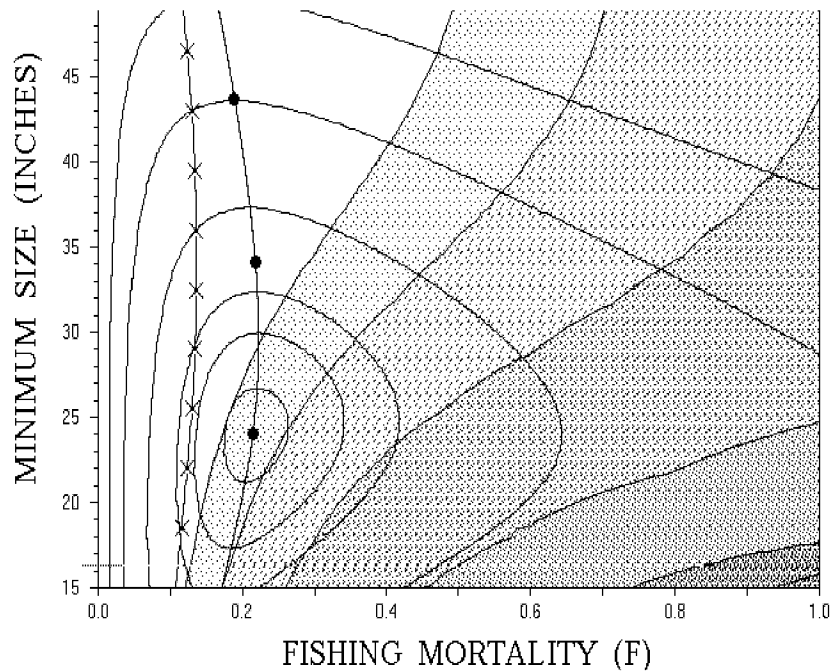
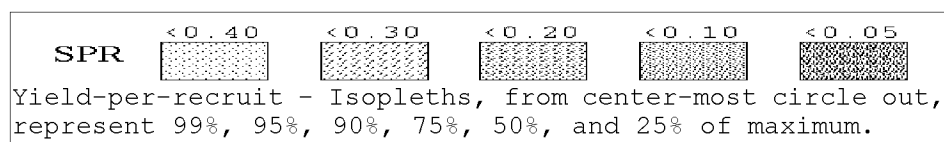


Figure 5. Yield and SPR for gag as a function of minimum size and fishing mortality (F) assuming current estimated growth and a release mortality of 20 percent. (Source: Schirripa and Goodyear 1994a)



Economic Impact: There is not enough information regarding the size frequency distribution of both commercial and recreational landings for black grouper; consequently, the effects of any minimum size limit alternative on black grouper cannot be estimated. However, increasing the minimum size limit for black grouper may provide some protection to the stock's spawning population. The following discussion only examines the economic impact of increasing the minimum size limit for gag.

Schirripa and Legault (1997) reported that the mean, median, and modal length of commercial catches are all above 24 inches TL (Table 30 in their report). In 1996, for example, the mean, median, and modal lengths (TL) were 28, 27, and 31 inches, respectively. Obviously, these numbers imply that there were catches lower and higher than the averages. In 1996, the minimum and maximum lengths (TL) were 12.6 inches and 51.2 inches, respectively. Given these catch characteristics, it is not surprising that the effects of an increase in the minimum size limit from 20 inches TL to 24 inches TL on commercial harvest are estimated to be relatively small (i.e., 7.6 percent for handlines and 1.1 percent for longlines, or about 6 percent for all gears combined). The table below may be used to approximate the effects of the minimum size limit increase on the revenue of the commercial fishery.

Year	Million Pounds ¹	Million Dollars ²
1990	1,812	4,367
1991	1,522	3,714
1992	1,575	4,205
1993	1,776	4,795
1994	1,547	3,821
1995	1,561	3,731
1996	1,478	3,798
1997	1,612	4,884
1998	1,757	5,624
Average (1990-1998)	1,627	4,293

¹See Table 1 for source of data.

²Source of average price data is Waters (1998), with the added assumption that the average price for 1998 is the same as that for 1997.

Based on these numbers, a 5.8 percent reduction in commercial landings in the first year of implementation of the new minimum size limit translates to a reduction in ex-vessel revenues of approximately \$249,000, based on 1990-1998 average, or \$326,000 based on 1998 data. Given the likely case that demand for gag is inflexible, the actual reduction in revenues would be slightly less than these numbers. Some portions of the estimated revenue reductions would be producer surplus, but there exists no empirical model to estimate this value. A phased increase in the minimum size limit would entail smaller reductions at first, but would likely approximate the reductions estimated above as the minimum size limit reaches 24 inches TL. Since handline vessels are the major commercial participants of the gag fishery, they would be the segment that would bear most of the revenue reductions.

The catch characteristics for the recreational sector significantly differ from those of the commercial sector. Schirripa and Legault (1997) show that the average lengths of recreational landings are close to or below 24 inches TL. In 1996, the mean, median, and modal lengths (TL) were 24.3 inches, 22.8

inches, and 20.9 inches, respectively. The minimum length was 9.6 inches TL while the maximum length was 48.3 inches TL. Table 2a, which is based only on 1996 and 1997 MRFSS data, shows that about 52 percent of fish landed by the recreational sector are between 20 and 24 inches TL. Using more complete poundage data, NMFS estimated that an immediate increase in the minimum size limit from 20 to 24 inches TL would entail a reduction in recreational harvest ranging from 22 to 36 percent. A phased-in implementation of the minimum size limit increase would spread the impacts over the phased-in period, i.e., 3 years as in the Proposed Alternative. In general, if effort is not redirected to larger sized fish, raising the minimum size limit eventually to 24 inches TL would entail a relatively substantial reduction in recreational harvest.

The Proposed Alternative would raise the minimum size limit by 2 inches TL the first year, 1 inch TL the second year, and another 1 inch TL the third year. The resulting reduction in pounds of recreational landings varies according to the base period considered. The 1990-97 base period provides for the low end estimates while the 1994-98 period provides for the high end estimates (see the table on page 19). Using 1990-98 as the base period, the Proposed Alternative is estimated to reduce recreational landings in pounds by 6.97 percent in the first year when the minimum size limit is raised to 22 inches TL, by an additional 12.15 percentage points in the second year when the minimum size limit is further raised to 23 inches TL, and by an additional 9.99 percentage points in the third year when the minimum size limit is set at 24 inches TL. Over a 3-year period, recreational landings in pounds would be reduced by 29.11 percent.

The number of fish landed by anglers would also be reduced by the Proposed Alternative. Based on Table 2a, an increase in minimum size limit from 20 to 22 inches TL would reduce recreational landings in numbers by 28.92 percent. A further reduction of 12.84 percent would occur with the increase in minimum size limit to 23 inches TL. Finally, an increase in the minimum size limit of 24 inches TL would reduce landings by 10.72 percent. Over a 3-year period, recreational landings in number of fish would be reduced by 52.48 percent.

The reduction in recreational harvest could be lower than the above estimates if some undersized fish are retained by anglers. This currently occurs with the 20-inch TL minimum size limit. The above estimates of the reduction in harvest may be higher if there is a 100 percent compliance with the minimum size limit increases because approximately 57 percent of fish landed are below 24 inches TL (Table 2a). However, under this later condition, raising the minimum size limit would only exacerbate the problem of discards because 71-87 percent of gag caught are already released under current rules (20 inch TL minimum size; GMFMC 1999).

The reduction in the number or pounds of fish that can be retained by the recreational sector would translate to a reduction in angler consumer surplus. In the absence of an empirical model, this reduction in consumer surplus cannot be quantified. To the extent that the reduction in consumer surplus translates to a reduction in trips taken, for-hire vessels would in turn experience reductions in profits. Again, in the absence of an empirical model, this reduction in profits cannot be quantified; however, it would probably be small considering the low level of gag harvested by for-hire vessels. The private/rental mode has a relatively strong participation in the recreational gag fishery, accounting for as much as 65 percent of recreational gag landings, 75 percent of total catch effort trips for gag, and 89 percent of total target effort trips for gag (Holiman, 1998). Given this information, it is logical to expect that the private/rental mode anglers would shoulder most of the burden of the recreational harvest reduction brought about by an increase in the minimum size limit.

Environmental Consequences

Physical Environment: The alternatives in this section are anticipated to have no impact on the physical environment or essential fish habitat (EFH).

Human Environment: A minimum size limit increase will move some of the fishing effort further offshore, since larger gag are found more commonly further offshore. As a result, a minimum size limit increase is expected to have a greater impact on the recreational fishery, which generally fishes closer to shore, than on the commercial fishery. Table 1 shows that the commercial proportion of harvest increased and the recreational proportion decreased immediately after 1990 when the 20-inch TL minimum size limit was implemented. However, in recent years the percentage of the catch between the commercial and recreational sectors has returned to levels similar to the 1986-89 average.

Fishery Resources: Increasing the minimum size limit to the size at 50 percent female gag maturity will provide increased protection for juvenile gag and should enhance the resource, provided that release mortality is not greater than the assumed levels (33 percent commercial, 20 percent recreational). Release mortality is an important consideration in the recreational fishery because the release rate since the 20-inch TL minimum size limit was implemented has averaged 78 percent, and will likely increase with the increased minimum size limit. In the commercial fishery, the mean size of gag retained has decreased from about 35 inches TL in 1990 to 28 inches TL in 1996, but still remains well above both the current 20-inch TL minimum size limit and the proposed 24-inch TL minimum size limit. Thus, release mortality is not expected to be a significant concern for the commercial sector. Black grouper will also benefit somewhat from increased protection of juveniles (with the same caveats about release mortality), but since the size at 50 percent black grouper female maturity is higher (33 inches TL), directed fishing effort will continue to exist on juvenile black grouper, and potential for recruitment overfishing will continue to exist. As a long-term strategy, the amount of time taken to raise the minimum size limit is of little consequence. However, gag are listed by NMFS as a stock that is approaching an overfished condition, a designation that requires the Council to take action within one year to stop the overfishing.

Impact on Other Fisheries: An increased minimum size limit on gag and black grouper may transfer some fishing effort to other groupers. Red grouper is the dominant species in the grouper fishery and is the most likely species to be affected.

Effect on Wetlands: The alternatives have no effect on wetlands.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. Adult black grouper are found from shore to depths of 150 m and are associated with wrecks and rocky coral reefs. An increases size limit is not anticipated to have a negative affect EFH.

8.2.2 Gag Bag Limit

Proposed Alternative: Status Quo - Gag remain part of the aggregate 5 grouper per person recreational bag limit with no sub-limit.

Rejected Alternative 1: Set a recreational bag limit for gag of 2 fish per person, to be included as part of the aggregate 5 grouper per person bag limit.

Rejected Alternative 2: Set a bag limit for gag of 0 fish for the captain and crew of for-hire vessels.

Rationale: A reduced bag limit would have only a minor impact on recreational gag harvest. As shown in Figure 6, the median catch-per-angler for private boats where gag are caught is less than 2 for most years from 1981 to 1996. Over 80 percent of private and shore mode angler trips where gag are caught produce 2 or less gag per angler (Figure 7). The catch rate from headboats has been averaging about .0024 gag per angler-hour, with a median of about .0012 gag per angler-hour (Figure 8). With such low catch rates, the affect of not allowing captain and crew of headboats to retain their catch is unlikely to be significant. A bag limit reduction received strong opposition in public testimony to the Council. The recreational for-hire industry felt that the perception that fishers could catch up to 5 fish was a major consideration in booking trips, and many would cease booking trips if the bag limit was reduced.

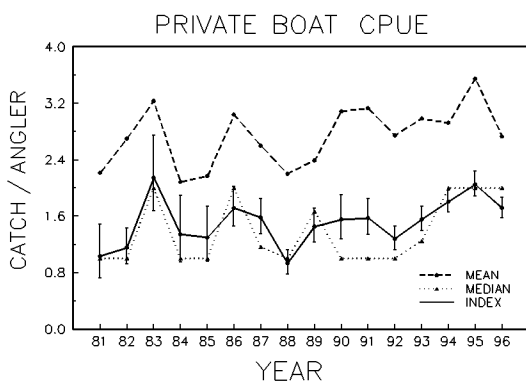


Figure 6. Catch-per-unit effort for gag from private/rental recreational boats, 1981-1996. (Source: Schirripa and Legault 1997)

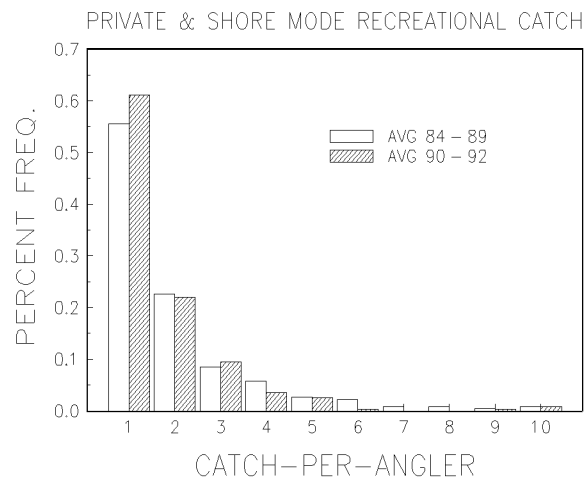


Figure 7. Average catch-per-angler of gag and black grouper from private and shore based mode for years 1984-88 and 1991-92. (Source: Schirripa and Goodyear 1994a)

Discussion: In 1998, Florida Marine Fisheries Commission considered a 2 gag per person bag limit in state waters as part of the 5 fish aggregate grouper limit, but delayed action on the Gulf side of the state to allow the Council to consider a similar bag limit in federal waters, also known as the exclusive economic zone (EEZ). A zero bag limit for the captain and crew of for-hire vessels is an additional alternative to reduce recreational fishing mortality. Fish caught by the captain and crew are sometimes used to supplement a customer's bag limit catch of fish. The mean catch-per-angler from private boats has been between about 2 to 3.5 fish per angler from 1981 to 1996 (Figure 6), and the majority of anglers caught only 1 gag (Figure 7 - note: this figure is for gag and black grouper combined), and the median catch (50 percent of anglers) has been below 2 fish per angler for most years. Thus, a 2-gag bag

limit would affect less than 50 percent of private boat anglers, and those who are affected would have their catch of gag reduced on average by about 1 fish per angler.

Economic Impacts: Table 2b shows that for the period 1995-1997, only about 3 percent of anglers that landed gag kept more than 2 fish. As mentioned above, most of the gag landings have been accounted for by the private/rental mode anglers, so that a majority of the 3 percent that kept more than 2 fish may be expected to be private/rental mode anglers. While a good portion of private/rental mode anglers may be adversely impacted by the 2-fish bag limit, the overall impact on the recreational fishery may be expected to be minimal. The alternative of a zero bag limit for captain and crew may also be expected to have minimal effects, since the for-hire sector accounts for a small percentage of total gag recreational landings. The Proposed Alternative (status quo) helps to avoid complicating the regulations affecting the fishery and the increase in enforcement costs that might ensue.

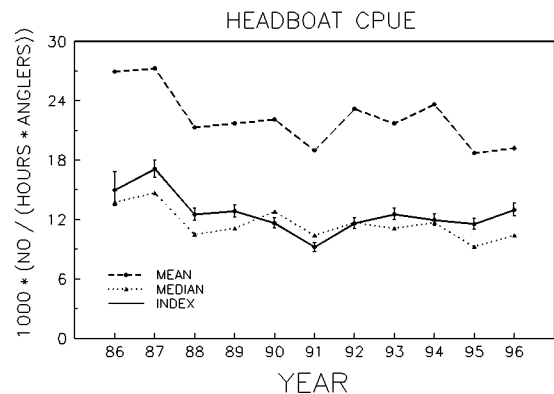


Figure 8. Catch-per-unit effort for recreational fishers from headboats, 1986-1996. (Source: Schirripa and Legault 1997)

Environmental Consequences

Physical Environment: The alternatives in this section are anticipated to have no impact on the physical environment or essential fish habitat (EFH).

Human Environment: The low catch rates indicated by the data suggest that the bag limit options will have little or no effect on the human environment.

Fishery Resources: The low catch rates indicated by the data suggest that the bag limit options will have little or no effect on the gag stock, but bag limits could prevent an unforeseen increase in fishing mortality if gag become more of a targeted species in the future.

Impact on Other Fisheries: The alternatives in this section will not affect other species.

Effect on Wetlands: The alternatives have no effect on wetlands.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom). Reef Fish Amendment 1 (GMFMC 1989) describes habitat damage by bottom longlines as similar to anchor damage (e.g. break hard and soft corals and scar reefs). A bag limit should not have a negative affect on EFH.

8.2.3 Gag Commercial Trip Limit

Proposed Alternative: Status Quo - No commercial trip limit for gag.

Rejected Alternative: Implement a commercial trip limit for gag of:

- a. 2000 pounds per trip
- b. 1000 pounds per trip
- c. 500 pounds per trip
- d. other trip limit

Rationale: As shown in the logbook analyses below, gag commercial trip limits would have very little effect on reducing gag harvest unless set to 500 pounds or less. In addition, a trip limit would force reef fish vessels to release incidentally caught gag in excess of the trip limit while fishing for other grouper species. This would increase the gag kill from release mortality, which is currently at very low levels (Figure 2). Therefore, the Council concluded that a gag trip limit was not an appropriate management tool.

Discussion:

The range of average catches per trip summarized below is from Table 3. Table 4 contains a summary from logbook records of the percent of trips that landed various pounds of gag from 1993 to 1997.

Any in catch: 5 to 478 pounds
>25% of catch: 43 to 1,014 pounds
>50% of catch: 43 to 1,034 pounds
>75% of catch: 13 to 2,056 pounds

Rejected Alternative (a) is well above the monthly and annual average catches-per-trip from 1990-1993, and would have no effective impact on gag harvest. During the period 1990-1993, the average catch-per-trip exceeded 2,000 pounds only once, in August 1992, for vessels when gag exceeded 75 percent of the catch (Table 3). The maximum catch-per-trip for handlines and longlines exceeded 2,000 pounds every year between 1990 and 1996, with catches as high as 7,701 pounds (in 1991) for handlines and 8,002 pounds (in 1993) for longlines (Table 5).

Rejected Alternative (b) is also above most of the average monthly catches-per-trip for 1990-1993, particularly those on trips where gag is less than 50 percent of the catch. In each year between 1990 and 1993, there was one month when the monthly average catch per trip exceeded 1,000 pounds for trips where gag exceeded 25 percent of the catch. In all other months, the average catch-per-trip was less than 1,000 pounds.

Rejected Alternative (c) would affect the average landings per trip in most months for trips where the catch is more than 50 percent gag. Trips where gag comprised less than 25 percent of the catch would generally not be affected.

Rejected Alternative (d) would allow the Council to select an alternative trip limit, provided the limit is not more restrictive than the most restrictive alternative presented (500 pounds per trip). The impact would be between that for Rejected Alternatives (a) and (c).

Gag Trip Limit Analyses from Logbooks

Year	1990	1991	1992	1993	1994	1995	1996	1997	All Years
No. Gag Trips	510	839	1015	3122	3787	3505	3668	3260	19,706
Logbook lbs.	146,588	195,760	189,939	657,773	725,897	769,832	710,757	658,944	4,055,490
Trip Limit	Number of Affected Gag Trips								
2500	3	3	2	6	8	17	3	4	46
2000	10	13	7	11	15	33	11	10	110
1500	23	21	10	24	38	63	32	36	247
1000	37	51	24	86	102	131	99	86	616
500	91	116	87	355	353	412	381	343	2,138
Trip Limit	Estimated Percent Reduction in Landings								
2500	<1%	<1%	2%	2%	1%	2%	<1%	<1%	1%
2000	2%	2%	3%	2%	2%	4%	1%	1%	2%
1500	7%	6%	5%	3%	4%	7%	2%	2%	4%
1000	16%	15%	9%	7%	8%	13%	6%	7%	9%
500	37%	33%	21%	22%	22%	28%	21%	21%	24%

Economic Impacts: Waters (1998) examined data from logbooks and general canvass data that can be used to assess the economic implications of imposing trip limits (and seasonal closures) on commercial vessels. Table 5a presents monthly information on the number of boats and the number of trips with gag as the main species, and Table 5b presents similar information with gag not being the main species⁷. Targeting effort for gag in terms of boats and trips remained stable from year to year. An average of 255 boats combined to average 1,318 trips annually. Targeted fishing effort generally was greatest between November and June. Incidental fishing effort (gag not the main species) also was relatively stable over time, with an average of 477 boats combining for an average of 2,568 trips annually. Incidental fishing effort for gag was above average between February and September. Boats that targeted gag accounted for an average of 55 percent of the total reported commercial landings of gag.

Tables 5c and 5d provide information that can be directly used to determine the effects of trip limits. Of the targeted trips for gag in 1997, about 15 percent landed more than 600 pounds (whole weights), 7 percent landed more than 1,000 pounds, and 1 percent landed more than 2,000 pounds (Table 5c). Of the non-targeted trips for gag in 1997, about 6 percent landed more than 600 pounds, 2 percent landed more than 1,000 pounds, and less than 1 percent landed more than 2,000 pounds (Table 5d).

As can be expected, the various trip limits would affect non-targeted trips less than targeted trips. It is only at the lower trip limit, such as 500 pounds, that the overall effects would start to become more than negligible, but mainly for those trips that targeted gag. While the overall effects appear to be small, those trips affected by the trip limit would experience large reductions in revenues. On a month-to-month basis in 1997, for example, average revenues per trip from gag (as the main species) comprised from 66 to 76 percent of total trip revenues from all species.

The expected tendency of those vessels affected by the trip limit is to shift their targeting behavior to other species. Understandably, the redirected effort will not fully compensate for reductions in gag landings per trip at the same cost; full compensation can be had only at a higher cost. Red grouper was the chief alternative species for boats that targeted gag. Some boats that targeted gag switched to red

⁷Gag is considered the main or targeted species in a trip if revenues from this species were greater than revenues from any other individual species. Revenues were estimated by multiplying landings reported in logbooks by average prices calculated from general canvass data (Waters, 1998).

grouper during the summer, primarily between May and September, with a combined average of 920 trips per year. In aggregate, boats that targeted gag also averaged 293 trips per year for black grouper, 209 trips per year for red snapper, and between 100 and 200 trips per year for vermilion snapper, greater amberjack, and king mackerel (Waters, 1998).

Environmental Consequences

Physical Environment: The alternatives in this section are anticipated to have no impact on the physical environment or essential fish habitat (EFH).

Human Environment: The most restrictive alternatives in this section would reduce the per trip harvest for a portion of reef fish vessel trips in which gag are landed, with a resulting reduction in revenue or effort shifting to other species to make up for lost revenue. The alternatives for higher trip limits, particularly the 2,000 pound level, would have little impact since these limits are above the catches for most trips. The Proposed Alternative for status quo, no trip limit, will have no negative impact on the human environment.

Fishery Resources: To the extent that the Rejected Alternatives reduce harvest, directed fishing mortality of gag would be reduced, but at the expense of increased release mortality of incidentally caught gag above the trip limit. Except for the 500 pound trip limit, this impact would be negligible. The Proposed Alternative for status quo, no trip limit, will have no negative impact on gag harvest and will neither contribute to a reduction in fishing mortality nor will it produce an increased loss of gag to release mortality.

Impact on Other Fisheries: Under the Rejected Alternatives, effort shifting to other species could occur with the degree of impact dependent upon the trip limit level. Red grouper is the dominant species in the grouper fishery and is the most likely species to be affected in areas where both red grouper and gag occur. As with the impact on gag resources, except for the 500 pound trip limit, this impact would be negligible.

Effect on Wetlands: The alternatives have no effect on wetlands.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. No trip limit is not anticipated to have a negative affect on EFH.

8.2.4 Gag Seasonal Closure

Proposed Alternative: Implement a closure to the commercial harvest and prohibition of sale of gag, black, and red grouper from February 15th to March 15th.

Rejected Alternative 1: Implement a seasonal closure for gag harvest for four months, January through April.

Rejected Alternative 2: Implement a seasonal closure for gag harvest for two months, February through March.

Rejected Alternative 3: Status Quo - No seasonal closure for the gag fishery.

Rationale: A closed season for gag, red, and black grouper would protect spawning stocks and reduce the harvest of these species. A closed season for only gag would result in commercial fishers targeting red grouper and other grouper species with an incidental bycatch and related release mortality of gag. Including red and black grouper in the closed season should reduce the targeting of grouper by commercial fishers and would reduce the harvest of these species. Other fisheries for reef fish available to commercial fishers during the proposed closed season include deep-water groupers, tilefish, greater amberjack (March to May is closed) and red snapper fishery (closed during January and from the 15th through the end of the month for the remaining months) .

Discussion: Gag in the Gulf of Mexico spawn from December through mid-May, with a peak in February through March (Koenig et al. 1996). Koenig et al. (1996) suggested that fishing activities on the spawning aggregations may be responsible for changes in the population size and sex-ratio. This suggestion is supported by observations of other researchers who reported that hook-and-line fishing on gag (and scamp) spawning aggregations tended to select males before females (Gilmore and Jones 1992; personal communication to Koenig et al. 1996).

The Proposed Alternative provides some protection for spawning gag because the closure period is during peak spawning. Red and black grouper spawning stocks will also receive some protection. Peak spawning for black grouper occurs from December to March (Crabtree and Bullock 1998). While peak spawning of red grouper (April and May) occurs after the proposed closure period, some red grouper are in spawning condition as early as March (Bullock and Smith 1991). The Proposed Alternative also provides some reduction in harvest for all three species. The average reduction of catch by the commercial fishery from February 15 to March 15 will be approximately 10 percent for gag (Table 6B), 6 percent for red grouper (Fig. 34 in Schirripa et al. 1999), and 10 percent for black grouper (NMFS, Commercial Fisheries Statistics Homepage).

Rejected Alternative 1 would protect gag spawning stocks as well as non-spawning gag through most of their active spawning season, and would reduce harvest of gag. In 1996, these four months accounted for 532,000 pounds of the commercial gag landings (Table 6A), and averaged 39 percent of the annual commercial gag harvest from 1986 to 1996 (Table 6B). The recreational fishery, based on MRFSS data only, harvested 23 percent of its average annual landings (both by number and by weight) during this period from 1982 to 1997 (Table 7). Incidental catch of gag would occur during the closure and would increase the amount of gag killed by release mortality. This would likely be a more significant factor for the commercial fishery which fishes in generally deeper water than the recreational fishery. Public testimony from recreational fishers suggested that mortality of released gag from that sector was low.

Rejected Alternative 2 would result in a shorter closed season, but would still protect some spawning aggregations and non-spawning gag during peak spawning. During these two months, the commercial fishery accounted for 247,000 pounds of landings in 1996 (Table 6A), and averaged about 20 percent of the annual commercial gag harvest from 1986 to 1996 (Table 6B). The recreational harvest levels cannot be determined, since each of these two months comprises a portion of a two-month wave in the MRFSS data, but is likely to be between 11 and 23 percent of the annual harvest. As with Rejected Alternative 1, release mortality of incidentally caught gag during the closed season would increase, particularly for the commercial sector and especially for the longline fishery.

Rejected Alternative 3 for status quo provides no protection for spawning gag. Without seasonal closures, the only way to protect gag spawning aggregations is to create areal closures. While areal closures may be advantageous in that they allow commercial fishers to fish year-round and reduce release mortality from incidentally caught gag, this concept has been met with resistance by the industry because the degree of protection on gag stocks was debatable (Kenchington 1999) and the initial area proposed for closure included a large portion of prime fishing area .

Economic Impacts: The table below, based on logbook data, shows the approximate percent of total commercial landings of gag, black, and red grouper that were made between February 15 and March 15 for the years 1993-1998.

Percent of total commercial landings of selected species between February 15 and March 15, 1993-98

Species	1993	1994	1995	1996	1997	1998	1993-98
Gag	5.7	8.0	19.0	6.5	9.4	12.2	9.9
Black	6.5	7.7	19.7	7.0	9.6	13.6	9.9
Red	6.3	5.2	10.4	6.2	7.1	12.2	7.4

Assuming no changes in the distribution of effort, the Proposed Alternative would reduce commercial landings of gag, black, and red grouper by 9.9 percent, 9.9 percent, and 7.4 percent, respectively, using 1993-1998 as the base period. The annual percentage shows wide variations in the potential impact of the Proposed Alternative; that is, 5.7 to 19 percent for gag, 6.5 to 19.7 percent for black, and 5.2 to 12.2 percent for red grouper. Applying the percent reduction in landings to the 1990-1998 average total revenues for each of the three species, the resulting reductions in commercial revenues would be approximately \$0.43 million for gag, \$0.13 million for black grouper, and \$0.97 million for red grouper.

Rejected Alternatives 1 and 2 would reduce commercial gag harvest by 39 and 20 percent, respectively. Based on 1990-1998 average landings of 1.6 million pounds valued at \$4.3 million, Rejected Alternative 1 would reduce ex-vessel revenues by about \$1.7 million, and Rejected Alternative 2 would reduce revenues by \$0.86 million. Approximately 55 percent of the revenue loss (\$0.94 million under Rejected Alternative 1 or \$0.47 million under Rejected Alternative 2) would be borne by vessels targeting gag. These vessels generally average 68 to 72 percent of their total trip revenues from sale of gag during the months that would be subject to the 4-month or 2-month closure.

With closure, commercial fishers might be expected to shift effort around the closed period, but it is very likely that a good portion of the lost effort might not be shifted to the open months. The Proposed Alternative would close a one-month period with the highest gag fishing effort for vessels targeting or not targeting gag. While no comparable fishing effort data are available for black grouper, it appears that the proposed closed period coincides with the highest fishing effort for red grouper based on the reported number of red grouper trips for February and March (see Table 53 of Schirippa et al. 1999). Rejected Alternative 1 would eliminate 4 months with highest gag fishing effort for vessels targeting gag and 3 months for vessels not targeting gag. Rejected Alternative 2 would eliminate 2 of the highest months of fishing by both types of vessels. Effort changes in response to the above alternatives would likely be directed to the time periods right before and after the closure. This would cause the seasonal distribution of landings to change, and landings would increase at these times. The result would be

reduced dockside prices during these periods and the eventual effect of the closures would be revenue reductions larger than those estimated above. For some vessels, the revenue loss can be compensated for by shifting to other species; but as noted earlier, the compensation will be less than full at the same cost level.

The Proposed Alternative would not directly affect the recreational fishery because the closure applies only to the commercial sector. Indirectly, the recreational sector would stand to benefit from the commercial closure because fishing competition between the commercial and recreational sectors would be reduced, at least in those areas where both sectors fish. Assuming that recreational effort is not shifted around as a result of seasonal closures, Rejected Alternative 1 would be expected to reduce recreational landings by about 23 percent while Rejected Alternative 2 would reduce landings between 11 and 23 percent. Based solely on MRFSS data (Holiman, 1998), Rejected Alternative 1 would affect about 18 percent of total target trips for gag and about 25 percent of total catch trips for gag. The corresponding effect of Rejected Alternative 2 would be roughly half of those of Rejected Alternative 1, assuming no change in effort distribution as a result of the closure. The reduction in trips for gag would translate to economic losses to anglers and the for-hire sector. Because the recreational gag fishery is dominated by the private/rental mode, this sector would likely bear most of the burden of the closures.

Just like commercial fishers, recreational fishers may be expected (under Rejected Alternatives 1 and 2) to shift their effort to the open season. The effort shifts would likely occur after, rather than before, the closure when weather becomes more favorable, particularly because most of gag anglers use the private/rental mode of fishing. There is a good possibility that recreational effort may shift more than that of the commercial sector because the recreational sector is not subject to market demands. Therefore, the likely reduction in recreational fishing effort and landings would be less than estimated under the assumption of no change in fishing effort.

Environmental Consequences

Physical Environment: The Proposed Alternative in this section is anticipated to have no impact or a slight positive affect on the physical environment. Longline gear is commonly used to fish for reef fish (e.g. longlines account for an average of 34.2% of reef fish caught in Statistical Area 6). Bottom gear, as described in Reef Fish Amendment 1 (GMFMC 1989), including bottom longlines, may damage reefs similar to anchor damage. A reduction in fishing caused by the closed seasons may provide increased protection of these essential fish habitats (EFH).

Human Environment: The Proposed Alternative will have an effect on the human environment. Commercial fishers will be affected more by the closed season because it only applies to them. A closed season will limit the choices of fisheries that a reef fish fisher can engage in, particularly in light of the overlap with other existing closures for red snapper and greater amberjack. The red snapper fishery will be open for the first 15 days of March and the greater amberjack fishery closes March 1st.

Fishery Resources: The Proposed Alternative may increase the amount of release mortality from incidental catch of gag during a closed season. Currently, the commercial sector has very low release mortality because most of the grouper caught offshore are above the minimum size limit and are retained. During a closed season, these fish would need to be released, and an increase in release mortality would likely occur. Because the proposed alternative only applies to the commercial fishery, there should not be an increase in release mortality by the recreational fishery.

Impact on Other Fisheries: The Proposed Alternative may create a shift in effort and an increase in fishing mortality for other species during a closed season. Both the red snapper and greater amberjack fisheries will be open for a portion of the proposed closure period and are likely species to be affected by an effort shift in areas where gag, red, and black groupers are harvested.

Effect on Wetlands: The alternatives have no effect on wetlands.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. Adult red grouper prefer depths of 30 to 120 m and select rocky outcrops, wrecks, reefs, ledges, crevices and caverns of rock bottom, as well as “live bottom” areas. Adult black grouper are found from shore to depths of 150 m and are associated with wrecks and rocky coral reefs. Reef Fish Amendment 1 (GMFMC 1989) describes habitat damage by bottom longlines as similar to anchor damage (e.g. break hard and soft corals and scar reefs). A seasonal closure should not have a negative effect and may actually be beneficial to EFH should the closure lower the amount of fishing effort on reef fishes during the time period.

8.2.5 Gag Area Closure

Proposed Alternative: The closure of sites 5 and 9 (as described in Appendix 1 as 219 square nautical miles total) year-round to all fishing under the jurisdiction of the Gulf Council with a 4-year sunset clause.

Site 5. “Madison and Swanson sites” (Whoopie Grounds by Moe 1963)

boundaries: NW= 29° 17'N, 85° 50'W NE= 29° 17'N, 85° 38' W,
 SW= 29° 06'N, 85° 50'W SE= 29° 06'N, 85° 38'W;

Site 9. “Steamboat Lumps”

boundaries: NW= 28° 14'N, 84° 48'W NE= 28° 14'N, 84° 37'W,
 SW= 28° 03'N, 84° 48'W SE= 28° 03'N, 84° 37'W;

Rejected Alternative 1: The following area is closed year-round to all reef fish fishing (and to bottom fishing gear capable of catching reef fish). The area is a simplified version of the following sites shown in Figure 9:

Site 8 (a-e). “40 Fathom Contour West of Middle Grounds” (The Edges by Moe 1963)

Site 9. “Steamboat Lumps”

boundaries: NW= 28° 51'N, 85° 14'W NE= 28° 51'N, 85° 04'W,
 SW= 28° 03'N, 84° 40'W SE= 28° 03'N, 84° 30'W;

Rejected Alternative 2: The following sites are selected for area closures to protect gag spawning aggregations (select from list). The site numbers and names are with reference to Figure 9:

Priority sites recommended by Dr. Chris Koenig, listed in order of priority:

Site 6. "Twin Ridges"

Site 5. "Madison and Swanson sites" (Whoopie Grounds by Moe 1963)

Site 3. "3 - 5's"

Other sites within the dominant gag spawning grounds (Figure 9):

Site 4. "Area North of Johnny Walker site" (Mud Banks by Moe)

Site 7. "Middle Grounds"

site 10. "Elbo"

Rejected Alternative 3: The areas selected in Alternative 1 will be closed to the harvest of gag

Rejected Alternative 4: The areas selected in Alternative 1 will be closed:

A. January through April

B. February through March

Rejected Alternative 5: Status Quo - No area closure for the gag fishery.

Rationale: The Council considered closing areas where gag are known to form spawning aggregations in lieu of a closed season in order to reduce fishing mortality on gag spawning aggregations and to protect adult male gag. Such closures are listed as appropriate regulatory changes that may be implemented under the TAC framework procedure (see page 6). The RFSAP suggested that closed areas might be a useful management tool to protect gag stocks. They noted that a substantial reduction in the proportion of males has occurred since the late 1970's, from 17 percent to 2-10 percent. They expressed concern that this sex ratio reduction may have a potentially negative consequence on population reproductive potential (GMFMC 1998a). Keeping areas closed year-round addresses this concern by protecting a portion of the male gag population that tends to stay offshore throughout the year. The RFSAP also noted that gag spawning aggregations are vulnerable to fishing and can be disrupted by fishing activities. They recommended that spatial and/or temporal closures be designed to protect the integrity of the aggregations (GMFMC 1998a). However, industry concerns about both the areas selected for closure and the science describing the benefits of closed areas to gag populations (Kenchington 1999) caused the Council to question the utility of areal closures to protect gag populations.

To study the potential effects of area closures on gag spawning aggregations, the Council selected two areas for year-round closure to all fishing where gag spawning is known to occur. The map in Figure 9 and area descriptions in Appendix I describe 14 areas that could be considered as reef fish reserves, out of which 8 sites (sites 3 to 10) are considered suitable gag spawning habitat. Because the Council is interested in evaluating the efficacy of area closures to protect gag spawning aggregations and male gag, Sites 5 and 9 were selected because they are both approximately the same size (115 and 104 square nautical miles, respectively) and they represent high (site 5) and low (site 9) relief sites. Because these areas will be closed for four years, they can be used to evaluate the effectiveness of areal closures as well as the relative importance of site type (high vs. low relief).

The Council discussed implementing the closed area with a gear restriction rather than, or in addition to, a harvest restriction. It is the Council's intent that a prohibition on the use of any fishing gear within

the closed areas would maximize enforceability of the closed area as well as minimize the negative impact from incidental catch and release of reef fish while targeting other species.

A four-year sunset clause was included in the proposed alternative to give the NMFS and Council time to evaluate the utility of closed areas.

Proposed Closed Site Descriptions: Dr. Chris Koenig (Florida State University) identified several habitats off of the west coast of Florida that have habitat characteristics of value to reef fish (Figure 9). Descriptions of all of the sites on the map are included in Appendix 1 of this document. The sites listed in the Proposed Alternative and in Rejected Alternatives 1 and 2 are within the dominant region where gag spawning aggregations are known to occur (Figures 10, 11, and 12). Dr. Koenig's descriptions identified sites both by latitude/longitude boundaries and by USGS lease blocks; however, the latitude-longitude coordinates are the operative locations of the sites for purposes of this amendment. The discussions provided for each site are those of Chris Gledhill (NMFS) and Chris Koenig (FSU).

Site 5 (Madison and Swanson) is 9.9 nautical miles wide by 10.3 nautical miles long. The proposed closed area is approximately 40 nautical miles southwest of Apalachicola, Florida. Site 9 (Steamboat Lumps) is 9.7 nautical miles wide and 11.7 nautical miles long and is approximately 95 nautical miles west of Tarpon Springs, Florida.

The proposed closed areas cover approximately a fifth of the area identified by Koenig et al. (1996) as the dominant spawning grounds for gag. However, gag may also form spawning aggregations outside of this region, so the total portion of spawning aggregations protected by the proposed closed area is likely less than one fifth. The Council considered a total of 8 potential reserve sites within the area where gag spawning aggregations may occur (Areas 3-10 in Figure 9 and Appendix I). The total of all the areas under consideration for closure was 1,205 square nautical miles. The combined 219 square nautical mile area proposed for a closure represents 18 percent of the total area considered by the Council.

Site 5 is denoted in Moe's (1963) fishing survey as having rock ledges with relief up to 5 fathoms (9 m). There is also plenty of recent anecdotal fishing information from port samplers (Debbie Fable, personal communication). This site also shows confirmed outcrops of limestone and reef fish habitat from the reef fish survey (Chris Gledhill, Pascagoula NMFS lab, personal communication). Also, (2) transects through this area by Ludwick and Walton (1957) showed pinnacle trends. Some of these formations have names- Madison and Swanson's Rocks.

Site 9, contiguous to the southern boundry of site 8, is due west of Clearwater, Florida and southwest of the Middle Grounds at a depth of 40-50 fathoms. There are prominent features reported to be low relief areas with limestone rock.

Potential Reserve Sites on W. FL Shelf

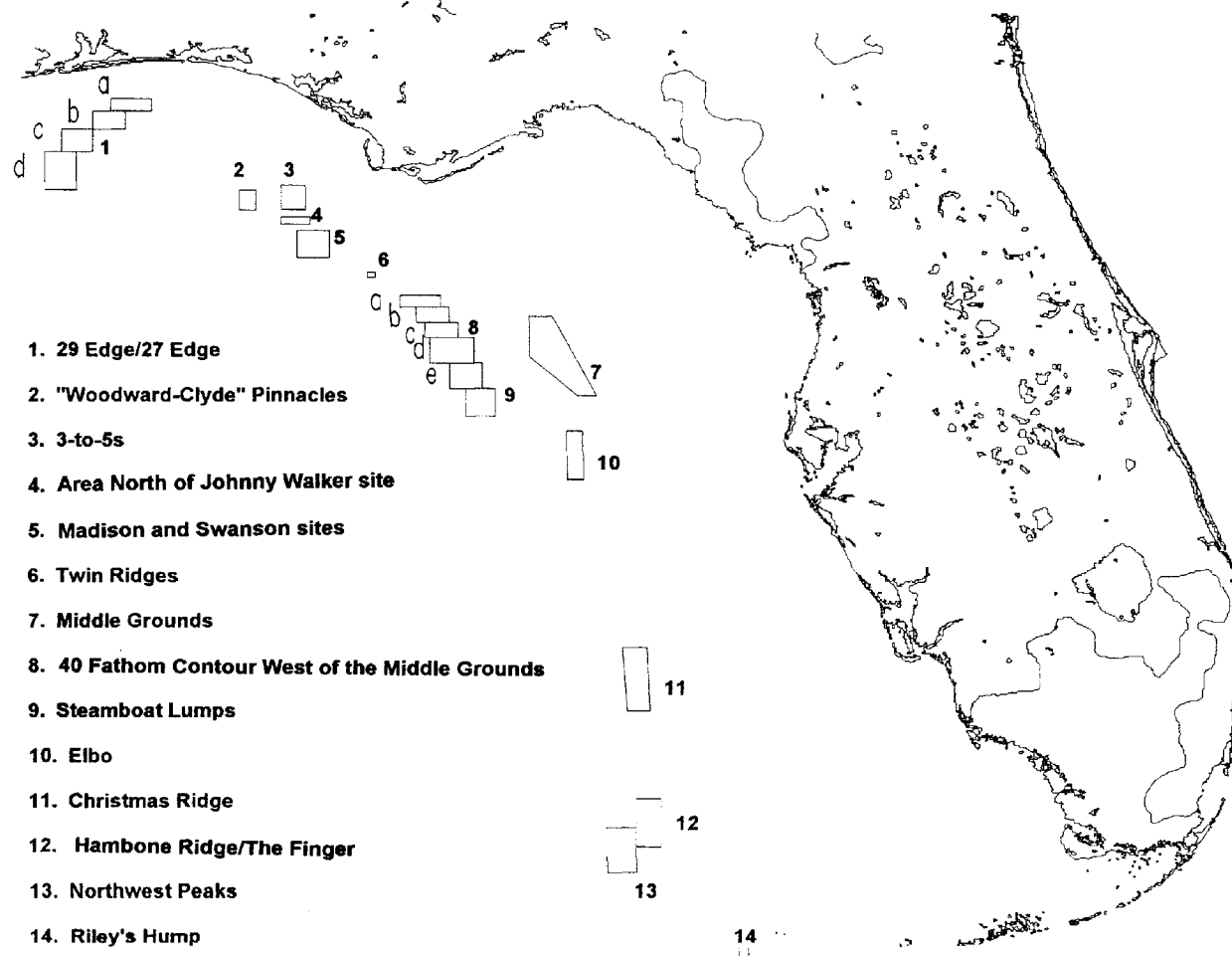


Figure 9. Potential reserve sites on west Florida shelf (source: Chris Koenig and Gary Fitzhugh)

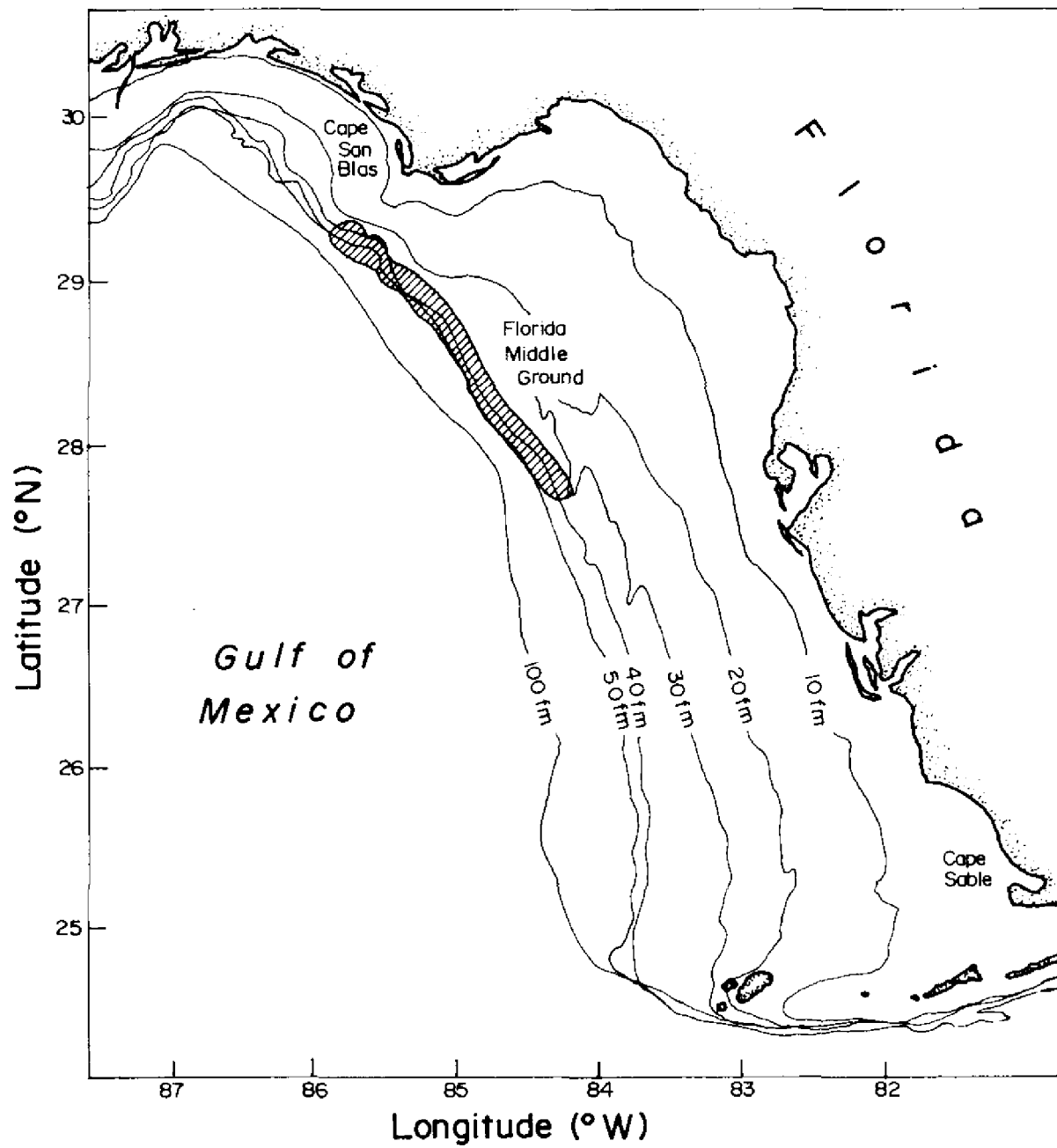


Figure 10. Dominant spawning grounds for gag off the Gulf coast of Florida (Source: Koenig et al. 1996).

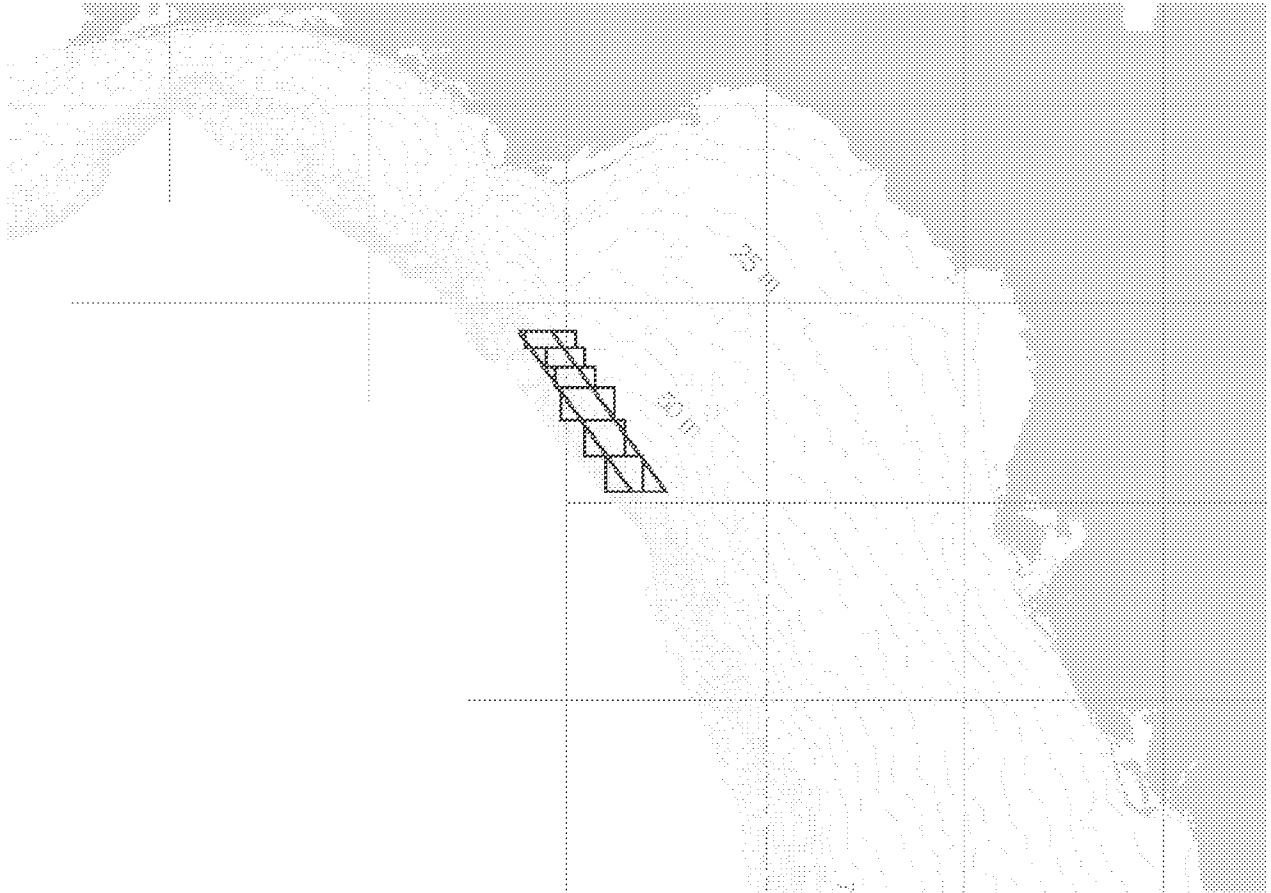


Figure 11. Proposed gag area closure. The boxes represent Dr. Chris Koenig's sites 8(a-e) and 9. The oblong region is the closed area as described in the Proposed Alternative.

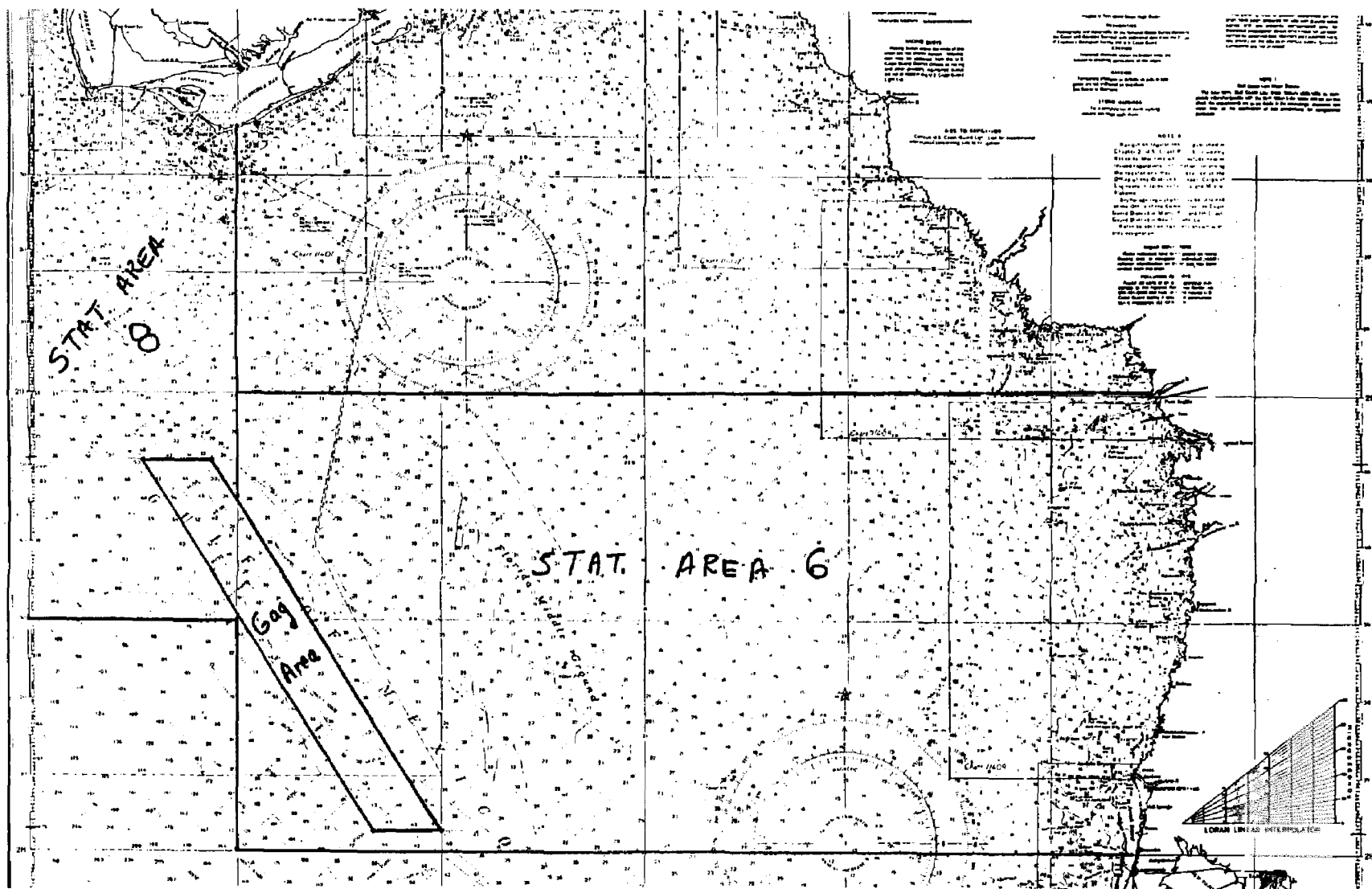


Figure 12. Gag closed area in reference to NMFS statistical grids.

Discussion: The following discussion of alternatives for gag closed area sites was provided by Chris Koenig of Florida State University.

"I would choose high relief sites first as habitat heterogeneity is an important prerequisite for reef fish abundance and diversity. From my experience with grouper fishers from the panhandle (which includes going out with them and developing a data base of at-sea-sampling), the best areas for gag aggregations are those we studied first, that is, they are high relief and undoubtedly great for gag aggregations (small scamp aggregations are still there). Although during our surveys we found very few gag anywhere, they undoubtedly formed aggregations there and were very abundant at one time, as were red snapper. They are "Twin Ridges" (no. 6 on the map), Madison and Swanson sites" (no. 5), and "3-5's" (no. 3). The "Area North of Johnny Walker site" (no. 4) is also considered good for gag aggregations. The aggregations have been heavily fished and the grouper/snapper abundance on them is not great now. But as with the Oculina Banks, it took less than 15 years of fishing to fish the gag aggregations out. Because the above sites are so depleted and yet so high relief (15 meters in some places) I would expect that they would be good reserve sites.

We know very little about the structure of the locations just west of the Florida Middle Grounds; Martin Moe says that they are very low relief. Some fishers have told me that they are good areas for gag spawning though. They are the "40 Fathom Contour West of the Middle Grounds" (site 8), "Steamboat Lumps" (site 9), and the "Elbo" (site 10). The sites further to the south are now being fished and gag are being caught in spawning condition. But my expectation is that there are few aggregations south of the "Elbo".

So I would prioritize the locations as follows: 1. "Twin Ridges", 2. "Madison and Swanson sites", 3. "3 - 5's", 4. "40 Fathom Contour West of the Middle Grounds", and the rest are of equal value."

The Proposed Alternative includes location priority 2 (site 5) and a portion of location priority 4 (site 9).

Rejected Alternative 1 was initially selected by the Council in lieu of a closed season in order to reduce fishing mortality on gag spawning aggregations and to protect adult male gag. Closing an area for a portion of the gag spawning season to all reef fish fishing allows the fishing industry to continue targeting gag year-round in other open areas. Enforcement officers have stated that larger closed areas can be more effectively enforced than small areas. The single area created by the combination of sites 8(a-e) and 9 forms the largest single closed area possible from the list of potential reserve sites in Figure 9 and Appendix I. The redefined area is a simple 4-sided area that overlays sites 8(a-e) and 9 and covers an area of approximately 423 nautical square miles (Figure 10), and falls within NMFS statistical grids 6 and 8 (Figure 11). This simplified area straddles the 40 fathom contour and would provide the same protection for gag spawning aggregations as the original 540 square nautical mile proposal (Figure 10). However, selection of this area was based on trip ticket data that may not accurately distinguish depths fished for extended fishing trips conducted by commercial fishermen. Therefore, the amount of fishing conducted in this area was probably underestimated. In addition, an industry funded evaluation of the gag fishery (Kenchington 1999) suggested that seasonally closed areas may not be the best method to protect gag stocks because gag demographic patterns could be a result of female-selective rather than male-selective harvest.

Rejected Alternative 2 contains options for closing the areas recommended by Dr. Chris Koenig other than those in the Proposed Alternative. Although the Council considered these areas, each would create a closed area smaller than the area in the Rejected Alternative 1 except for the Middle Grounds.

Rejected Alternative 3 contains an option to close the selected areas only to harvest of gag rather than to all reef fish. However, closing an area only to gag fishing would be difficult to enforce and would increase the number of gag killed from release mortality. A closure to all reef fish fishing would protect gag from bycatch, as well as directed fishing, and would protect all reef fish species occurring in the designated areas. A similar closure was implemented in 1994 for Riley's Hump (Amendment 5) to protect spawning aggregations of mutton snapper.

Rejected Alternative 4 contains options for the timing of the area closures to be in effect only during the spawning season, or the peak months for spawning season, rather than year-round. The Council rejected these options in favor of a year-round closure because male gag, which tend to stay offshore year-round, would be protected. Male gag abundance relative to female gag has been reduced substantially in recent years, leading to concerns by some biologists that spawning success could be negatively affected. In addition, a year-round closure would protect not only gag spawning aggregations, but spawning aggregations of other species that may occur during different times of the year.

Economic Impacts: The economic impacts of closing any of the areas presented here cannot be properly assessed in the absence of good economic information on fishing activities in the subject areas. Some reports indicate that these areas are mainly used by commercial fishers. Hence, other than stating that this portion of the fishery is most likely to be adversely affected by the closure of any area, only some general effects of area closures will be discussed.

Depending on the length of time the area will be closed, the effects of the closure are either temporary or permanent. Permanent effects can be either positive or negative depending on the contribution of the fish in the protected area to the stock as a whole. If the area(s) closed to fishing contribute significantly to the long-term sustainability of the stock, then the fishery dependent on the stock would benefit. However, if the closed area(s) only minimally contributes to the long-term sustainability of the stock, the adverse effects to the fishery by not being able to use the resource in the area(s) would be carried over to the future. Whatever scenario is eventually realized, the economic issue is characterized as a tradeoff in the short-term (and long-term) costs of having an area closed to fishing and the future benefits from that management measure. In the particular case of the Proposed Alternative, the costs involved (at least to the commercial sector) will be incurred over a period of four years.

With the exception of Site 10 under Rejected Alternative 2, all the areas covered in each of the alternatives for area closure fall within Statistical Areas 6 and 8. In determining the impacts of the various alternatives, the discussion below will focus on fishing-related activities in Statistical Areas 6 and 8.

The following table presents the distribution of catches of snapper and grouper by statistical areas for the period 1993-1998. The initial year was so selected because this is the first year logbook reporting was made mandatory for all vessels with commercial reef fish permits. The end year is the last year for which a complete set of data are available. For both Statistical Areas 6 and 8, the logbook reporting system does not adequately cover species other than reef fish. Public testimony indicated some fishing activity for non-reef fish species occur in the proposed closed areas .

In the following table, Statistical Area 6 has the highest percent share of harvest for gag, the second highest share for black grouper (Statistical Area 7 is highest), and second highest share for red grouper (Statistical Area 5 is highest). Statistical Area 8 accounts for a lower proportion of reef fish catches than Statistical Area 6. Nevertheless, a fair amount of gag are caught in Area 8. On average, Statistical Area

6 has accounted for 28.4 percent of all gag, 22 percent of all black grouper, and 23 percent of all red grouper catches in the Gulf. Statistical 8 has accounted for 7.3 percent, 15 percent, and 2.3 percent, respectively, of these species' catches in the Gulf.

Average percent share of harvest of reef fish, by statistical area, 1993-1998.

Area ↗	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Gag	0.1	1.6	5.4	7.9	23.7	28.4	19.5	7.3	2.2	1.1	0.8	0.0	0.4	0.2	0.3	0.4	0.3	0.1	0.1	0.0	0.1
Black Gr.	0.9	5.3	5.7	4.8	16.0	21.9	23.0	15.4	2.3	0.9	0.4	0.1	0.4	0.4	0.3	0.5	0.8	0.4	0.2	0.0	0.0
Red Gr.	0.3	4.0	14.3	13.0	33.8	23.0	8.4	2.3	0.8	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others	1.5	5.0	2.8	2.2	4.5	4.0	3.8	3.6	3.8	7.1	3.9	0.8	4.6	4.1	4.7	10.6	15	8.4	5.4	2.0	2.5
All Species	1.0	4.4	6.6	6.0	15.5	11.9	6.2	3.8	3.0	4.5	2.4	0.5	2.9	2.7	3.0	6.3	8.5	5.0	3.1	1.2	1.6

Note: "Others" includes all species in the reef fish FMP other than gag, black grouper, and red grouper; "All Species" includes gag, black grouper, red grouper, and other reef fish.

Because there are no direct estimates of fish caught in any of the areas considered in the various area closure alternatives, the potential impacts of any area closure are simply inferred from an examination of catches by water depths. Most of the relevant areas for closure, especially in the Proposed Alternatives and in some of the rejected alternatives, straddle the 40-fathom line and likely include areas with depths from 30 to 50 fathoms. Data for reef fish catches by water depths are based on Florida trip ticket information as supplied by the Florida Marine Research Institute (Brown 1999).

The table below shows the percent of trips made in Statistical Areas 6 and 8 that reported or did not report catch by water depths. Also shown is the total number of trips made in each of two statistical areas. Reporting of depths fished has been relatively high, especially since 1995 when reporting of such information became mandatory.

Percent of total trips reporting and not reporting catch by water depths, 1993-1998.

Year	Statistical Area 6			Statistical Area 8		
	With Depth (%)	Without Depth (%)	Total Trips	With Depth (%)	Without Depth (%)	Total Trips
1993	61.0	39.0	1599	44.9	55.1	907
1994	66.4	33.6	1745	52.8	47.2	772
1995	87.5	12.5	1854	84.5	15.5	728
1996	95.4	4.6	1679	99.4	0.6	648
1997	94.6	5.4	1942	99.4	0.6	689
1998	98.8	1.2	2065	99.5	0.5	689

Most fish caught in these Statistical Areas 6 and 8 were in depths greater than 50 fathoms (Table below). This information is inconsistent with reports from fishermen who testified before the Council. Many fishermen have indicated that they concentrate their fishing effort for gag and red grouper in depths between 30 and 50 fathoms. One possible cause for the differences between the table and the testimony is that trip tickets have only one space to record depth fished. If a fishermen fishes a variety of water depths (e.g. they start fishing in shallower waters and end up in deeper waters) but only indicates on their trip ticket the deeper waters fished, then the trip ticket will not accurately describe where they fished.

Consequently, the estimation of the effects that area closures will have on fisheries will be grossly underestimated.

Average percent distribution of reef fish caught in statistical areas 6 and 8, by water depths, 1993-1998.

Species	Water Depth Range (fathoms)			
	Unknown	< 30	30 - 50	> 50
Statistical Area 6				
Gag	14.4	4.3	15.4	65.9
Black	20.5	3.8	13.2	62.6
Red	14.7	4.3	4.9	76.2
Other reef fish	16.8	1.4	2.3	79.5
All Species	15.3	4.0	7.1	73.6
Statistical Area 8				
Gag	7.8	0.5	0.3	91.3
Black Grouper	0.0	0.0	0.0	100.0
Red Grouper	11.2	0.7	1.7	86.4
Other Reef Fish	24.4	0.4	0.5	74.6
All Species	13.6	0.5	0.7	85.2

Given the two tables above, the percentage reduction in commercial catch of various reef fish species from an area closure can be estimated. Since Rejected Alternative 1 covers a wide area and would ban reef fish fishing year-round, it is insightful to first estimate the potential impacts of this rejected alternative. It covers approximately 423 square nautical miles and most of the area is located in Statistical Area 6, which includes the waters off Tarpon Springs through Crystal River, and a relatively small portion is located in Statistical Area 8, which includes the waters off Panama City. While the major objective of such a closure would be the protection of gag, fishing for all other reef fish (including incidental harvest by bottom fishing gear) would be affected.

In estimating the effects of Rejected Alternative 1, it is assumed that the area covered by this alternative includes all the 30 to 50-fathom areas in Statistical Areas 6 and 8. While this assumption may be more applicable to Statistical Area 6, it may not readily apply to Statistical Area 8 since only a small portion of this area is included under Rejected Alternative 1.

Under Rejected Alternative 1, which would permanently ban the harvest of reef fish and other species in the 30- to 50-fathom areas of Statistical Areas 6 and 8, commercial landings of reef fish caught in Statistical Areas 6 and 8 would be reduced by an average of 7.1 percent and 0.7 percent, respectively (see "All Species" row of immediately preceding table). Gag, black grouper, red grouper, and other reef fish catches from Statistical Area 6 would be reduced by 15.4 percent, 13.2 percent, 4.9 percent, and 2.3 percent, respectively. The corresponding reductions in catches from Statistical Area 8 would be 0.3

percent, 0.0 percent, 1.7 percent, and 0.5 percent, respectively.

The foregoing reductions in catches from two statistical areas under Rejected Alternative 1 can be expanded to the entire reef fish fishery by multiplying them by the corresponding area's percent share of total landings. Using this approach, the total reduction in gag catches would be approximately 4.39 percent, of which 4.37 percent come from Statistical Area 6 ($15.4 \% \times 28.4 \% = 4.37 \%$) and the rest from Statistical Area 8 ($0.3 \% \times 7.3 \% = 0.02 \%$). The corresponding overall reduction for black grouper would be 2.89 percent, all of which is accounted for by Statistical Area 6 ($13.2 \% \times 21.9 \%$) while that for red grouper is 1.17 percent, of which 1.13 percent comes from Statistical Area 6 ($4.9 \% \times 23 \% = 1.13 \%$), and the rest comes from Statistical Area 8 ($1.7 \% \times 2.3 \% = 0.04 \%$). The overall reduction for other reef fish would be relatively negligible at 0.09 percent.

Using the 1990-1998 average commercial revenues for the three reef fish species, the foregoing reductions in catches from Rejected Alternative 1 would translate to reductions in ex-vessel revenues of \$150,000 for gag, \$38,000 for black grouper, \$115,000 for red grouper, and \$40,000 for other reef fish. Rejected Alternative 1, then, would effect an overall reduction in commercial ex-vessel revenues of \$343,000 annually. Considering the permanency of the closure under Rejected Alternative 1, the commercial sector would stand to lose approximately \$4.9 million of ex-vessel revenues, assuming a 7 percent discount rate.

The impacts of the other closure alternatives may be inferred from those of Rejected Alternative 1, since in all likelihood this alternative has the largest impacts on fishing participants. As mentioned earlier, Rejected Alternative 1 covers 423 square nautical miles. It would ban all reef fishing and bottom gear capable of catching reef fish and close the area year-round. The Proposed Alternative covers only 219 square nautical miles and sunsets after 4 years, although the number of species affected is larger than that under Rejected Alternative 1. The Proposed Alternative would affect not only reef fish but all species under the jurisdiction of the Gulf Council (with the potential inclusion of highly migratory species). Rejected Alternative 3 closes the same area as Rejected Alternative 1 but only for harvesting gag. Rejected Alternative 4 also closes the same area as Rejected Alternative 1 but only for 2 or 4 months of the year. Rejected Alternative 2 may or may not cover a wider area than that under Rejected Alternative 1. The priority sites (Sites 3, 5, and 6) encompass 196 square nautical miles. On the other hand, the other sites (Sites 4, 7, and 10) cover a wider area of 475 square nautical miles. It may be noted, however, that about 72 percent of these 475 square nautical miles is accounted for by Site 7 (Middle Grounds), which is located in Statistical Area 6 along the 20-fathom isobath. From the previous table showing the percent distribution, by water depths, of harvest in Statistical Area 6, Site 7 could potentially account for much less catch than those areas included under Rejected Alternative 1. Hence, even in the case where Rejected Alternative 2 covers a wider area than Rejected Alternative 1, the latter is still likely to effect larger impacts than the former.

The Proposed Alternative covers an area that is approximately 52 percent of that under Rejected Alternative 1. Based on this proportion, the Proposed Alternative would reduce catches of gag, black grouper, red grouper, and other reef fish by 2.28 percent, 1.5 percent, 0.61 percent, and 0.05 percent, respectively. The corresponding ex-vessel revenue reductions would be \$78,000, \$20,000, \$60,000, and \$21,000 for gag, black grouper, red grouper, and other reef fish, respectively. In sum, the Proposed Alternative would bring about a reduction in commercial ex-vessel revenues amounting to \$179,000 annually for 4 years. At a discount rate of 7 percent, the total reduction in commercial ex-vessel revenues would be approximately \$600,000.

It is worth noting here that the derived economic affects of the Proposed Alternative are likely to be overestimates. The Proposed Alternative covers more of Statistical Area 8 and much less of Statistical Area 6 than Rejected Alternative 1. Based on trip ticket reports as summarized in a table above, the relevant areas in Statistical Area 6 are more productive than those in Statistical Area 8, so that dropping an area in the former and adding an area in the latter for closure purposes would lessen the affects.

Rejected Alternative 2 is broadly specified so that its effects cannot be readily inferred from those of Rejected Alternative 1. Per discussion above regarding the productivity of the biggest area (Site 7) potentially included under Rejected Alternative 2, the affects of this alternative are deemed to be smaller than those of Rejected Alternative 1.

As can be inferred from the affects of Rejected Alternative 1, Rejected Alternative 3 would reduce the overall catch of gag by 4.39 percent or \$150,000 in annual ex-vessel revenues. At a discount rate of 7 percent and under a permanent closure, the total revenue reduction would amount to \$2.1 million.

Rejected Alternative 4 closes areas to fishing for a 4 or 2 month period. Based 1993-1998 commercial reef fish logbook data from January through April, percent commercial total landings were 39 percent for gag, 40 percent for black grouper, 29 percent for red grouper, and 49 percent for other reef fish. The corresponding percent total landings for the 2-month period of February through March were 20 percent for gag, 20 percent for black grouper, 14 percent for red grouper, and 35 percent for other reef fish. Applying the area closure and economic values from Rejected Alternative 1 provides estimates of the affects of Rejected Alternative 4 and are as follows:

Under the 4-month closure option of Rejected Alternative 4, the catch reductions would be 1.71 percent for gag, 1.16 for black grouper, 0.34 percent for red grouper, and 0.04 percent for other reef fish. The corresponding reductions in commercial ex-vessel revenues are: \$59,000, \$15,000, \$33,000, and \$20,000, respectively. Total revenue reductions would be \$127,000 annually, or \$1.81 million overall using a 7 percent discount rate.

Under the 2-month closure option of Rejected Alternative 4, the catch reductions would be 0.88 percent for gag, 0.58 percent for black grouper, 0.16 percent for red grouper, and 0.03 for reef fish. Commercial ex-vessel revenues would be reduced by \$30,000 for gag, \$8,000 for black grouper, \$16,000 for red grouper, and \$14,000 for other reef fish. Total revenue reductions would be \$68,000 annually, or \$971,000 overall using a 7 percent discount rate. While the reductions in harvest and revenues under Rejected Alternative 4 would appear to be relatively small in amount, their impacts could be significant on the vessels that depend on the harvest of reef fish primarily from such closed areas. The next table shows the annual number of vessels catching a certain amount of reef fish, coastal pelagics, and highly migratory species in the two mentioned statistical areas. It should be noted that catches of species other than reef fish, as reported in reef fish logbooks, are relatively insignificant in these areas. In fact, the number of vessels does not differ at all whether or not species other than reef fish are included. Included in the tables are vessels that landed as low as one pound and as high as 80,000 pounds.

Number of vessels with harvest of reef fish and other species from statistical areas 6 or 8.

Annual Harvest (Pounds)	Number of Vessels						
	1993	1994	1995	1996	1997	1998	Average
< 1,000	85	80	87	69	86	106	86
1,000 < 5,000	104	123	124	113	117	117	116
5,000 < 10,000	62	61	45	60	51	45	54
10,000 < 15,000	30	47	27	25	37	32	33
15,000 < 20,000	13	21	11	16	19	15	16
≥ 20,000	31	47	12	34	49	29	34
Total	325	379	317	317	359	344	340

For the period 1993-1998, an average of 340 vessels caught reef fish and other species in Statistical Areas 6 and 8. These vessels comprise the universe that would be directly affected by closed areas. Understandably, there are vessels that would be minimally affected and some that would experience larger reductions in harvests if prohibited from fishing in certain parts of the two statistical areas. Most of these vessels catch a greater portion of their landings from Statistical Area 6. There are reported to be 60 to 70 vessels that catch most of their fish from 30 to 50 fathoms of water in Statistical Area 6. These vessels could be those that reported large catches as shown in the table above. The average crew size for these vessels is approximately 2 to 3 persons.

Of an average of 340 vessels harvesting reef fish and other species in Statistical Areas 6 and 8, only some are likely to be highly dependent on catches from the proposed closed areas. Any reductions in vessel catch and income would tend to materially affect the fishing operations of these vessels and the livelihood of the crew. Waters (1996) reported that, on average, a high-volume vessel (top 25% in landings) with vertical lines in the eastern Gulf earned approximately \$53,000 per year while low-volume boats (bottom 25% in landings) earned \$21,000 per year. In addition, the captain and crew of high-volume vessels together earned \$24,000 per year or 45 percent of total revenues while those of low-volume vessels earned \$8,000 per year or 38 percent of total revenues.

To compensate for any potential revenue reduction from an area closure, affected vessels would have to fish in other areas and compete with other commercial vessels and recreational vessels. This practice would likely not fully offset revenue losses and would likely increase fishing costs. While it is likely that all affected vessels would incur higher costs in transferring to other fishing areas, longliners in Statistical Area 6 are particularly vulnerable to such higher costs because both the longline ban and any area closure would severely restrict their fishing area. It is important to note that longlining activities in Statistical Area 6 are a significant component of all reef fish fishing in the area, as can be gleaned from the table below. While longliners are also major producers in Statistical Area 8, they are already banned from most of the areas considered under any of the alternatives, particularly the Proposed Alternative.

Handlines are the dominant gear in harvesting reef fish in Statistical Area 6, accounting for an annual average landings of 752,000 pounds, or 47 percent of landings, for the period 1993-1998. But longlines are a vital component of the fishery, accounting for an average of 564,000 pounds, or 35 percent of

landings, for the same period. Longlines accounted for as low as 24 percent to as high as 44.4 percent of all landings in Statistical Area 6. Since the Proposed Alternative would severely reduce the area in Statistical Area 6 where longliners can fish, there is a good possibility that the total loss arising from the implementation of the proposed area closure would be greater than the estimated loss of \$179,000.

Harvests of reef fish and other species from Statistical Area 6, by gear type.

Gear	1993		1994		1995		1996		1997		1998		Average	
	Pounds (1000)	%	Pounds (1000)	%	Pounds (1000)	%	Pounds (1000)	%	Pounds (1000)	%	Pounds (1000)	%	Pounds (1000)	%
Handlines	742	46.9	855	45.1	580	46.5	671	43.4	874	40.5	791	66.7	752	47.0
Longlines	650	41.1	512	27.0	300	24.1	677	43.8	958	44.4	285	24.0	564	35.2
Traps	135	8.5	453	23.9	335	26.9	163	2.3	292	13.5	88	7.4	244	15.3
Others	53	3.4	76	4.0	31	2.5	35	10.6	34	1.6	23	1.9	42	2.6
Total	1,580		1,896		1,246		1,546		2,158		1,187		1,602	

In addition to the vessels that would be affected by any area closure, dealers receiving fish from the affected vessels will also experience adverse impacts. The following table shows the number of dealers that handled reef fish and other species caught in Statistical Areas 6 and 8. For the period 1993-1998, an average of 83 dealers received reef fish that were harvested in the two mentioned statistical areas. Some dealers received less than 100 pounds while others received more than 200,000 pounds. These dealers comprise the universe of dealers that would be directly affected by the closed areas. As with the case for vessels, there are dealers that would be minimally affected by closed areas and there are those that would face large reductions in fish received from various vessels fishing in the area that would be closed. Alternative supply sources may not be readily available, or if available, the fish supplied may cost more or be of lower quality.

Number of dealers receiving reef fish and other species harvested from statistical areas 6 or 8.

Annual Receipts (Pounds)	Number of Dealers						
	1993	1994	1995	1996	1997	1998	Average
< 10,000	39	44	45	50	55	63	49
10,000 < 20,000	10	6	9	7	8	11	9
20,000 < 40,000	7	7	7	3	6	6	6
40,000 < 60,000	7	4	3	5	3	3	4
60,000 < 80,000	3	3	5	8	2	6	5
≥ 80,000	9	14	7	10	15	7	10
Total	75	78	76	83	89	96	83

Although in general, dealers have more flexibility than vessels in generating revenues, those that depend highly on vessels now fishing in potentially closed areas would also be adversely affected, at least in the short run. Most of the dealers that received fish caught by vessels in Statistical Area 6 handle only small amounts. There are, however, 2 to 11 dealers that handled large volumes of fish caught in this area. It is highly likely that these will be ones that will be affected by the reduction in landings due to the area closures. The magnitude of this effect cannot be estimated.

The long-term benefits from the area closures would be those accruing to the long-term sustainability of the protected stocks and the fishery dependent on these stocks. While gag is the major species intended to be protected, other species (e.g., red grouper) would also be protected. The magnitude of these benefits cannot be estimated with available information.

A 4-year or permanent closure that provides long-term benefits to the stock and the fishing participants brings along the issue of allocation. In such situation, it is obvious that a fishing sector that depends on the stock for harvest, such as the commercial fishery, would be permanently prohibited from fishing in the area. Only non-use fishing may be allowed so that most of the benefits from closing an area would be allocated to this user group. Unless the closure contributes to the relaxation of management measures due to enhanced stock abundance, or in the case of gag the presence of sufficient numbers of males in the population, closing an area to fishing would favor one user group over another. Even in the situation of an increasing abundance, any net benefits that may result from closing an area would be distributed in a disproportional manner partly because a certain segment of the fishery bears the greater costs of an area closure.

Another issue that accompanies area closures relates to the costs of monitoring and enforcing the closure. Certainly, the more areas closed the higher the costs would be, particularly if the closed areas are individually small in geographical scope. Both intended and unintended violations would be high in such situation. A vessel monitoring system (VMS) may be developed to enhance enforcement, but understandably, there are costs that would be expended by both the government and industry with this type of a system (see Amendment 16A to the Reef Fish FMP for a discussion of the costs involved in developing and maintaining a VMS). For the present time, enforcement of the proposed area closures would be included as part of the routine enforcement activities around this area.

Environmental Consequences

Physical Environment: Bottom longlines have accounted for about 25 percent of the gag harvest from 1990-1996. The Generic Amendment for Addressing Essential Fish Habitat Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hardbottoms, offshore reefs and wrecks, coral, and live bottom. Reef Fish Amendment 1 (GMFMC 1989), in describing habitat concerns, stated that fishing gear such as bottom trawls, bottom longlines, and traps may damage reefs with effects similar to anchor damage, i.e., they can break hard and soft corals and scar reefs. A prohibition of bottom gears capable of catching reef fish within the closed area will protect habitat essential to spawning aggregations and to male gag which remain offshore at other times of the year. The alternatives in this section are anticipated to have no negative impact on the physical environment or essential fish habitat, and may have a beneficial impact from the prohibition of bottom gears capable of catching reef fish.

Human Environment: The proposed closed areas affect primarily the commercial fishery; however, public testimony indicated that area 5 was used by charter vessels trolling for king mackerel and billfish. It

would in particular displace fishing vessels that target spawning aggregations. Schirripa and Legault (1994) in the 1994 gag stock assessment examined logbook records and found that in 1993, for the top 15 vessels catching gag, the average percent gag in any given trip was 44 percent. They concluded that in 1993 there were approximately 15 vessels that heavily targeted gag. However, the data suggested that targeting of gag may be very seasonal for some vessels and that many trips may target them only at times when they are more easy to catch (i.e., in spawning aggregations).

Fishery Resources: The Proposed Alternative for area closures is expected to reduce commercial landings by 2.55 percent for gag, 1.5 percent for black grouper, 0.61 percent for red grouper, and 0.05 percent for other reef fish. This corresponds to a reduction in revenues of \$78,000, \$38,000, \$115,000, and \$40,000, respectively. Annually, the commercial sector would lose \$179,000 in ex-vessel revenues and over a 4-year period, the total revenue loss to the commercial sector would be \$600,000, using a 7 percent discount rate. Approximately 340 vessels and 83 dealers would be adversely affected by the closure, although most likely some lower number of both vessels and dealers would be directly affected. There is some anecdotal information that some for-hire vessels fish in the proposed closed area in Statistical Area 8, so they would also bear some cost of the closure. In addition, some for-hire vessels may be indirectly affected by the closure as some commercial vessels redirect their effort to areas frequented by these for-hire vessels. To the extent that an area chosen to be closed to fishing addresses the unique problems associated with gag demographics, the long-term sustainability of the stock and the fishery dependent on it would be preserved. Other species, such as red grouper, would also be protected. Because most of the areas contemplated to be closed are mainly used by commercial fishers, the short-term adverse impacts of the closure would be mainly borne by the commercial sector. Due to the fact that these long-term benefits cannot be estimated, the net effect of this action cannot be determined.

Impact on Other Fisheries: Closures to all fishing will protect the gag stock and other species that utilize the areas from fishing mortality during the period of closure. Scamp was specifically mentioned by Dr. Koenig as a species that shares spawning areas with gag. In addition, Dr. Koenig noted that red snapper were once abundant in these areas. Anecdotal information from fishers suggests that red snapper are beginning to reappear in some of these areas. A total closure could protect these fish while their populations become reestablished. A closure applied only to gag would have a negative impact on other species due to effort shifting within the affected area.

Effect on Wetlands: The alternatives have no effect on wetlands.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. Reef Fish Amendment 1 (GMFMC 1989) describes habitat damage by bottom longlines as similar to anchor damage (e.g. break hard and soft corals and scar reefs). Areal closures are not anticipated to have a negative effect on the bottom and may actually be beneficial to EFH because fishing activities will be excluded within the closed area.

8.3 Private and Public Costs

The preparation, implementation, enforcement and monitoring of this or any federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Costs associated with this specific action include:

Council costs of document preparation, meetings, public hearings, and information dissemination	\$50,000
NMFS administrative costs of document preparation, meetings and review	35,000
Monitoring and law enforcement costs	none
Public burden associated with permits	none
NMFS costs associated with permits	none
TOTAL	\$85,000

The Council and NMFS costs of document preparation are based on member and staff time, travel, printing, and any other relevant items where funds were expended directly for this specific action. The proposed measures, particularly those relating to the closed area, would entail additional monitoring and enforcement costs, but these costs cannot be quantified at this time. It is important to note, however, that under a fixed level of enforcement budget and personnel, a redirection of resources would be undertaken in order to conduct monitoring and enforcement activities necessitated by the actions in this amendment. There are no additional permit costs to either the public or NMFS, since there are no proposed adjustments to the current permitting regulations.

8.4 Summary and Net Impact of Alternatives for Action

By current definition, gag is not overfished, but it may be undergoing overfishing. Given this condition, the setting of TAC would start the process of arresting the stock's movement towards an overfished status. Just like any other TAC, it would impose a constraint on the expansion of the fishery. While the general economic issue is determining the net economic impact by comparing the short-term costs to the long-term gains, the absence of necessary information to conduct this type of analysis prompted the simple examination of short-term impacts. The short-term impacts of TAC setting would be determined by the chosen level of TAC. Using historical landings information, a TAC less than 3.4 million pounds would start to effectively constrain landings. Rejected Alternative 1 and a subset of Rejected Alternative 3 would fall into this category. These two alternatives would likely set into motion the derby-like effects experienced in the red snapper fishery. The extent of impacts would depend on the commercial/recreational allocation ratio adopted.

Raising the minimum size limit for gag from 20 inches to 24 inches TL would effect a 5.8 percent reduction in revenues, or \$249,000, for the commercial fishery. The impacts on the recreational fishery are larger, but would be partly mitigated by the gradual increase in the minimum size limit. In the first year of implementation when the minimum size limit is raised to 22 inches TL, recreational landings

would be reduced by 6.97 percent in pounds, or 28.9 percent in numbers of fish. When the minimum size limit is increased to 23 inches TL, recreational landings would be reduced by an additional 12.15 percent for pounds, or 12.84 percent for number of fish. In the third year when the minimum size limit is raised to 24 inches TL, recreational landings would be reduced by an additional 9.99 percent for pounds, or 10.72 percent for number of fish. Because the private/rental mode is the predominant segment in the recreational gag fishery, it will bear the highest reduction in landings.

Imposing a 2-fish bag limit for gag, as in Rejected Alternative 1, would have relatively small impacts on the recreational fishery, primarily because only about 3 percent of anglers keep more than 2 fish. Because most gag are landed by the private/rental mode, this group would bear most of the burden of the 2-fish bag limit. This dominance of the recreational gag fishery by the private/rental mode also implies that the alternative to impose a zero bag limit for captain and crew, as in Rejected Alternative 2, would result in minimal adverse impacts. Choice of status quo avoids the increase in enforcement cost of an action that would otherwise have minimal impacts on the fishery.

Among the alternatives for commercial trip limit, Sub-options (c) and (d) of the Rejected Alternative may be expected to affect revenues and costs of commercial vessels the most. Higher trip limits, as in Sub-options (a) and (b) of the Rejected Alternative, will affect revenues the least.

The short-term affects of the proposed February 15-March 15 closure to commercial harvest and sale of gag, black, and red grouper would amount to reductions in commercial harvest of 9.9 percent for gag, 9.9 percent for black grouper, and 7.4 percent for red grouper. These reductions in ex-vessel revenues would be \$430,000, \$130,000, and \$970,000, respectively. Annually, this equals \$1.53 million in commercial sector, ex-vessel losses. A shift in commercial effort by the closure may cause a market glut to occur before and/or after the closed months. This would only worsen the adverse affects on the commercial fishery because revenues would decrease further with accompanying increases in costs.

The Proposed Alternative for area closure is expected to reduce commercial landings by 2.55 percent for gag, 1.5 percent for black grouper, 0.61 percent for red grouper, and 0.05 percent for other reef fish. This corresponds to a reduction in revenues of \$78,000, \$38,000, \$115,000, and \$40,000, respectively. Annually, the commercial sector would lose \$179,000 in ex-vessel revenues and over a 4-year period, the total revenue loss to the commercial sector would be \$600,000, using a 7 percent discount rate. Approximately 340 vessels and 83 dealers would be adversely affected by the closure, although most likely some lower number of both vessels and dealers would be directly affected. There is some anecdotal information that some for-hire vessels fish in the proposed closed area in Statistical Area 8, so they would also bear some cost of the closure. In addition, some for-hire vessels may be indirectly affected by area closures as some commercial vessels redirect their effort to areas frequented by these for-hire vessels. To the extent that an area chosen to be closed to fishing addresses the unique problems associated with gag, the long-term sustainability of the stock and the fishery dependent on it would be preserved. Other species, such as red grouper, would also be protected. Because most of the areas contemplated to be closed are mainly used by commercial fishers, the short-term adverse impacts of the closure would be mainly borne by the commercial sector. Due to the fact that these long-term benefits cannot be estimated, the net effect of this action cannot be determined.

The total effects on the commercial sector by the three proposed actions are not strictly additive, and should be adjusted for combined effects due to any combination of the three actions. Before proceeding with summation of total effects, three points should be noted here. First, only the minimum size limit

increase has direct effects on the recreational sector although there is some possibility that some for-hire vessels may be affected by the area closures. Second, no quantitative estimates in commercial and recreational catch reduction are available for the minimum size limit increase on black grouper. Third, only the area closures effect the commercial catch of other reef fish.

To correct for the combined effects, it is first assumed that each action (e.g., minimum size limit or seasonal closure) includes the combined effects of a paired action, e.g., minimum size limit and seasonal closure. Given this assumption, the total affect of the three proposed actions may be calculated as the sum of each action, less the combined effects of any pair of actions, plus the combined effects of the three actions. For gag, the total reduction in commercial harvest from the three proposed actions would amount to 17.06 percent, or the sum of 5.8 percent from minimum size limit, 9.9 percent from seasonal closure, and 2.28 percent from area closure; less 0.57 percent (combined effects of minimum size limit and seasonal closure), 0.13 percent (combined effects of minimum size limit and area closure), and 0.23 percent (combined effects of seasonal and area closures); plus 0.01 percent (combined effects of the three actions). The total commercial harvest reduction for black grouper is 11.25 percent, or the sum of the effects of seasonal closure (9.9 percent) and area closure (1.5 percent) less the combined effects of 0.15 percent. Commercial harvest of red grouper would be reduced by a total of 7.96 percent, or the sum of the effects from the seasonal closure (7.4 percent) and area closure (0.61 percent) less the combined effects of 0.05 percent.

The one-time cost in the preparation of this document is relatively minimal at \$85,000. Monitoring and enforcement costs, which would be incurred on a continuing basis mainly due to the proposed area closure, are taken to be included in current expenditures for monitoring and enforcing fishing rules and regulations; however, the additional burden will likely be borne in a reduced presence in other activities.

8.5 Determination of a Significant Regulatory Action

Pursuant to Executive Order 12866, a regulation is considered a "significant regulatory action" if it is likely to result in a rule that may: 1) have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of the recipients thereof; or 4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

The entire Gulf commercial reef fish harvest sector has an ex-vessel value of approximately \$45 million. In 1998, the commercial fishery generated total revenues of \$5.6 million for gag, \$1.2 million for black grouper, and \$8.6 million for red grouper. Considering the size of the fishery, a \$100 million annual impact due to this amendment is not likely to happen. Prices of reef fish to consumers may not be expected to increase significantly as a result of this amendment, since there is expected to be no substantial reduction in overall reef fish harvest. Resulting changes in gag, black, and red grouper prices is not expected to be substantial, although some perceptible effects may be expected since the potential reduction in harvest due to the proposed minimum size limit increase, seasonal closure, and area closure would amount to approximately 17 percent for gag, 11 percent for black grouper, 8 percent for red grouper, and 0.05 percent for other reef fish. Overall cost increases to the commercial gag industry are not expected to be substantial, although certain segments of this fishery, in particular those that may be

affected by area closures, may experience some cost increases by shifting fishing effort to other areas. Costs to the local and federal governments are relatively minimal. The proposed minimum size limit increase, seasonal closure, and area closures are expected to have some adverse, but unquantifiable, effects on employment, competition, and investment.

Measures in this amendment do not interfere or create inconsistency with any action of another agency, including state fishing agencies. Florida is currently considering changes to their regulations affecting gag, some of which are included in this amendment. Also, measures in this amendment do not affect any entitlements, grants, user fees, or loan programs. The proposed area closures are a relatively new measure in the Gulf, and thus may raise novel legal and policy issues. In addition, a fair amount of controversy has been raised about area closures relative to the overall management of gag and other reef fish resources in the Gulf.

Mainly because of the new and controversial issues raised by the proposed area closure, this regulation, if enacted, would constitute a significant regulatory action.

8.6 Initial Regulatory Flexibility Analysis

Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to relieve small businesses, small organizations, and small governmental entities from burdensome regulations and record keeping requirements. The category of small entities likely to be affected by the proposed plan amendment is that of commercial and for-hire businesses currently engaged in the reef fish fishery. The impacts of the proposed action on these entities have been discussed above. The following discussion of impacts focuses specifically on the consequences of the proposed action on the mentioned business entities.

The Regulatory Flexibility Act requires a determination as to whether or not a proposed rule has a significant impact on a substantial number of small entities. If the rule does have this impact then an Initial Regulatory Flexibility Analysis (IRFA) has to be completed for public comment. The IRFA becomes final after the public comments have been addressed. If the proposed rule does not meet the criteria for "substantial number" and "significant impact," then a certification to this effect must be prepared.

Determination of Significant Economic Impact on a Substantial Number of Small Entities

In general, a "substantial number" of small entities is more than 20 percent of those small entities engaged in the fishery (NMFS, 1992). In 1992 when the moratorium on the issuance of new commercial permits was started, a total of 2,200 permits were issued to qualifying individuals and attached to vessels, and are deemed to comprise the reef fish fishery in the U.S. Gulf of Mexico. There are currently 1,204 active permits while others are in the process of being renewed. Waters (1998) reported that in 1997, about 281 vessels targeted gag and 473 vessels caught gag but not as the main species. There are about 1,286 charterboats and 91 headboats operating in the Gulf. The Small Business Administration (SBA) defines a small business in the commercial fishing activity as a firm with receipts of up to \$2.0 million annually. SBA also defines a small business in the charterboat activity as a firm with receipts up to \$3.5 million per year. Practically all current participants of the reef fish fishery readily fall within such definition of

small business.

The area closures alone would directly affect about 340 commercial vessels or about 28 percent of all active commercially permitted vessels and indirectly affect some of the for-hire vessels in Florida. The minimum size limit increase and seasonal closure would affect some of the 754 commercial vessels that harvested gag. Based on this finding, the "substantial number" criterion will be met. The outcome of "significant impact" is less clear but can be triggered by any of the five conditions or criteria discussed below.

The regulations are likely to result in a change in annual gross revenues by more than 5 percent. Among the measures considered, the setting of TAC and the seasonal closure are likely to affect gross revenues of commercial and for-hire vessels catching or targeting gag. The combined commercial revenue reductions from minimum size limit increase, seasonal closure, and area closure are estimated to be about 17 percent for gag, 11 percent for black grouper, 8 percent for red grouper, and 0.05 percent for other reef fish. With these percentage reductions, the 5 percent threshold is likely to be exceeded.

Annual compliance costs (annualized capital, operating, reporting, etc.) increase total costs of production for small entities by more than 5 percent. The capital cost of complying with the measures considered in this amendment is deemed to be relatively small, although operating costs for vessels targeting gag, black, and red grouper could increase in the process of shifting fishing operations to open areas, to target larger sized fish, or to fish outside of the closed season.

Compliance costs as a percent of sales for small entities are at least 10 percent higher than compliance costs as a percent of sales for large entities. All the firms expected to be adversely impacted by the rule are small entities and hence there is no differential impact.

Capital costs of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities. General information available as to the ability of small-business, fishing firms to finance items such as a switch to new gear indicate that this would be a problem for at least some of the firms. The evidence is that the banking community is becoming increasingly reluctant to finance changes of this type, especially if the firm has a history of cash flow problems. Vessels targeting gag are the ones that would be affected in this fashion, although the extent of such impacts cannot be estimated.

The requirements of the regulation are likely to result in a number of the small entities affected being forced to cease business operations. This number is not precisely defined by SBA but a "rule of thumb" to trigger this criterion would be two percent of the small entities affected. The area closure would have substantial adverse impacts on some vessel operations, but it cannot be ascertained as to whether some of these vessels would exit the fishery altogether. Low-volume vessels are particularly vulnerable to the potential reduction in revenues.

Mainly because of the potential revenue reductions from both the minimum size limit increase, seasonal closure, and area closures, some small businesses would likely be adversely impacted in a significant way. Hence, the determination is made that the proposed rule will have a significant economic impact on a substantial number of small business entities, and an Initial Regulatory Flexibility Analysis (IRFA) is required.

The full details of the economic analyses conducted for the proposed rule are contained in the RIR and some of the relevant results are summarized for the purposes of the IRFA.

Description of the reasons why action by the agency is being considered: The need and purpose of the actions are set forth in Section 3 of this document.

Statement of the objectives of, and legal basis for, the proposed rule: The specific objectives of this action and the general objectives of the Reef Fish FMP are enumerated in Sections 3 and 5 of this document. The Magnuson-Stevens Fishery Conservation and Management Act, as amended, provides the legal basis for the rule.

Description and estimate of the number of small entities to which the proposed rule will apply: The area closures would affect in varying proportions the 242 commercial vessels that harvested gag in Statistical Area 6 while the minimum size limit increase would affect some of the 754 commercial vessels that derive some or most of their revenues from gag. An unknown number of for-hire vessels would be affected by some measures in this amendment.

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 nature of the reporting, record keeping, and other compliance requirements of the proposed rule are not materially different from the current practice.

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.

Description of significant alternatives to the proposed rule and discussion of how the alternatives attempt to minimize economic impacts on small entities: For 4 of the 7 sets of measures considered in this amendment, the Council has chosen the status quo as the proposed alternatives in order to minimize the adverse economic impacts on small entities that would result from this amendment. Regarding the minimum size limit on gag, the proposed alternatives would have differential impacts on the commercial and recreational sectors. An immediate increase from 20 inches TL to 24 inches TL would effect a 5.8 percent reduction in commercial landings and a 6.97 percent (first year) and up to 29.11 percent (third year) reduction in recreational landings. The proposed alternatives of a gradual increase in the minimum size limit for the recreational sector could lessen the adverse impacts on this sector. A significant alternative that would have further cushioned the adverse economic effects of the minimum size limit increase is a 1-inch increase every two years. This alternative, however, would delay the protection accorded to the gag stock. The NMFS has determined that a 32 to 39 percent reduction in fishing mortality is needed to attain $F_{30\%SPR}$, and this would necessitate more drastic reductions in commercial and recreational harvests. Relative to this target, a 1-inch increase in the minimum size limit occurring every two years would eventually require larger reductions in catches in the near future. With the intent of achieving the necessary reduction in fishing mortality with relatively small or gradual adverse economic impacts, the proposed alternatives has been chosen over all other alternatives, including the status quo. The potential impacts of the proposed minimum size limit for black grouper cannot be estimated.

Inclusive of the status quo, four alternatives were considered for seasonal closure. Of the seasonal closure considered, the Proposed Alternative is deemed to have the least economic impacts on fishery participants.

It adversely affects only the commercial sector while the other closure alternatives would have also negatively affected the recreational sector. In addition, the Proposed Alternative lasts for only 1 month while the other closure alternatives would have lasted for 2 or 4 months.

Inclusive of the status quo, there are four other significant alternatives to the proposed area closures: (1) closure of a bigger area, (2) closure of other areas than those in (1), (3) closure of the same area as in (1) but only for harvest of gag, and (4) closure of the same area as in (1) but only from January through April or February through March. Among the alternatives considered in this section, the Proposed Alternative stands somewhere in the middle in terms of protecting spawning gag population (particularly the males) and in terms of economic impacts. Rejected Alternative 1 would offer the best protection to spawning gag populations and possibly for enforcement, but it would also entail the largest adverse economic impacts. The alternative to close other areas could not be effectively enforced as Rejected Alternative 1 but would still entail similar adverse economic impacts as those of Rejected Alternative 1. The same enforcement problem would arise if the proposed closed areas only prohibit the harvest of gag. In addition, such measure would tend to increase the incidental catch and resulting mortality of gag when fishing for other species is allowed. A 2-month or 4-month closure of the same area as that under Rejected Alternative 1 would be ineffective in protecting male gag which tend to stay offshore year-round. The potential harvest reduction, and thus the adverse economic impacts from this measure, would be smaller than that under a year-round closure. A 4-year sunset period of the Proposed Alternative would partly mitigate the adverse impacts of this alternative.

9.0 ENVIRONMENTAL ASSESSMENT

In addition to the following sections, please refer to the Environmental Consequences discussions under each of the management alternative sections.

9.1 Environmental Consequences

Physical Environment:

The proposed closed area closure is expected to have a beneficial impact on the physical environment by eliminating bottom gear such as bottom longlines from a region of critical spawning habitat for gag. Alternatives in the remaining sections in this amendment are anticipated to have no impact on the physical environment or essential fish habitat (EFH).

Human Environment:

Recreational harvesters will see a reduction in the rate of catch of legal sized gag as a result of the size limit increase. A 22-inch TL minimum size limit is estimated to reduce the number of recreationally harvested gag by about 34 percent initially (range 29 to 47 percent), based on the minimum size distribution of the recreational harvest during 1996 and 1997 (Table 2a). In the second year, when the size limit is increased to 23 inches TL, there could be an additional reduction of up to 12 percent (range 10 to 20 percent) in numbers, and in the third year, when the size limit is increased to 24 inches TL, an additional reduction in numbers of up to 11 percent (range 7 to 12 percent). It takes gag about a year to grow from 20 to 24 inches TL, so there should be a fairly rapid partial rebound of catch rates as the stock recovers and juvenile gag grow into the minimum size limit, thus, these numbers may overestimate the actual harvest reduction. However, larger gag tend to be found further offshore, so at least a portion of the recreational reduction in harvest rate will be permanent unless recreational gag fishers also move

further offshore to catch the larger fish. The commercial fishery will also have reduction in harvest, but the impact will be much less than for the recreational sector. The closed area will affect primarily the commercial fishery, and will displace some commercial fishers and may affect some charter and private vessels that either make multi-day trips to offshore areas or have powerful engines to make day trips offshore.

Fishery Resource: The alternatives in this amendment are expected to reduce fishing mortality on gag, and possibly on black and red grouper. Gag are not currently considered to be overfished, but such reductions are needed to maintain the stock above the overfished threshold. There may be some increase in fishing mortality on other species due to effort shifting, but alternatives in the section on area closures can protect all species in the affected area and provide a multi-species benefit. The overall reduction in gag fishing mortality from the proposed alternatives may be sufficient to keep the fishing mortality rate below the current overfishing threshold of $F_{20\% \text{ SPR}}$. It is expected that NMFS will approve a Council proposal in the Generic Sustainable Fisheries Act Amendment (GMFMC 1999) to increase the overfishing threshold to $F_{30\% \text{ SPR}}$ for most grouper species. Additional measures to reduce the overall fishing mortality to $F_{30\% \text{ SPR}}$ may occur as a result of additional management measures on the aggregate shallow-water and deep-water groupers that could be proposed following a review of a red grouper stock assessment scheduled later this year.

Effect on Endangered Species and Marine Mammals: The NOAA will conduct a consultation under Section 7 of the Endangered Species Act. A consultation was previously conducted regarding the impact of Amendment 1 which included the framework measures under which this action is being taken. A biological opinion resulting from that consultation found that neither the directed fisheries nor the proposed action jeopardize the recovery of endangered or threatened species or their critical habitat.

Effect on Wetlands: The proposed action will have no effect on flood plains, wetlands, or rivers.

Effect on Essential Fish Habitat (EFH): The Generic Amendment for Addressing EFH Requirements (GMFMC 1998c) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. Reef Fish Amendment 1 (GMFMC 1989) describes habitat damage by bottom longlines as similar to anchor damage (e.g. break hard and soft corals and scar reefs). Increases in minimum size, seasonal closures, and area closures are not anticipated to have a negative affect on the bottom. Seasonal and area closures may actually be beneficial to EFH because fishing activities will be limited during certain times or excluded within certain areas.

Mitigating Measures: No mitigating measures related to the proposed action are necessary because there are no harmful impacts to the environment.

Unavoidable Adverse Affects: The proposed action does not create unavoidable adverse affects.

Irreversible and irretrievable commitments of resources: There are no irreversible commitments of resources caused by implementation of this amendment.

9.2 Finding of No Significant Environmental Impact

The proposed amendment is not a major action having significant impact on the quality of the marine or

human environment of the Gulf of Mexico. The proposed action is an adjustment of the original regulations of the FMP under the framework procedure set forth in Amendment 1 and modified in Amendments 11 and 14 and the March 1997 Regulatory Amendment to rebuild overfished reef fish stocks. The proposed action should not result in impacts significantly different in context or intensity from those described in the environmental impact statement and environmental assessment published with the regulations implementing the FMP and Amendments 1 and 5, and should not have an adverse impact on essential fish habitat as described in the Generic Amendment for Addressing Essential Fish Habitat Requirements in the Fishery Management Plans of the Gulf of Mexico (GMFMC 1999).

Having reviewed the environmental assessment and available information relative to the proposed actions, I have determined that there will be no significant environmental impact resulting from the proposed actions. Accordingly, the preparation of a formal environmental impact statement on these issues is not required for this amendment by Section 102(2)(c) of the National Environmental Policy Act or its implementing regulations.

Approved: _____
Assistant Administrator for Fisheries

Date

10.0 OTHER APPLICABLE LAW

Habitat Concerns

Reef fish habitats and related concerns were described in the FMP and updated in Amendments 1 and 5 and in the Generic Amendment for Addressing Essential Fish Habitat Requirements in the Fishery Management Plans of the Gulf of Mexico. The actions in this regulatory amendment do not affect the habitat.

Vessel Safety Considerations

A determination of vessel safety with regard to compliance with 50 CFR 600.355(d) has been requested from the U.S. Coast Guard. Actions in this regulatory amendment are not expected to affect vessel safety.

Coastal Zone Consistency

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 requires that all federal activities which directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. The proposed changes in federal regulations governing red snapper in the EEZ of the Gulf of Mexico will make no changes in federal regulations that are inconsistent with either existing or proposed state regulations.

This regulatory amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi, and Texas to the maximum extent possible. This determination has been submitted to the responsible state agencies under Section 307 of the Coastal Zone Management Act administering approved Coastal Zone Management programs in the states of Alabama, Florida, Mississippi, Louisiana, and Texas.

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 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 does not propose, through this regulatory amendment, to establish any reporting requirements or burdens.

Federalism

No federalism issues have been identified relative to the actions proposed in this regulatory amendment. Therefore, preparation of a federalism assessment under Executive Order 12612 is not necessary.

11.0 REFERENCES

- Bell, F.W. 1997. Review of the economics of management strategies for red snapper in the Gulf of Mexico. Peer Review of Red Snapper Research and Management in the Gulf of Mexico. 34 p.
- Brown, S. 1999. Commercial reef fish harvest, by species and depth, from Statistical fishing area 6, 1993-98. FDEP-FMRI, 100 8th Avenue SE, St. Petersburg, Florida 33701-5095. 7 p.
- Bullock, L.H. and G. B. Smith. 1991. Seabasses (Pisces: Serranidae). Memoirs of the Hourglass Cruises. 8(2):1-243.
- Crabtree, R.E. and L.H. Bullock. 1998. Age, growth, and reproduction of black grouper, *Mycteroperca bonaci*, in Florida waters. Fishery Bulletin 96(4):735-753.
- GMFMC. 1989. Amendment Number 1 to the reef fish fishery management plan. Gulf of Mexico Fishery Management Council, Tampa, Florida. 356 p.
- GMFMC. 1991. Framework adjustment to the reef fish fishery management plan for the reef fish resources of the Gulf of Mexico, November 1991. 15 p.
- GMFMC. 1998a. August 1998 report of the reef fish stock assessment panel (revised). Gulf of Mexico Fishery Management Council, Tampa, Florida. 19 p.
- GMFMC. 1998b. Report of the second ad hoc finfish stock assessment panel. Gulf of Mexico Fishery Management Council, Tampa, Florida. 21 p.
- GMFMC. 1998c. Generic amendment for addressing essential fish habitat requirements in the following fishery management plans of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, Tampa, Florida. 238 p. + app.
- GMFMC. 1999. Generic Sustainable Fisheries Act amendment to the following FMPs: Gulf coral and coral reef resources, coastal migratory pelagics, red drum, reef fish, shrimp, spiny lobster, and stone crab. Gulf of Mexico Fishery Management Council, Tampa, Florida. 157 p. + app.
- Gilmore, R.G. and R.J. Jones. 1992. Color variation and associated behavior in the epinepheline groupers, *Mycteroperca microlepis* (Goode and Bean) and *M. phenax* Jordan and Swain. Bull. Mar. Sci. 51(1):83-103.
- Holiman, S.G. 1998. Summary data for the southeast recreational gag and vermilion snapper fisheries, 1982-97. National Marine Fisheries Service, Southeast Regional Office, Fisheries Economic Office, St. Petersburg, Florida. SERO-ECON-98-21. 133 p.
- Kenchington, T. J. 1999. Management of the Gulf of Mexico Gag Grouper fishery: a reconsideration. Gadus Associates, Musquodoboit Harbour, Nova Scotia. 46 p. A report prepared for the Southeastern Fisheries Association, Inc.

- Koenig, C.C., F.C. Coleman, L.A. Collins, Y. Sadovy, and P.L. Colin. 1996. Reproduction in gag (*Mycteroperca microlepis*) (Pisces: Serranidae) in the eastern Gulf of Mexico and the consequences of fishing spawning aggregations. P. 307-323. In F. Arreguín-Sánchez, J.L. Munroe, M.C. Balgos and D. Pauly (eds.). Biology, fisheries and culture of tropical groupers and snappers. ICLARM Conf. Proc. 48. 449 p.
- Ludwick, J.C. and W.R. Walton. 1957. Shelf edge calcareous prominences in the northeastern Gulf of Mexico. AAPG Bulletin 41:2054-2101.
- Mace, P.M. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. Can. J. Fish. Aquat. Scie. 51:110-122.
- McGovern, J.C., D.M. Wyanski, O.Pashuk, C.S. Manooch II, and G.R. Sedberry. 1998. Changes in the sex ratio and size at maturity of gag, *Mycteroperca microlepis*, from the Atlantic coast of the southeastern United States during 1976-1995. Fishery Bulletin 96(4):797-807.
- Moe, M.A. 1963. A survey of offshore fishing in Florida. Florida State Board of Conservation. No. 4.
- NMFS. 1995. Characterization of the reef fish fishery of the eastern U.S. Gulf of Mexico. National Marine Fisheries Service, Southeast Fisheries Science Center, Galveston and Miami Laboratories. 43 p.
- Schirripa, M.J. and C.P. Goodyear. 1994a. Status of the gag stocks of the Gulf of Mexico - assessment 1.0. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory Contribution No. MIA-93/94-61. 155 p.
- Schirripa, M.J. and C.P. Goodyear. 1994b. Addendum: status of the gag stocks of the Gulf of Mexico - assessment 1.0. National Marine Fisheries Service, Southeast Fisheries Science Center, Miami Laboratory Contribution No. MIA-93/94-61A. 5 p.
- Schirripa, M.J. and C.M. Legault. 1997. Status of the gag stocks of the Gulf of Mexico: assessment 2.0. National Marine Fisheries Service, Southeast Fisheries Science Center, Sustainable Fisheries Division, Miami, Florida. 114 p.
- Schirripa, M. J., C. M. Legault, and M. Ortiz. 1999. The red grouper fishery of the Gulf of Mexico: Assessment 3.0. National Marine Fisheries Service, Southeast Fisheries Science Center, Sustainable Fisheries Division, Miami, Florida. 121 p.
- Waters, J.R. 1998. Economic review of the commercial fisheries for vermilion snapper and gag in U.S. waters of the Gulf of Mexico. NMFS-SERO at Beaufort, 101 Pivers Island Road, Beaufort, NC 28516. 7 p. + tables.
- Waters, J.R. 1997. An overview of economic research on the commercial red snapper fishery in the Gulf of Mexico. Presentation to the Panel for the Review of the Economics of Management Strategies for Red Snapper in the Gulf of Mexico, New Orleans, LA, August 18, 1997.

Waters, J.R. 1996. An economic survey of commercial reef fish vessels in the U.S. Gulf of Mexico. NMFS-SERO at Beaufort, 101 Pivers Island Road, Beaufort , NC 28516. 637 p. + tables, figures, and appendices.

Wilson, R.R. and K.M. Burns. 1996. Potential survival of released groupers caught deeper than 40 m based on shipboard and in-situ observations, and tag-recapture data. Bulletin of Marine Science 58(1):234-247.

12.0 PUBLIC REVIEW

Regulatory Amendments are normally drafted after the Council has decided on proposed management measures under the framework procedure for setting TAC, with public testimony taken at the Council meeting where final action is scheduled. Public testimony on possible regulatory actions for gag under the framework procedure for setting TAC was taken at the following Council meetings prior to drafting of this regulatory amendment:

November 10-13, 1997 meeting in Longboat Key, Florida (but no persons spoke on this subject)
September 14-17, 1998 in Mobile, Alabama on Wednesday, September 16, 1998

A public hearing draft of this regulatory amendment was prepared following the September 14-17, 1998 Council meeting, and public hearings on the regulatory amendment were at the following locations. Hearings were held from 7:00 p.m. to 10:00 p.m. except those marked with an asterisk which were held from 3:00 p.m. to 5:00 p.m.

Monday, December 7, 1998

Pier House
One Duval Street
Key West, Florida 33040

Tuesday, December 8, 1998

Steinhatchee Elementary School City Hall Auditorium
1st Avenue South
Steinhatchee, Florida

Wednesday, December 9, 1998

3001 Municipal Drive
Madeira Beach, Florida

Thursday, December 10, 1998

Courtyard Marriott
4455 Metro Parkway
Fort Myers, Florida

***Monday, December 14, 1998**

National Marine Fisheries Service
Panama City Laboratory
3500 Delwood Beach Road
Panama City, Florida

***Tuesday, December 15, 1998**

Orange Beach Community Center
27235 Canal Road
Orange Beach, Alabama

***Thursday, December 17, 1998**

Larose Regional Park
2001 East 5th Street
Larose, LA 70373

A public workshop was held June 23, 1999 in Panama City, Florida to receive comments from the public and representatives of fishing and conservation organizations for alternatives to the original proposed measures.

In addition, public testimony was taken at the following Council meetings:

January 11-14, 1999 in Biloxi, Mississippi, on Wednesday, January 6, 1999
March 1-4, 1999 in Baton Rouge, Mississippi on Wednesday, March 3, 1999

July 12-15, 1999 in Key West, Florida on Wednesday, July 14, 1999

LIST OF AGENCIES CONSULTED

Gulf of Mexico Fishery Management Council's

- Reef Fish Stock Assessment Panel
- Socioeconomic Panel
- Standing and Special Reef Fish Scientific and Statistical Committee

National Marine Fisheries Service

- Southeast Regional Office
- Southeast Fisheries Science Center

RESPONSIBLE AGENCY

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- Steven Atran, Population Dynamics Statistician
- Tony Lamberte, Economist
- Wayne Swingle, Biologist
- Rick Leard, Biologist
- Peter Hood, Biologist

Table 1. Commercial and Recreational Gag Harvest, 1986-1996

	1,000 Pounds			Percent	
	Comm	Rec	Total	Comm	Rec
1986	1590	3897	5487	29%	71%
1987	1478	2701	4179	35%	65%
1988	1171	4276	5447	21%	79%
1989	1703	2870	4573	37%	63%
1990	1812	1528	3340	54%	46%
1991	1522	1836	3358	45%	55%
1992	1575	2023	3598	44%	56%
1993	1776	2259	4035	44%	56%
1994	1547	1740	3287	47%	53%
1995	1561	2348	3909	40%	60%
1996	1478	1809	3287	45%	55%
1997	1612	2742	4354	37%	63%
1998	1757	3800	5557	32%	68%
1986-87*	3068	6598		32%	68%
1986-89	5942	13744		30%	70%
1990-96	11271	13543		45%	55%
all years	20582	33829		38%	62%

* Historical allocation required under TAC framework procedure

Data source: Schirripa and Legault 1997

Table 2. Mean Size at Age and 50 percent Maturity Points for Black Grouper and Gag

	Black Grouper	Gag
50% Female Maturity	33 inches TL (5.2 years)	24 inches TL (3.6 years)
50% Male Maturity	48 inches TL (15.5 years)	43 inches TL (11.0 years)
Max. Observed Age	33 years	21 years
	Mean Size (inches TL)	
Age		
1	13	13
2	19	18
3	24	22
4	28	25
5	32	29
6	35	32
7	38	34
8	40	37
9	42	39
10	43	41
11	44	43
12	45	45
13	46	47
14	47	48
15	48	49
16	48	50
17	49	52
18	49	53
19	50	53
20	50	54
21	50	55
22	50	
23	50	
24	51	
25	51	
26	51	
27	51	
28	51	
29	51	
30	51	
31	51	
32	51	
33	51	

Sources: For black grouper, all data is from Crabtree and Bullock (1998). For gag, mean size at age is from Schirripa and Goodyear (1994a), female 50 percent maturity is from Schirripa and Goodyear (1994b), and male 50 percent maturity is from Schirripa and Legault (1997).

Note: The size at transition from female to male may be affected by factors other than size, and can change over time. The sizes for 50 percent male maturity given in Table 2 are based on the most current information available for black grouper and gag.

Table 2a. GULF OF MEXICO RECREATIONAL GAG SIZE FREQUENCIES (TOTAL LENGTH) OF LANDED FISH, MRFS DATA.

	1996			1997			ALL		
LENGTH (INCHES)	N	%	CUMM.	N	%	CUMM.	N	%	CUMM.
Less than 10	1	0.45%	0.45%		0.00%	0.00%	1	0.12%	0.12%
>10 but less than 11	1	0.45%	0.91%		0.00%	0.00%	1	0.12%	0.25%
>11 but less than 12		0.00%	0.91%	3	0.52%	0.52%	3	0.37%	0.62%
>14 but less than 15		0.00%	0.91%	1	0.17%	0.69%	1	0.12%	0.75%
>16 but less than 17	1	0.45%	1.36%		0.00%	0.69%	1	0.12%	0.87%
>17 but less than 18	1	0.45%	1.82%		0.00%	0.69%	1	0.12%	1.00%
>18 but less than 19	3	1.36%	3.18%	2	0.34%	1.03%	5	0.62%	1.62%
>19 but less than 20	14	6.36%	9.55%	13	2.23%	3.26%	27	3.37%	4.99%
>20 but less than 21	41	18.64%	28.18%	58	9.97%	13.23%	99	12.34%	17.33%
>21 but less than 22	41	18.64%	46.82%	92	15.81%	29.04%	133	16.58%	33.92%
>22 but less than 23	45	20.45%	67.27%	58	9.97%	39.00%	103	12.84%	46.76%
>23 but less than 24	16	7.27%	74.55%	70	12.03%	51.03%	86	10.72%	57.48%
>24 but less than 25	16	7.27%	81.82%	55	9.45%	60.48%	71	8.85%	66.33%
>25 but less than 26	9	4.09%	85.91%	53	9.11%	69.59%	62	7.73%	74.06%
>26 but less than 27	10	4.55%	90.45%	54	9.28%	78.87%	64	7.98%	82.04%
>27 but less than 28	6	2.73%	93.18%	38	6.53%	85.40%	44	5.49%	87.53%
>28 but less than 29	7	3.18%	96.36%	33	5.67%	91.07%	40	4.99%	92.52%
>29 but less than 30		0.00%	96.36%	21	3.61%	94.67%	21	2.62%	95.14%
>30 but less than 31	2	0.91%	97.27%	9	1.55%	96.22%	11	1.37%	96.51%
>31 but less than 32	2	0.91%	98.18%	5	0.86%	97.08%	7	0.87%	97.38%
>32 but less than 33	2	0.91%	99.09%	2	0.34%	97.42%	4	0.50%	97.88%
>33 but less than 34	1	0.45%	99.55%	2	0.34%	97.77%	3	0.37%	98.25%
>34 but less than 35		0.00%	99.55%	5	0.86%	98.63%	5	0.62%	98.88%
>36 but less than 37		0.00%	99.55%	1	0.17%	98.80%	1	0.12%	99.00%
>38 but less than 39	1	0.45%	100.00%		0.00%	98.80%	1	0.12%	99.13%
>40 but less than 41		0.00%	100.00%	1	0.17%	98.97%	1	0.12%	99.25%
>45 but less than 46		0.00%	100.00%	1	0.17%	99.14%	1	0.12%	99.38%
>47 but less than 48		0.00%	100.00%	1	0.17%	99.31%	1	0.12%	99.50%
>48 but less than 49		0.00%	100.00%	1	0.17%	99.48%	1	0.12%	99.63%
>49 but less than 50		0.00%	100.00%	1	0.17%	99.66%	1	0.12%	99.75%
>51 but less than 52		0.00%	100.00%	1	0.17%	99.83%	1	0.12%	99.88%
>57 but less than 58		0.00%	100.00%	1	0.17%	100.00%	1	0.12%	100.00%
ALL	220	100.00%	100.00%	582	100.00%	100.00%	802	100.00%	100.00%

Table 2b. GULF OF MEXICO GAG RECREATIONAL LAND FREQUENCIES (AS A PERCENTAGE OF INTERCEPTS THAT CATCH GAG), MRFSS DATA.

#	1995			1996			1997			ALL		
FISH	N	%	CUMM	N	%	CUMM.	N	%	CUMM.	N	%	CUMM.
0	418	66.77%	66.77%	469	68.17%	68.17%	487	58.46%	58.46%	1374	64.00%	64.00%
0.5	30	4.79%	71.57%	42	6.10%	74.27%	83	9.96%	68.43%	155	7.22%	71.22%
1	111	17.73%	89.30%	115	16.72%	90.99%	171	20.53%	88.96%	397	18.49%	89.71%
2	33	5.27%	94.57%	24	3.49%	94.48%	52	6.24%	95.20%	109	5.08%	94.78%
3	13	2.08%	96.65%	23	3.34%	97.82%	15	1.80%	97.00%	51	2.38%	97.16%
4	9	1.44%	98.08%	4	0.58%	98.40%	6	0.72%	97.72%	19	0.89%	98.04%
5	10	1.60%	99.68%	7	1.02%	99.42%	15	1.80%	99.52%	32	1.49%	99.53%
6	1	0.16%	99.84%		0.00%	99.42%	1	0.12%	99.64%	2	0.09%	99.63%
7		0.00%	99.84%	1	0.15%	99.56%	2	0.24%	99.88%	3	0.14%	99.77%
8		0.00%	99.84%	1	0.15%	99.71%		0.00%	99.88%	1	0.05%	99.81%
9		0.00%	99.84%	2	0.29%	100.00%	1	0.12%	100.00%	3	0.14%	99.95%
10		0.00%	99.84%		0.00%	100.00%		0.00%	100.00%	0	0.00%	99.95%
11		0.00%	99.84%		0.00%	100.00%		0.00%	100.00%	0	0.00%	99.95%
12	1	0.16%	100.00 %		0.00%	100.00%		0.00%	100.00%	1	0.05%	100.00%

Table 3 (Table 63 from Schirripa and Goodyear 1994a). Gag catch, catch per trip and catch per day reported by fishers participating in the Gulf of Mexico Reef Fish Logbook Program who landed in any Gulf state ports. The columns labeled 'any in catch' include all trips in which gag were landed. The columns labeled '>25% of catch, >50% of catch, and >75% of catch' include only trips where gag exceeded the indicated percentage of the catch by weight.

ALL STATES COMBINED 1990												
Mon	Any in catch			>25% of catch			>50% of catch			>75% of catch		
	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch
1	5	1	5	0	0	0	0	0	0	0	0	0
2	214	71	214	214	71	214	0	0	0	0	0	0
3	43	43	129	43	43	129	43	43	129	43	43	129
4	372	54	10042	462	91	7396	494	118	4942	728	218	2184
5	478	75	37787	707	126	33220	756	137	26445	696	201	9054
6	328	50	23304	590	102	18281	547	154	4926	48	48	145
7	281	34	18239	506	70	11131	378	79	4163	75	50	150
8	241	33	19302	525	81	11553	379	103	2272	0	0	0
9	390	50	23008	823	103	18933	1034	172	10337	598	217	2390
10	257	35	12079	441	81	8378	543	116	4888	85	85	170
11	204	41	6721	244	68	5126	184	88	1844	122	95	852
12	145	40	1304	110	96	767	101	101	608	101	101	608
SUM	320	46	152133	543	96	115128	556	128	60552	365	170	15681

ALL STATES COMBINED 1991												
Mon	Any in catch			>25% of catch			>50% of catch			>75% of catch		
	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch
1	295	55	23315	374	81	16834	382	144	8788	156	95	1715
2	284	49	20136	408	84	16721	292	110	7016	218	115	1958
3	438	63	29378	802	116	23264	1025	159	14349	802	165	5612
4	249	42	22439	501	91	17033	479	146	10049	260	213	2339
5	214	34	20961	443	93	15493	897	133	9865	730	154	2918
6	222	31	19524	510	65	13267	595	56	3567	21	21	42
7	181	22	13010	447	56	6703	221	74	883	13	7	13
8	154	22	8957	455	80	5009	534	107	3202	19	19	19
9	230	30	10793	1014	121	8114	967	116	2900	272	34	272
10	173	21	7112	431	86	4307	465	116	1861	57	38	113
11	180	28	7939	287	57	5445	162	68	812	109	109	438
12	229	37	12808	342	78	10594	380	104	6833	117	59	1053
SUM	242	36	196373	470	84	142782	504	120	70124	275	120	16492

ALL STATES COMBINED 1992												
Mon	Any in catch			>25% of catch			>50% of catch			>75% of catch		
	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch
1	222	40	15330	327	69	11121	378	103	7185	458	203	3662
2	379	60	26514	835	141	21699	990	165	17826	752	177	6018
3	220	36	13874	293	75	9365	332	93	6306	272	117	2448
4	193	41	17146	268	75	12585	316	111	7894	309	143	3711
5	211	44	22368	321	89	17984	302	92	9070	173	98	2248
6	176	35	15490	337	84	8767	261	87	1304	78	52	156
7	132	26	14219	299	70	8365	309	98	2161	246	99	986
8	127	25	13004	360	127	6117	660	192	4618	2056	514	2056
9	142	29	14440	324	86	10038	551	154	6613	937	165	2811
10	139	28	9746	220	57	5729	231	110	2310	175	131	1047
11	168	29	9571	259	74	6480	290	135	3775	312	250	2496
12	212	44	17817	281	77	12377	331	122	7936	288	136	2592
SUM	188	36	189519	333	84	130627	407	121	76999	364	157	30231

ALL STATES COMBINED 1993												
Mon	Any in catch			>25% of catch			>50% of catch			>75% of catch		
	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch	/Trip	/Day	Catch
1	216	39	27871	322	77	18365	361	115	10836	468	136	4208
2	221	39	28257	401	85	19654	437	95	10479	250	125	1752
3	247	55	48069	573	140	35552	547	159	16969	378	119	4535
4	256	58	80824	414	118	55105	357	138	27810	310	186	13964
5	198	47	75002	331	109	45732	247	124	21976	229	135	11915
6	208	42	64152	319	96	34734	281	135	16314	246	167	4673
7	185	33	56501	267	69	29684	284	96	13085	223	103	3796
8	161	29	41657	286	62	20606	306	100	8275	157	108	1727
9	195	33	52882	403	95	27784	567	160	16440	1153	299	8072
10	165	31	35707	281	90	21072	298	117	11902	116	87	2093
11	231	51	32971	334	127	22719	303	135	14860	317	171	8565
12	299	61	24243	486	117	17007	477	132	8591	370	176	3697
SUM	208	41	568137	356	97	348014	342	126	177538	295	154	68996

Table 4. Number and Cumulative Percent of Commercial Gag Trips by Poundage, 1993-1997

Pounds	1993		1994		1995		1996		1997	
	No. Trips	Cum. %	No. Trips	Cum. %	No. Trips	Cum. %	No. Trips	Cum. %	No. Trips	Cum. %
1-100	1627	52%	2104	56%	1873	53%	1999	54%	1733	53%
1-200	523	69%	645	73%	613	71%	654	72%	548	70%
1-300	303	79%	335	81%	299	79%	325	81%	315	80%
1-400	185	84%	217	87%	179	85%	178	86%	186	85%
1-500	129	89%	133	91%	129	88%	131	90%	135	89%
1-600	87	91%	85	93%	104	91%	95	92%	86	92%
1-700	66	94%	59	94%	69	93%	62	94%	56	94%
1-800	54	95%	51	96%	51	95%	51	95%	45	95%
1-900	41	97%	32	97%	35	96%	44	96%	39	96%
1-1000	21	97%	24	97%	22	96%	30	97%	31	97%
1-1100	21	98%	14	98%	18	97%	24	98%	17	98%
1-1200	15	98%	18	98%	18	97%	6	98%	10	98%
1-1300	5	99%	18	99%	8	98%	23	99%	5	98%
1-1400	12	99%	8	99%	12	98%	6	99%	6	99%
1-1500	9	99%	6	99%	12	98%	8	99%	12	99%
1-1600	2	99%	9	99%	6	98%	5	99%	15	99%
1-1700	3	99%	5	99%	9	99%	7	99%	7	100%
1-1800	5	100%	6	100%	6	99%	3	100%	0	100%
1-1900	0	100%	1	100%	6	99%	6	100%	2	100%
1-2000	3	100%	2	100%	3	99%	0	100%	2	100%
2001+	11	100%	15	100%	33	100%	11	100%	10	100%
TOTAL	3122		3787		3505		3668	19.48	3260	

Source: NMFS reef fish logbook data

Table 5. Mean and Maximum Catch-per-Trip for Gag and Black Grouper Combined

Year	Handlines		Bottom Longlines		Fish Traps	
	Mean	Max	Mean	Max	Mean	Max
90	228	2,785	559	6,000	79	968
91	206	7,701	378	4,169	112	1,302
92	212	3,985	342	6,136	108	1,568
93	259	5,745	342	8,002	90	3,208
94	232	5,835	274	5,500	77	1,404
95	261	6,289	307	4,859	82	2,378
96	244	3,975	317	3,505	87	2,652

Source: Schirripa and Legault 1997.

TABLE 5a.
NUMBER OF BOATS THAT LANDED GAG AS THE MAIN SPECIES
Gulf logbook data as of June 4, 1998

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1993	41	32	41	78	66	63	60	35	46	54	67	66	230
1994	73	81	99	85	102	75	55	57	50	56	57	74	257
1995	76	72	85	82	84	62	44	44	47	71	100	85	255
1996	58	66	47	80	83	84	53	49	56	69	79	96	252
1997	85	93	88	70	115	83	56	56	65	63	94	89	281

MONTHLY PERCENTAGES OF BOATS THAT LANDED GAG AS THE MAIN SPECIES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1993	17.8	13.9	17.8	33.9	28.7	27.4	26.1	15.2	20.0	23.5	29.1	28.7
1994	28.4	31.5	38.5	33.1	39.7	29.2	21.4	22.2	19.5	21.8	22.2	28.8
1995	29.8	28.2	33.3	32.2	32.9	24.3	17.3	17.3	18.4	27.8	39.2	33.3
1996	23.0	26.2	18.7	31.7	32.9	33.3	21.0	19.4	22.2	27.4	31.3	38.1
1997	30.2	33.1	31.3	24.9	40.9	29.5	19.9	19.9	23.1	22.4	33.5	31.7

NUMBER OF TRIPS WITH GAG AS THE MAIN SPECIES
Gulf logbook data as of June 4, 1998

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1993	62	45	60	123	133	101	86	51	61	85	118	111	1,036
1994	112	122	179	142	173	113	79	75	81	101	110	136	1,423
1995	116	103	141	142	130	101	62	55	65	101	177	117	1,310
1996	82	96	58	156	131	122	87	80	72	103	125	168	1,280
1997	130	123	144	93	205	135	94	92	97	107	177	144	1,541

MONTHLY PERCENTAGES OF TRIPS WITH GAG AS THE MAIN SPECIES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1993	6.0	4.3	5.8	11.9	12.8	9.7	8.3	4.9	5.9	8.2	11.4	10.7	100.0
1994	7.9	8.6	12.6	10.0	12.2	7.9	5.6	5.3	5.7	7.1	7.7	9.6	100.0
1995	8.9	7.9	10.8	10.8	9.9	7.7	4.7	4.2	5.0	7.7	13.5	8.9	100.0
1996	6.4	7.5	4.5	12.2	10.2	9.5	6.8	6.3	5.6	8.0	9.8	13.1	100.0
1997	8.4	8.0	9.3	6.0	13.3	8.8	6.1	6.0	6.3	6.9	11.5	9.3	100.0

TABLE 5b.
NUMBER OF BOATS THAT LANDED GAG BUT NOT AS THE MAIN SPECIES
 Gulf logbook data as of June 4, 1998

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1993	74	91	128	156	192	148	153	153	153	127	105	115	470
1994	83	162	185	176	149	166	174	175	166	134	126	161	502
1995	115	135	159	171	189	154	153	146	145	94	123	133	479
1996	116	183	167	149	169	180	143	159	183	108	132	124	463
1997	126	179	190	117	156	164	173	151	175	140	115	105	473

MONTHLY PERCENTAGES OF BOATS THAT LANDED GAG BUT NOT AS THE MAIN SPECIES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1993	15.7	19.4	27.2	33.2	40.9	31.5	32.6	32.6	32.6	27.0	22.3	24.5
1994	16.5	32.3	36.9	35.1	29.7	33.1	34.7	34.9	33.1	26.7	25.1	32.1
1995	24.0	28.2	33.2	35.7	39.5	32.2	31.9	30.5	30.3	19.6	25.7	27.8
1996	25.1	39.5	36.1	32.2	36.5	38.9	30.9	34.3	39.5	23.3	28.5	26.8
1997	26.6	37.8	40.2	24.7	33.0	34.7	36.6	31.9	37.0	29.6	24.3	22.2

NUMBER OF TRIPS WITH GAG BUT NOT AS THE MAIN SPECIES
 Gulf logbook data as of June 4, 1998

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1993	94	107	190	267	315	226	240	238	245	179	143	152	2,396
1994	96	248	298	284	199	236	256	251	237	172	163	201	2,641
1995	160	167	245	248	286	233	235	186	229	110	164	173	2,436
1996	146	371	261	204	253	262	221	246	288	140	171	158	2,721
1997	168	286	337	158	240	242	262	207	261	189	162	137	2,649

MONTHLY PERCENTAGES OF TRIPS WITH GAG BUT NOT AS THE MAIN SPECIES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1993	3.9	4.5	7.9	11.1	13.1	9.4	10.0	9.9	10.2	7.5	6.0	6.3	100.0
1994	3.6	9.4	11.3	10.8	7.5	8.9	9.7	9.5	9.0	6.5	6.2	7.6	100.0
1995	6.6	6.9	10.1	10.2	11.7	9.6	9.6	7.6	9.4	4.5	6.7	7.1	100.0
1996	5.4	13.6	9.6	7.5	9.3	9.6	8.1	9.0	10.6	5.1	6.3	5.8	100.0
1997	6.3	10.8	12.7	6.0	9.1	9.1	9.9	7.8	9.9	7.1	6.1	5.2	100.0

TABLE 5c.
DISTRIBUTION OF POUNDS (WHOLE WGT) PER TRIP OF GAG AS THE MAIN SPECIES
Gulf logbook data as of June 4, 1998

POUNDS PER TRIP	1993		1994		1995		1996		1997	
	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT
0 - 200	481	46.4	755	53.1	654	49.9	694	54.2	864	56.1
201- 400	233	22.5	270	19.0	269	20.5	249	19.5	282	18.3
401- 600	123	11.9	152	10.7	128	9.8	106	8.3	159	10.3
601- 800	67	6.5	79	5.6	84	6.4	72	5.6	83	5.4
801-1000	50	4.8	51	3.6	59	4.5	52	4.1	51	3.3
1001-1200	25	2.4	31	2.2	20	1.5	37	2.9	35	2.3
1201-1400	20	1.9	20	1.4	22	1.7	21	1.6	20	1.3
1401-1600	14	1.4	22	1.5	14	1.1	18	1.4	8	0.5
1601-1800	8	0.8	12	0.8	12	0.9	7	0.5	12	0.8
1801-2000	2	0.2	9	0.6	6	0.5	8	0.6	17	1.1
2001-2200	4	0.4	5	0.4	9	0.7	7	0.5	2	0.1
2201-2400	2	0.2	3	0.2	6	0.5	2	0.2	2	0.1
2401-2600	.	.	5	0.4	4	0.3	2	0.2	3	0.2
2601-2800	3	0.3	2	0.1	4	0.3	2	0.2	1	0.1
2801-3000	1	0.1	.	.	3	0.2	1	0.1	.	.
3001-3200	.	.	2	0.1	1	0.1	.	.	.	.
3201-3400	.	.	1	0.1	2	0.2	.	.	.	.
3401-3600	1	0.1	.	.	4	0.3	.	.	.	.
3601-3800	.	.	.	.	.	.	1	0.1	.	.
3801-4000	.	.	.	.	2	0.2	1	0.1	1	0.1
4001-4200	1	0.1	.	.	1	0.1	.	.	.	.
4201-4400	.	.	1	0.1	.	.	.	.	.	.
4401-4600	.	.	.	.	2	0.2	.	.	.	.
4801-5000	.	.	.	.	1	0.1	.	.	1	0.1
5001-5200	.	.	.	.	1	0.1	.	.	.	.
5201-5400	.	.	.	.	1	0.1	.	.	.	.
5401-5600	.	.	1	0.1	.	.	.	.	.	.
5601-5800	.	.	.	.	1	0.1	.	.	.	.
5801-6000	.	.	1	0.1	.	.	.	.	.	.
6001-7000	1	0.1	.	.	.	.	.	.	.	.
7001-8000	.	.	1	0.1	.	.	.	.	.	.
TOTAL TRIPS	1,036	100.0	1,423	100.0	1,310	100.0	1,280	100.0	1,541	100.0

TABLE 5d.
DISTRIBUTION OF POUNDS (WHOLE WGT) PER TRIP OF GAG BUT NOT AS THE MAIN SPECIES
Gulf logbook data as of June 4, 1998

POUNDS PER TRIP	1993		1994		1995		1996		1997	
	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT	TRIPS	PERCENT
0 - 200	1,845	77.0	2,106	79.7	1,928	79.1	2,138	78.6	2,000	75.5
201- 400	269	11.2	312	11.8	245	10.1	306	11.2	342	12.9
401- 600	127	5.3	123	4.7	108	4.4	138	5.1	143	5.4
601- 800	72	3.0	52	2.0	71	2.9	62	2.3	65	2.5
801-1000	36	1.5	26	1.0	38	1.6	33	1.2	46	1.7
1001-1200	21	0.9	6	0.2	13	0.5	16	0.6	25	0.9
1201-1400	10	0.4	7	0.3	10	0.4	8	0.3	6	0.2
1401-1600	5	0.2	2	0.1	5	0.2	7	0.3	2	0.1
1601-1800	4	0.2	3	0.1	6	0.2	6	0.2	7	0.3
1801-2000	1	0.0	2	0.1	6	0.2	3	0.1	7	0.3
2001-2200	1	0.0	1	0.0	1	0.0	1	0.0	.	.
2201-2400	2	0.1	.	.	1	0.0	.	.	3	0.1
2401-2600	.	.	.	.	2	0.1	1	0.0	.	.
2601-2800	.	.	.	.	.	.	1	0.0	.	.
2801-3000	.	.	.	.	1	0.0	.	.	1	0.0
3001-3200	.	.	.	.	.	.	.	.	2	0.1
3201-3400	.	.	.	.	1	0.0	.	.	.	.
3401-3600	1	0.0	1	0.0	.	.	1	0.0	.	.
4201-4400	1	0.0	.	.	.	.	.	.	.	.
8001-9000	1	0.0	.	.	.	.	.	.	.	.
TOTAL TRIPS	2,396	100.0	2,641	100.0	2,436	100.0	2,721	100.0	2,649	100.0

Table 6A. Estimated commercial landings of gag from U.S. waters of the Gulf of Mexico, gutted weight by month and year, 1986-1996 (Source: Schirripa and Legault 1997).

MONTH	86	87	88	89	90	91	92	93	94	95	96
1	190279	123530	81715	173929	244034	129448	122024	143460	173145	119354	156613
2	146365	188664	106005	152167	135627	155317	144808	122062	174731	113991	164582
3	108742	137203	117241	177194	235884	202600	158381	202531	197732	141912	82866
4	180420	142808	109485	142612	195803	202170	156977	206818	162082	115217	128355
5	145123	135129	117858	158374	228485	163746	181796	205545	161779	116630	133698
6	164488	106262	103710	136146	178646	165798	148384	155310	122450	126423	113087
7	145052	114751	66790	113977	121062	110026	114932	133899	107867	105453	86307
8	92200	114670	64842	110167	127426	69701	66028	111017	121508	83428	74836
9	115765	94149	62678	97146	132610	79098	129383	113555	80841	78399	80199
10	80467	75942	78291	83472	110227	70467	130792	95363	85516	118859	121721
11	97935	88468	66391	147928	62260	75453	84874	157789	72855	257802	166053
12	118933	121409	121232	135592	9225	111671	171191	171074	122211	217297	206845

Table 6B. Estimated commercial landings of gag from U.S. waters of the Gulf of Mexico in percentages, gutted weight by month and year, 1986-1996 (Source: Schirripa and Legault 1997).

MONTH	86	87	88	89	90	91	92	93	94	95	96	AVG
1	0.120	0.086	0.075	0.107	0.137	0.084	0.076	0.079	0.109	0.075	0.103	0.096
2	0.092	0.131	0.097	0.093	0.076	0.101	0.090	0.067	0.110	0.071	0.109	0.094
3	0.069	0.095	0.107	0.109	0.132	0.132	0.098	0.111	0.125	0.089	0.055	0.102
4	0.114	0.099	0.100	0.088	0.110	0.132	0.098	0.114	0.102	0.072	0.085	0.101
5	0.092	0.094	0.108	0.097	0.128	0.107	0.113	0.113	0.102	0.073	0.088	0.101
6	0.104	0.074	0.095	0.084	0.100	0.108	0.092	0.085	0.077	0.079	0.075	0.088
7	0.091	0.080	0.061	0.070	0.068	0.072	0.071	0.074	0.068	0.066	0.057	0.071
8	0.058	0.079	0.059	0.068	0.072	0.045	0.041	0.061	0.077	0.052	0.049	0.060
9	0.073	0.065	0.057	0.060	0.074	0.052	0.080	0.062	0.051	0.049	0.053	0.062
10	0.051	0.053	0.071	0.051	0.062	0.046	0.081	0.052	0.054	0.075	0.080	0.061
11	0.062	0.061	0.061	0.091	0.035	0.049	0.053	0.087	0.046	0.162	0.110	0.074
12	0.075	0.084	0.111	0.083	0.005	0.073	0.106	0.094	0.077	0.136	0.137	0.089
TOTAL	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 7. MRFSS Estimates of Recreational Landings of Gag From the Gulf of Mexico by Wave
(Source: Holiman 1998)

Year	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6	
	Jan-Feb		Mar-Apr		May-Jun		Jul-Aug		Sep-Oct		Nov-Dec	
	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
1982	9,647	5,310	63,313	344,978	53,683	493,290	29,924	125,143	7,159	14,518	114,191	324,895
1983	11,012	11,831	47,657	331,266	86,801	342,463	61,248	242,697	18,159	120,585	41,796	434,399
1984	10,411	56,805	4,459	58,001	33,510	150,364	44,324	229,760	28,306	173,392	258,140	2,013,911
1985	19,604	122,453	12,486	84,960	15,615	93,394	74,540	348,705	91,512	856,403	21,801	161,187
1986	24,153	146,657	12,692	62,070	16,737	75,536	24,802	122,242	54,423	198,504	10,111	22,216
1987	10,038	31,766	41,150	203,864	42,524	248,246	20,091	152,445	39,321	265,867	20,311	75,501
1988	15,579	191,140	11,961	29,357	51,268	238,762	26,366	299,526	14,064	86,391	60,038	564,874
1989	46,834	389,717	26,132	145,282	23,017	146,429	4,937	26,120	23,641	142,851	18,372	109,878
1990	7,482	11,546	2,914	17,887	22,666	228,549	11,063	77,063	23,253	190,482	103,735	906,416
1991	55,407	460,948	32,508	273,867	26,774	202,406	49,254	507,344	46,761	278,909	53,260	390,581
1992	7,706	80,103	35,325	219,419	48,393	326,550	28,657	126,533	76,931	512,724	62,829	463,678
1993	56,582	392,159	55,193	330,471	85,945	514,289	33,359	203,593	48,386	311,951	76,433	529,923
1994	7,994	72,863	50,958	340,851	54,054	309,505	88,760	651,282	7,282	47,252	71,235	524,926
1995	65,124	449,259	97,360	685,530	73,048	499,527	48,768	269,382	43,603	267,140	71,788	456,842
1996	14,977	60,203	42,363	256,151	83,568	469,993	81,040	450,622	73,810	406,668	47,482	320,317
1997	65,798	500,545	37,613	231,546	81,074	463,585	61,347	323,621	43,134	310,814	117,586	825,866
Total	428,348	2,983,305	574,084	3,615,500	798,677	4,802,888	688,480	4,156,078	639,745	4,184,451	1,149,108	8,125,410
% No.	10%		13%		19%		16%		15%		27%	
% Wt.		11%		13%		17%		15%		15%		29%

MRFSS = Marine Recreational Fishery Statistics Survey

APPENDIX 1 - Reef Fish Habitat Sites Off of Gulf Coast of Florida

The following are descriptions of habitat sites identified by Dr. Chris Koenig and Chris Gledhill on Figure 9. Most of these sites are far offshore. Site locations are identified both by latitude/longitude boundaries and by USGS lease blocks and the discussion is that of Chris Gledhill and Chris Koenig. The size of each area in square nautical miles was calculated by Kathy Scanlon, U.S. Geological Survey.

1. 29 Edge/27 Edge, North and West rim of the DeSoto Canyon (several sites within the same area - total area = 367 sq. naut. mi.)

Area A (62 sq. naut. mi), USGS lease blocks 853-857, 897-901;

boundaries: N= 30° 09'N, S= 30° 04'N, E=86° 43'W, W=86° 58'W;

Area B (75 sq. naut. mi), USGS lease blocks 939-942; 983-986, 15-18;

boundaries: N=30° 04'N, S=29° 57'N, E=86° 53'W, W=87° 05'W;

Area C (86 sq. naut. mi), USGS lease blocks 57, 58, 101, 102, 145, 146;

boundaries: N=29° 57'N, S=29° 48'N, E=87° 05'W, W=87° 16'W;

Area D (144 sq. naut. mi), USGS lease blocks 185-188, 229-232, 273-276, 317-320, 361-364.

boundaries: N=29° 48'N, S=29° 33'N, E=87° 11'W, W=87° 22'W.

Discussion: This area includes a site that has been slated for oil and gas development (proposed Chevron Development unit 56). It is a high relief area which has been significant in reef fish fishery production but due to proximity from shore has historically received high fishing pressure (Moe 1963). The area is large, but the most significant habitat occurs between 50 and 150 meters. A ridge extends about 8 km (5 miles) thru the Chevron site in lease blocks 99, 56, and 57. We broke the area into four discrete blocks, each covered by smaller (5x5 km) lease blocks.

The following sites (on charts) are arranged from north to south along the West Florida Shelf:

2. "Woodward-Clyde" Pinnacles (42 sq. naut. mi)

Destin Dome USGS lease blocks 473, 474, 516, 517, 518, 562.

boundaries: NW= 29° 33'N, 86° 11'W NE= 29° 33'N, 86° 05' W
SW= 29° 25'N, 86° 11'W SE= 29° 25'N, 86° 05'W

Discussion: These are high relief (up to 11 m) pinnacles on the 90 m contour reported in the Eastern Gulf of Mexico Marine Habitat Study (vol. 1, 1979) by Woodward-Clyde consultants.

3. "3-to-5s" area (76 sq. naut. mi)

Destin Dome USGS lease blocks 434, 478, 522, 566, Apalachicola USGS lease blocks 397, 398, 441, 442, 485, 486, 529, 530.

boundaries: NW= 29° 35'N, 85° 56'W NE= 29° 35'N, 85° 47'W
 SW= 29° 25'N, 85° 56'W SE= 29° 25'N, 85° 47'W

Discussion: This is a rugged area along the 20 fathom contour just off Panama City. This was listed in Martin Moe's 1963 survey of offshore fishing in Florida and has similar features to the Middle Grounds. The bottom is mostly sand with irregular reef relief of 3 to 4 fathoms.

**4. Area North of Johnny Walker site (denoted as Mud Banks by Moe 1963) (28 sq. naut. mi)
Apalachicola USGS lease blocks 654, 617, 618, 619.**

boundaries: NW= 29° 22'N, 85° 56'W NE = 29° 22'N, 85° 45'W
 SW = 29° 19'N, 85° 45'W SE = 29° 19'N, 85° 5'W

Discussion: This area is a 7-8 mile rock ledge with a steep seaward slope just north of the Johnny Walker, Madison and Swanson sites. The depth is about 30 fathoms.

**5. Madison and Swanson sites (denoted as Whoopie Grounds by Moe 1963) (115 sq. naut. mi).
Apalachicola USGS lease blocks 706, 707, 708, 709, 750, 751, 752, 753, 794, 795, 796, 797, 838, 839, 840, 841.**

boundaries: NW= 29° 17'N, 85° 50'W NE= 29° 17'N, 85° 38' W
 SW= 29° 06'N, 85° 50'W SE= 29° 06'N, 85° 38'W

Discussion: This area is denoted in Moe's (1963) fishing survey as having rock ledges with relief up to 5 fathoms (9 m). There is also plenty of recent anecdotal fishing information from port samplers (Debbie Fable, pers. Comm.). This site also shows confirmed outcrops of limestone and reef fish habitat from the reef fish survey (Chris Gledhill, Pascagoula NMFS lab, pers. comm.). Also, (2) transects through this area by Ludwick and Walton (1957) showed pinnacle trends. Some of these formations have names- Madison and Swanson's Rocks.

6. Twin Ridges site (5 sq. naut. mi).

USGS lease block 979 bordering Apalachicola and Florida Middle Ground bathymetric maps.

boundaries: NW= 29° 00'N, 85° 24'W NE= 29° 00'N, 85° 21'W
 SW= 28° 58'N, 85° 24'W SE= 28° 58'N, 85° 21'W

Discussion: This is the rugged double ridge line that was mapped with side-scan sonar during the spring 1997 cruise (NMFS Panama City, Pascagoula/USGS Woods Hole) showing notable reef fish habitat features at 70-80 meters (233-262 feet) depths. This site covers about one lease block and is embedded in a larger area marked by Moe (1963). This area was originally picked for survey by NMFS because it enclosed a concentrated area of gag/copperbelly catches recorded from recent at-sea reports.

7. Florida Middle Grounds. (340 sq. naut. mi).

Large area (irregular polygon) on the 20 fathom isobath that covers about 40 USGS lease blocks

**boundaries:: (A). 28° 42.5'N, 84° 24.8'W;
(B). 28° 42.5'N, 84° 16.3'W;
(C). 28° 11'N, 84° 0'W;
(D). 28° 11'N, 84° 07'W;
(E). 28° 26.6'N, 84° 24.8'W.**

Discussion: This area was designated in the Coral Reef Fishery Management Plan (1982) as a HAPC (habitat areas of particular concern). Its coordinates are therefore already fixed. Current restrictions apply to gear--no bottom longlines, traps, pots or bottom trawls. It is thought that many species of grouper and snapper spawn in this area.

8. 40 Fathom Contour West of the Middle Grounds (denoted as The Edges by Moe 1963) (several sites within the same area - total area = 436 sq. naut. mi.)

Area A (61 sq. naut. mi), Florida Middle Grounds USGS lease blocks 147, 148, 149, 150, 151, 191, 192, 193, 194, 195;

**boundaries: NW= 28° 51'N, 85°12'W NE= 28° 51'N, 84° 57'W,
SE= 28° 46'N, 84° 57'W SW= 28° 46'W, 85° 12'W;**

Area B (67 sq. naut. mi), Florida Middle Grounds USGS lease blocks 237, 238, 239, 240, 281, 282, 283, 284;

**boundaries: NW= 28° 46'N, 85°06'W NE= 28° 46'N, 84° 54'W,
SE= 28° 40'N, 84° 54'W SW= 28° 40'W, 85° 06'W;**

Area C (57 sq. naut. mi), Florida Middle Grounds USGS lease blocks 326, 327, 328, 329, 370, 371, 372, 373;

**boundaries: NW= 28° 40'N, 85°03'W NE= 28° 40'N, 84° 51'W,
SE= 28° 34'N, 84° 51'W SW= 28° 34'W, 85° 03'W;**

Area D (143 sq. naut. mi), Florida Middle Grounds USGS lease blocks 415, 416, 417, 418, 419, 459, 460, 461, 462, 463, 503, 504, 505, 506, 507, 547, 548, 549, 550, 551;

**boundaries: NW= 28° 34'N, 85°01'W NE= 28° 34'N, 84° 45'W,
SE= 28° 24'N, 84° 45'W SW= 28° 24'W, 85° 01'W;**

Area E (108 sq. naut. mi), Florida Middle Grounds USGS lease blocks 593, 594, 595, 596, 637, 638, 639, 640, 681, 682, 683, 684, 725, 726, 727, 728;

**boundaries: NW= 28° 24'N, 84°54'W NE= 28° 24'N, 84° 42'W,
SE= 28° 14'N, 84° 42'W SW= 28° 14'W, 84° 54'W;**

Discussion: Although this site is of low relief, we directly observed a gag and scamp spawning aggregations with an ROV on a R/V Chapman survey in 1994. A Fishery Acoustic System (FAS) survey was conducted by NMFS Panama City and Pascagoula in 1996. This site is also listed in Moe's 1963 survey as an extensive linear area along the 40 fathom isobath scattered high relief rocky outcrops of limestone rock extending parallel to the coastline. At-sea fishing surveys also revealed this is currently an active region of commercial grouper fishing.

9. "Steamboat lumps". (104 sq. naut. mi.)

Florida Middle Grounds USGS lease blocks 771, 772, 816, 860, 861, 862, 906

boundaries: NW= 28 14'N, 84 48'W NE= 28 14'N, 84 37'W
 SW= 28 03'N, 84 48'W SE= 28 03'N, 84 37'W

Discussion: This area is due W. of Clearwater, Fla. and SW of the Middle Grounds at a depth of 40-50 fathoms. These are prominent features reported to be low relief areas with limestone rock.

10. " The Elbo". (107 sq. naut. mi).

Elbo USGS lease blocks 36, 37, 80, 81, 124, 125, 168, 169, 212, 213, 256, 257, 300, 301;

boundaries NW= 27 57'N, 84 11'W NE= 27 57'N, 84 05'W
 SW= 27 38'N, 84 11'W SE= 27 38'N, 84 05'W

Discussion: This is a large ridge as wide as 3 nautical miles composed of limestone rock (Moe 1963). It rises 4-8 fathoms above the bottom and can be seen on the bathymetric map by the 30 fathom isobath due west of Tampa Bay.

11. "Christmas Ridge". (191 sq. naut. mi).

Charlotte Harbor USGS lease blocks 444, 445, 446, 488, 489, 490, 532, 533, 534, 576, 577, 578, 620, 621, 622, 664, 665, 666, 708, 709, 710, 752, 753, 754, 796, 797, 798;

boundaries: NW= 26° 31'N, 83° 51'W NE= 26° 31'N, 83° 41'W
 SW= 26° 06'N, 83° 49'W SE= 26° 06'N, 83° 42'W

Discussion: The main features of this area are rock ridges of several fathoms in relief at about 45 fathom depths. These ridges follow the depth contours.

12. "Hambone Ridge/the Finger". (153 sq. naut. mi).

Pulley Ridge USGS lease blocks 445, 446, 447, 489, 490, 491, 533, 534, 535, 577, 578, 579, 621, 622, 623, 665, 666, 667, 709, 710, 711;

boundaries: NW= 25° 31'N, 83° 46'W NE= 25° 31'N, 83° 37'W
 SW= 25° 12'N, 83° 46'W SE= 25° 12'N, 83° 37'W

Discussion: Moe (1963) describes these as well defined rock ridges rising 4-5 F above a flat sand bottom along the 40 fathom contour.

13. "Northwest Peaks". (182 sq. naut. mi).

Pulley Ridge USGS lease blocks 617, 618, 619, 620, 661, 662, 663, 664, 705, 706, 707, 708, 749, 750, 751, 752, 793, 794, 795, 796, 837, 838, 839, 840, 881, 882, 883, 884.

**boundaries: NW= 25° 20'N, 83° 57'W NE= 25° 20'N, 83° 46'W
SW= 25° 02'N, 83° 57'W SE= 25° 02'N, 83° 46'W**

Discussion: This is a relatively deep site with depths below 50 fathoms. This area is northwest of the Tortugas and has high rock pinnacles with one peak rising to 25 fathoms, but it is not depicted on the bathymetric chart.

14. "Riley's Hump". (11 sq. naut. mi).

**boundaries: NW= 24° 32.2'N, 83° 08.7'W NE= 24° 32.2'N, 83° 05.2'W
SW= 24° 28.7'N, 83° 05.2' W SE= 24° 28.7'N, 83° 08.7'W**

Discussion: This area is a rise between the 20 and 30 fathom isobaths southwest of the Dry Tortugas and it covers about one lease block of area. This area is designated as a mutton snapper spawning grounds in Amendment 5 (supplement) of the Reef Fish FMP (1993). No fishing is allowed in this area in May and June but other times of the year fishing is not restricted.

APPENDIX 2

1993-1998 Average Commercial Reef Fish Harvest, by Species and Depth Statistical Areas 6 and 8

Source: Florida Department of Environmental Protection, Marine Fisheries Information System (Brown 1999).

SPECIES	Depth Range (fathoms)									
	Unidentified		< 30		30 - 50		> 50		All Depths	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Grouper, Black	22,097	44,902	4,047	8,798	14,162	32,026	67,409	148,864	107,714	234,590
Grouper, Gag	53,829	117,754	11,485	25,335	36,650	83,829	390,126	875,809	492,089	1,102,727
Grouper, Other	4,020	7,084	35	54	77	109	14,720	26,065	18,853	33,313
Grouper, Red	144,673	249,986	38,261	65,219	44,876	80,400	791,077	1,379,835	1,018,888	1,775,440
Grouper, Scamp	9,138	19,891	478	1,013	1,506	3,428	46,872	107,215	57,996	131,547
Grouper, Yellowedge	14,996	32,240	31	54	0	0	57,748	128,934	72,776	161,228
Snapper, Gray	6,299	10,334	1,786	2,860	1,269	2,208	45,879	80,671	55,235	96,074
Snapper, Mutton	265	429	49	59	241	472	1,139	2,158	1,696	3,119
Snapper, Other	26,622	39,756	160	264	665	1,143	53,137	85,307	80,584	126,472
Snapper, Red	2,790	6,101	18	41	248	538	13,554	28,984	16,611	35,665
Snapper, Silk	251	526	0	0	2	4	2,100	4,505	2,354	5,036
TOTAL	284,982	529,004	56,354	103,700	99,698	204,161	1,483,762	2,868,346	1,924,796	3,705,211

