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SECRETARIAL AMENDMENT 2

TO THE

REEF FISH FISHERY MANAGEMENT PLAN

TO SET GREATER AMBERJACK SUSTAINABLE

FISHERIES ACT TARGETS AND THRESHOLDS AND TO

SET A REBUILDING PLAN

**(Includes Environmental Assessment,
and Regulatory Impact Review)**

November 2002

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Abbreviations Used in This Document

ABC	Acceptable (or Allowable) Biological Catch
CEQ	Council on Environmental Quality
CPUE	Catch-per-unit-effort
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
F	Rate of instantaneous fishing mortality, a measure of the rate at which fish are removed from the population by fishing.
— F_{MSY}	F that can sustain maximum sustainable yield
— F_{OY}	F that can produce optimum yield.
— $F_{30\%SPR}$	F that can sustain a population at 30 percent SPR
— $F_{40\%SPR}$	F that can sustain a population at 40 percent SPR
FEIS	Final Environmental Impact Statement
FIS	Fishery Impact Statement
FL	Fork Length
FMP	Fishery Management Plan
FMRI	Florida Marine Research Institute
FSAP	Ad Hoc Finfish Stock Assessment Panel
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
HG	Harvest Goal
— HG	Commercial Harvest Goal
— RHG	Recreational Harvest Goal
IFQ	Individual Fishing Quota

IRFA	Initial Regulatory Flexibility Analysis
M	Rate of Instantaneous Natural Mortality
MEY	Maximum Economic Yield
MFMT	Maximum Fishing Mortality Threshold
MGF	Multispecies Groundfish Fishery
mp	Million Pounds
M-SFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NMFS	National Marine Fisheries Service
NRC	Natural Resource Community
NSG	National Standard Guidelines
OY	Optimum Yield
Plan	Reef Fish FMP for the Gulf of Mexico
RA	Regional Administrator (NMFS Southeast Regional Office) (formerly Regional Director)
RFA	Regulatory Flexibility Act of 1980
RFSAP	Reef Fish Stock Assessment Panel
RIR	Regulatory Impact Review
SBA	Small Business Administration
SEFC or SEFSC	Southeast Fisheries Center, Miami, Florida (NMFS Southeast Regional Office)
SEIS	Supplemental Environmental Impact Statement
SEP	Socio-economic Panel
SERO	Southeast Regional Office
SIA	Social Impact Assessment
SFA	Sustainable Fisheries Act
SPR	Spawning Potential Ratio

SSBR	Spawning Stock Biomass Ratio (an older term for SPR)
SSB	Spawning Stock Biomass
TAC	Total Allowable Catch
Y	Yield
YPR	Yield Per Recruit
VPA	Virtual Population Analysis

Fishery Impact Statement/Social Impact Assessment

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This table of contents and summary of social and economic impacts on fishery participants and communities are provided to aid the reader in reviewing fishery and social impacts by referencing corresponding sections of the amendment that are inclusive of the Fishery Impact Statements (FIS) and the Social Impact Analysis (SIA).

Summary

Sustainable fishing parameters, such as maximum sustainable yield (MSY), minimum stock size threshold (MSST), and maximum fishery mortality threshold (MFMT) are mainly biological in nature but have relevance to the determination of impacts on fishing participants to the extent that they provide the general benchmark for regulatory measures. Regulatory measures, such as those considered in this amendment, that flow from the choice of these sustainable fishing parameters are the ones that have immediate impacts on fishing participants. The determination of optimum yield (OY) is frequently done on biological grounds to assure the sustainability of the stock, and absent is the explicit consideration of economic and social factors in setting OY values. Nevertheless, OY alternatives, in terms of specific values, are proposed and socioeconomic factors are implicitly introduced in the process of the Gulf of Mexico Fishery Management Council's (Council) selection of a Preferred Alternative. The general impacts of these alternatives would become an important issue at such time when the greater amberjack stock is fully rebuilt, since OY represents the long-term management goal.

The economic issue involved in a rebuilding strategy may be characterized as a tradeoff in value of catches over time. A larger harvest now would yield greater commercial and recreational benefits in the short-term, but at the expense of a slower stock recovery. Conversely, a smaller harvest now would generate fewer short-term benefits, but likely would also lead to a faster realization of the benefits of a larger greater amberjack resource in the future made possible by a faster recovery of the fish stock. While the larger stock should yield additional benefits to the recreational sector, this may not be the case for the commercial sector. The current 3-month closure, as stated by fishermen in public testimony, has adversely affected the market that is now satisfied by the substitution of alternative fish species.

The general approach employed in this amendment is the provision of harvest goals during the rebuilding period. Using hard total allowable catches (TAC) creates a significant likelihood that a derby fishery may occur during the rebuilding period (See Remedial Order Opinion, Conservation Law Foundation vs. Evans, Civil Action No. 00-1134 for adverse affects of hard TACs). Harvest goals, unlike an explicit or hard TAC, do not require quota closures once the harvest levels are reached. However, regulations may be changed as needed to constrain commercial and recreational harvest to the chosen harvest goals. In order to determine the socioeconomic implications of a rebuilding strategy on the commercial and recreational fishing participants, harvest goals are allocated between the two sectors using two allocation ratios.

One such ratio is based on Amendment 1 to the Reef Fish Fishery Management Plan (FMP) which uses the landings history of both sectors for the period 1979-1987, resulting in a 14 percent commercial and 86 percent recreational allocation. Two other alternatives used are based on the commercial/recreational landings ratio in more recent years, resulting in an allocation ratio of 43 percent commercial and 57 percent recreational if based on 2001 data, or 48 percent commercial and 52 percent recreational if based on average landings/harvests for 1999-2001.

There is no specific TAC for greater amberjack at present (Section 8.2.2, Alternative 6-no action), but several management measures are currently in effect to protect the stock. For the first year of the rebuilding plan, the harvest goals range from 2.9 mp (Alternative 1, Option b and Alternative 2, Option b) to 5.75 mp (Alternative 4, Option b), and for rebuilding over a 10-year period in which the stock size rebuilds to B_{MSY} or above, total harvest goals range from 40.0 mp (Alternative 4, Option a) to 70.6 mp (Alternative 1, Option a). If all alternatives have equal probability of rebuilding the stock within 10 years and assuming the same management regime were adopted for each alternative, it is probably not necessary to calculate the 10-year net present values to conclude that Option a of Alternative 1 would provide the greatest economic benefits given this alternative has the highest total harvest goal. It may be noted, however, that each alternative would rebuild the stock at different times, with the most initially restrictive harvest likely to provide the shortest time for rebuilding. This condition is important for two reasons. First, it would change the assumption of the same management regime, since once the stock is rebuilt, restrictions imposed on the fishery may be relaxed. The shorter then the period for the stock to recover to the target level, the earlier would be the timing in relaxing fishing regulations and in increasing the harvest goals. To account for differing rebuilding periods among the alternatives, the time period is extended to 20 years, with explicit consideration of discounting. This analysis still results in Option a of Alternative 1 being ranked first as it is associated with the largest net present values. Second, the assumption that all alternatives have equal probability of successfully rebuilding the stock is no longer valid. It is likely that paths that provide for a shorter rebuilding period have higher probability of successfully rebuilding the stock than those that provide for a longer time period. Among those that provide for shorter recovery period, the Preferred Alternative, which is one of the most restrictive alternatives, is likely to be associated with the highest probability of successfully rebuilding the stock. One factor that should be taken into consideration in the rebuilding time periods is as the stock is rebuilt, the average size of the fish will increase, and the same level of catch-per-unit-effort (CPUE) in terminal fish will result in increased landings in terms of pounds (i.e., the allocations will be filled sooner).

If current landings, which hover around 2.0 mp, extend to at least 2003 and/or the first few years of the rebuilding period, adoption of a harvest goal under any alternative would not result in short-term required reductions in total harvest. The lowest expected harvest for 2003 is 2.9 mp (Alternative 1, Option b and Alternative 2, Option b) and is above most recent landings in the fishery. The possibility of a required total harvest reduction under Alternative 5, which sets a harvest goal of 4.0 mp from 2003 to 2005, is even more unlikely, and thus short-term negative economic impacts on the fishery would not ensue. This raises then the issue of whether there is a need to relax current regulations on greater amberjack without necessarily setting the fishery off the rebuilding path. Given the nature of the rebuilding strategy, which is that of providing for harvest goals rather than hard TACs, it is probably not prudent, at least in the next year or so, to relax regulations because of the possibility of harvests to exceed a given harvest goal, especially the one under the Preferred Alternative. If future harvests consistently remain below the harvest goals and future stock assessments indicate the rebuilding strategy is on track, then regulations may be relaxed but the extent of such relaxation has to be tempered by the potential increase in catchability due increasing biomass and increase in fishing effort.

Because there are no expected changes in current regulations that would require a reduction in harvest, the choice of any rebuilding path is not expected to introduce disruptions in the harvest and supporting industries. Current participation in the greater amberjack fishery would remain essentially unaffected. Over the long-term, participation in the fishery may increase with a rebuilding stock or may experience reductions if the stock is not fully rebuilt.

Any effects on other fisheries by the management measures cannot be fully determined at this time. There should be very little if any impacts to managed species in the exclusive economic zone (EEZ) because greater amberjack, while a desirable species, is not targeted as much as some other reef fish species (e.g., groupers and snappers). Because greater amberjack is a top level predator in the reef fish complex, it is possible that as the stock increases, forage species may be adversely affected. However, the interrelationships between reef fish species is not well known. To assess these patterns, complex models would need to be developed. Unfortunately, these models are only in the development stages and, therefore, would be impracticable to apply at this time.

1.0 INTRODUCTION

The greater amberjack resource in the Gulf of Mexico was declared overfished by the National Marine Fisheries Service (NMFS) on February 9, 2001[1]. This determination was based on the 2000 greater amberjack stock assessment (using data through 1998) conducted by the NMFS Southeast Fisheries Science Center (SEFSC) (Turner et al. 2000) and the December 2000 Report of the Reef Fish Stock Assessment Panel (RFSAP) (GMFMC 2000a). The results of several analyses indicated that the stock biomass was below the level needed to sustain harvest at maximum sustainable yield (MSY), with the best estimate indicating that the stock biomass was at less than half the biomass needed to sustain MSY, below the minimum level allowed under the 1998 NMFS National Standard Guidelines[2].

Currently, the Reef Fish Fishery Management Plan (FMP) requires that overfished stocks be restored to a level of 20 percent transitional spawning potential ratio (SPR) within a time period equal to one and one-half times the average time it would take a year class in an unfished population to replace itself, also known as the generation time. However, in order to comply with the requirements of the NMFS National Standard Guidelines (NSG), new biomass based targets and recovery time frame parameters need to be implemented.

The RFSAP concluded in its December 2000 report that the amberjack stock may not be experiencing overfishing if regulations previously implemented by the Council, but not factored into the 2000 stock assessment, have reduced fishing mortality (GMFMC, 2000a). These regulations include: 1) an annual Gulfwide closed season for greater amberjack from March through May (implemented in 1998); 2) a reduced bag limit for greater amberjack, from three to one fish per person (implemented in 1997); and 3) bag and size limits for lesser amberjack and for banded rudderfish, which are often mistaken for greater amberjack (implemented in 1999). The NMFS concurred with this conclusion, stating in a February 9, 2001 letter to the Council that "the Gulf of Mexico greater amberjack stock is overfished, but is not experiencing overfishing." A 2002 analysis by Turner and Scott, which incorporated recent landings data through the year 2000, indicated that overfishing had indeed been halted (Turner and Scott 2002). Because overfishing has been halted, and because recent landings have been below levels required to rebuild the stock within a ten-year time frame, the rebuilding plan alternatives considered in this document do not contain additional management measures to further reduce fishing mortality.

This Secretarial Amendment proposes to establish new biomass-based targets and thresholds for greater amberjack, as well as a schedule to rebuild the stock to a non-overfished level within ten years. These actions are proposed to bring the amberjack fishery into compliance with the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (M-SFCMA), Sustainable Fisheries Act (SFA), NMFS NSGs, and NMFS technical guidance on implementing National Standard 1 (Restrepo et al. 1998).

It should be noted that some requirements of the SFA and M-SFCMA are being met through other Council actions. The Council's Generic SFA amendment (amends the Reef Fish FMP) describes fishing communities. Section 7.0 of this document contains additional information on fishing communities. The portion of the Generic SFA amendment that was intended to address bycatch reporting requirements for this fishery was disapproved. The Council is currently working to meet

[1] Letter to Council Chairperson Kay Williams from NMFS Acting Regional Administrator Joseph Powers dated February 9, 2001.

[2] Federal Register, volume 63, no. 84: Friday May 1, 1998, pages 24212-24237.

that requirement through the development of a new Generic SFA Amendment and Amendment 18 to the Reef Fish FMP. The Council is complying with the legal mandates to define essential fish habitat (EFH) and to minimize the impacts of fishing on such habitat by preparing a comprehensive EIS for its Generic EFH amendment. This EIS is under development and will apply the Reef Fish FMP. After the EIS has evaluated the effect of fishing gear on EFH, the Generic EFH amendment will be amended to address this issue.

2.0 HISTORY OF MANAGEMENT RELATING TO GREATER AMBERJACK

The Reef Fish FMP (with its associated environmental impact statement) was implemented in November 1984. The original list of species included in the management unit consisted of snappers, groupers, and sea basses. *Seriola* species, including greater amberjack, were in a second list of species included in the fishery, but not in the management unit. The species in this list were not considered to be target species because they were generally taken incidentally to the directed fishery for species in the management unit. Their inclusion in the FMP was for purposes of data collection, and their take was not regulated.

The following history of management only pertains to greater amberjack management so some amendments may not be listed. For a more complete history of reef fish management in the Gulf of Mexico, please consult the most recent amendment to the reef fish fishery management plan.

On November 7, 1989, NMFS published a control date notice, which 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. It does not prevent any other date for eligibility or other method for controlling fishing effort from being proposed and implemented.

Amendment 1 [with its associated environmental assessment (EA), regulatory impact review (RIR), and initial regulatory flexibility analysis (IRFA)] to the Reef Fish Fishery Management Plan, implemented in 1990, added greater amberjack and lesser amberjack to the list of species in the management unit. It set a greater amberjack recreational minimum size limit of 28 inches fork length (FL) and a 3 fish recreational bag limit, and a commercial minimum size limit of 36 inches FL. This amendment 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. A framework procedure for specification of TAC was created to allow for annual management changes. This amendment also established a commercial vessel reef fish permit as a requirement for harvest in excess of the bag limit and for the sale of reef fish.

Amendment 4 (with its associated EA and RIR), implemented in May 1992, added the remaining *Seriola* species (banded rudderfish and Almaco jack) to the management unit, and established a moratorium on the issuance of new commercial reef fish vessel permits for a maximum period of three years.

Amendment 5 (with its associated supplemental environmental impact statement, RIR, and IRFA), implemented in February 1994, required that all finfish except for oceanic migratory species be landed with head and fins attached, and closed the region of Riley's Hump (near Dry

Tortugas, Florida) to all fishing during May and June to protect mutton snapper spawning aggregations.

Amendment 11 (with its associated EA and RIR) was partially approved by NMFS and implemented in January 1996. It implemented a new reef fish permit moratorium for no more than 5 years or until December 31, 2000, during which time the Council was to consider limited access for the reef fish fishery.

Amendment 12 (with its associated EA and RIR), submitted in December 1995 and implemented in January 1997, reduced the greater amberjack bag limit from 3 fish to 1 fish per person, and created an aggregate bag limit of 20 reef fish for all reef fish species not having a bag limit (including lesser amberjack, banded rudderfish, and Almaco jack). NMFS disapproved proposed provisions to include lesser amberjack and banded rudderfish along with greater amberjack in an aggregate 1-fish bag limit and to establish a 28-inch FL minimum size limit for those species.

Amendment 15 (with its associated EA, RIR, and IRFA), implemented in January 1998, closed the commercial greater amberjack fishery Gulfwide during the months of March, April, and May.

An August 1999 regulatory amendment (with its associated EA, RIR, and IRFA) increased the commercial minimum size limit for gag and black grouper from 20 to 24 inches total length, increase the recreational minimum size limit for gag and black grouper from 20 to 22 inches total length, and then 1-inch per year until it reached 24 inches, implement a seasonal closure on commercial harvest and prohibition on sale of gag, black, and red grouper from February 15th to March 15th, and close two areas (i.e., create two marine reserves), 115 and 104 square nautical miles respectively, year-round to all fishing under the jurisdiction of the Gulf Council with a 4-year sunset closure.

Generic Sustainable Fisheries Act Amendment (with its associated EA, RIR, and IRFA), partially approved and implemented in November 1999, set the maximum fishing mortality threshold (MFMT) for greater amberjack at $F_{30\%\ SPR}$. Estimates of MSY, MSST, and OY were disapproved because they were based on spawning potential ratio (SPR) proxies rather than biomass based estimates.

Amendment 16B (with its associated EA, RIR, and IRFA), implemented in November 1999, set a slot limit of 14 to 22 inches FL for banded rudderfish and lesser amberjack for both the commercial and recreational fisheries, and an aggregate recreational bag limit of five fish for banded rudderfish and lesser amberjack.

Amendment 17 (with its associated EA), implemented by NMFS in August 2000, extended the commercial reef fish permit moratorium for another 5 years, from its previous expiration date of December 31, 2000 to December 31, 2005, unless replaced sooner by a comprehensive controlled access system.

3.0 PROBLEMS REQUIRING A SECRETARIAL PLAN AMENDMENT

The M-SFCMA requires that all FMPs, amendments, and regulations be consistent with the 10 National Standards. National Standard 1 states that "conservation and management measures, shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry." To that point, the M-SFCMA goes on to state that FMPs will "specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery" [§303(a)(10)]. Because NMFS has declared greater amberjack to be overfished, and because criteria for MSY, OY, and MSST have not been defined in terms of biomass for greater amberjack, and thereby consistent with National Standard Guidelines (NSG), an amendment to the FMP needs to be developed to address these issues. A Secretarial rather than a plan amendment needs to be submitted because the Council was not able to develop a rebuilding schedule within the one year deadline set forth in the M-SFCMA [§304(e)(3)]. The rebuilding plan shall 1) be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock of fish within the marine ecosystem; and 2) not exceed 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise [§304(e)(4)(A)].

4.0 PURPOSE AND NEED FOR ACTION

On February 9, 2001, NMFS notified the Council that the Gulf of Mexico stock of greater amberjack was overfished, but was not experiencing overfishing. Section 304(e) of the M-SFCMA requires that within 1 year of being notified that a stock is being overfished, the Council must develop measures to end overfishing and rebuild the stock. Because the Council did not meet this one-year deadline, this action must be taken through a Secretarial amendment.

NMFS concluded that overfishing is not currently occurring due to the recent implementation of management measures that were not reflected in the stock assessment. These measures included: 1) a reduction in the greater amberjack recreational bag limit from 3 to 1 fish (implemented 1997); 2) a commercial closed season during March, April and May (implemented 1998); and 3) partial protection of misidentified juvenile greater amberjack by establishment of a slot limit on lesser amberjack/banded rudderfish of 14 and 22 inches FL plus an aggregate 5-fish recreational bag limit. As a result of this finding, additional measures to end overfishing are not needed. However, a plan to rebuild the stock that complies with §304(e) of the M-SFCMA and the NMFS NSGs must be specified.

Before a rebuilding plan can be initiated, overfished and overfishing targets and thresholds must be specified so that rebuilding goals are known. Based on the Council's partially approved generic SFA amendment, only the maximum fishing mortality threshold (MFMT) proxy of $F_{30\%SPR}$ was approved for amberjack. Presently, greater amberjack are considered overfished when the stock is below the level of 20 percent transitional SPR, a level that is inconsistent with the current MFMT value of $F_{30\%SPR}$. Proxies for MSY and OY, though not approved, were set at 30 percent static SPR and 40 percent static SPR, respectively, in the Generic SFA amendment (GMFMC, 1999). The minimum stock size threshold (MSST) was to be implemented through framework as estimates of B_{MSY} and biomass based estimates of MSY became available. Therefore, the purpose of this Secretarial amendment is to 1) specify MSY, OY, MFMT, and MSST levels to bring greater amberjack into compliance with current fishery management standards and 2) establish a greater amberjack rebuilding plan that complies with SFA and NMFS NSGs.

5.0 PROPOSED ACTIONS

Through this Secretarial amendment, the Council proposes to 1) specify MSY, OY, MFMT, and MSST levels for greater amberjack that are in compliance with current fishery management standards and 2) establish a rebuilding plan for greater amberjack in the Gulf of Mexico. The proposed alternatives within this Secretarial amendment for SFA status criteria are as follows:

Maximum Sustainable Yield (MSY) for greater amberjack is the yield associated with $F_{30\%\ SPR}$ (proxy for F_{MSY}) when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{30\%\ SPR}$ to be 9.5 million pounds (mp).

Optimum Yield (OY) for greater amberjack is the yield associated with an $F_{40\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{40\%\ SPR}$ to be 8.5 mp.

Set MFMT = $F_{30\%\ SPR}$ ($F_{30\%\ SPR}$ is currently estimated at 0.25); The greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{30\%\ SPR}$ is greater than 50 percent.

Set the minimum stock size threshold (MSST) to (1-M)*B_{MSY} or 75 percent of B_{MSY}. Using the proxy of F_{MSY} being $F_{30\%\ SPR}$, B_{MSY} is estimated to be 28.4 mp. Greater amberjack stocks in the Gulf of Mexico will be considered overfished if the probability that $B_{current}$ is less than MSST is greater than 50 percent.

For the rebuilding plan, the proposed alternative is as follows:

Limit the harvest of greater amberjack for 3- year intervals with the expected harvest set at the yield associated with $F_{40\%}$ for the first year of each interval (Rebuild the stock in 7 years). Expected harvest would be 2.9 mp for 2003-2005, 5.2 mp for 2006-2008, 7.0 mp for 2009-2011, and for 7.9 mp for 2012.

6.0 MANAGEMENT OBJECTIVE AND OPTIMUM YIELD

Optimum Yield

[Note: NMFS took the following action regarding overfishing targets and thresholds that were developed in the Generic Sustainable Fisheries Act Amendment (GMFMC, 1999) regarding reef fish. The SPR proxies submitted for maximum fishing mortality threshold (MFMT) were approved with the exception of red snapper. The MFMT approved for greater amberjack was $F_{30\%\ SPR}$. All of the spawning potential ratios (SPRs) submitted as proxies for MSY, OY, and MSST were disapproved based on national standards 1 and 2 because NMFS felt they were not consistent with the best available scientific information (i.e., they were not expressed in terms of biomass) and did not provide an adequate basis for achieving OY on a continuing basis. Therefore, until new targets and thresholds presented in this amendment are adopted, approved, and implemented, the following is the current definition of OY.]

The primary objective and definition of Optimum Yield (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 spawning potential ratio (SPR). If the Preferred Alternative for OY proposed in this amendment is implemented, then OY would be defined as the yield associated with an $F_{40\%SPR}$ when the stock is at equilibrium.

Definition of Overfishing

The following is the definition of overfishing contained in Amendment 1 of the Reef Fish Fishery Management Plan (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 current definition of overfishing that was approved in the Council's Generic SFA amendment is to set the overfishing threshold (MFMT) at a fishing mortality rate equivalent to 30 percent static SPR ($F_{30\%SPR}$) for all of the reef fish stocks, except red snapper, Nassau grouper, and goliath grouper. This definition for greater amberjack would be modified in this Secretarial amendment (should the Preferred Alternative be implemented) so that the stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{30\%SPR}$ is greater than 50 percent. In addition, this amendment proposes to establish a new criterion for greater amberjack to assess if the stock is overfished. This criterion or minimum stock size threshold is $(1-M)*B_{MSY}$ or 75 percent of B_{MSY}. The stock would be considered overfished if the probability that $B_{current}$ is less than MSST is greater than 50 percent.

7.0 DESCRIPTION OF THE FISHERY

The greater amberjack fishery occurs throughout the Gulf of Mexico (GOM); but most fish have been landed along the west coast of Florida (National Marine Fisheries Service, personal communication[3]). Total landings peaked in 1989 at 9.896 million pounds (mp) and from 1986 to 1993 were generally greater than 4 mp (Figure 1). In recent years (1995-2001), total landings have hovered around 2 mp.

The portion of the fishery that has shown the greatest decline has been the recreational fishery (Figure 1). Harvest declined from a high of 7.2 mp in 1989 to a low of approximately 700,000 pounds in 1995. The recreational fishery includes various classes of fishermen such as private anglers, charter, head and party-boat operators and their customers who in many cases are tourists. For the years, 1986-1999, recreational landings have generally accounted for most of the catch (average 69 percent), and in 1986, accounted for as much as 85 percent. Years where the commercial harvest exceeded the recreational harvest were 1990 and 1995-1997. In general, the headboat harvest has comprised less than 10 percent of the total harvest.

The commercial fishery has generally maintained a harvest between 1 and 1.5 mp with the exception of 1987 to 1989 when the harvest was around 2 mp (Figures 1 and 2). The GOM greater amberjack fishery includes commercial fishermen using a variety of gear types such as bottom longline, vertical line gear (handline and bandit gear), spearfishing, and fish traps.

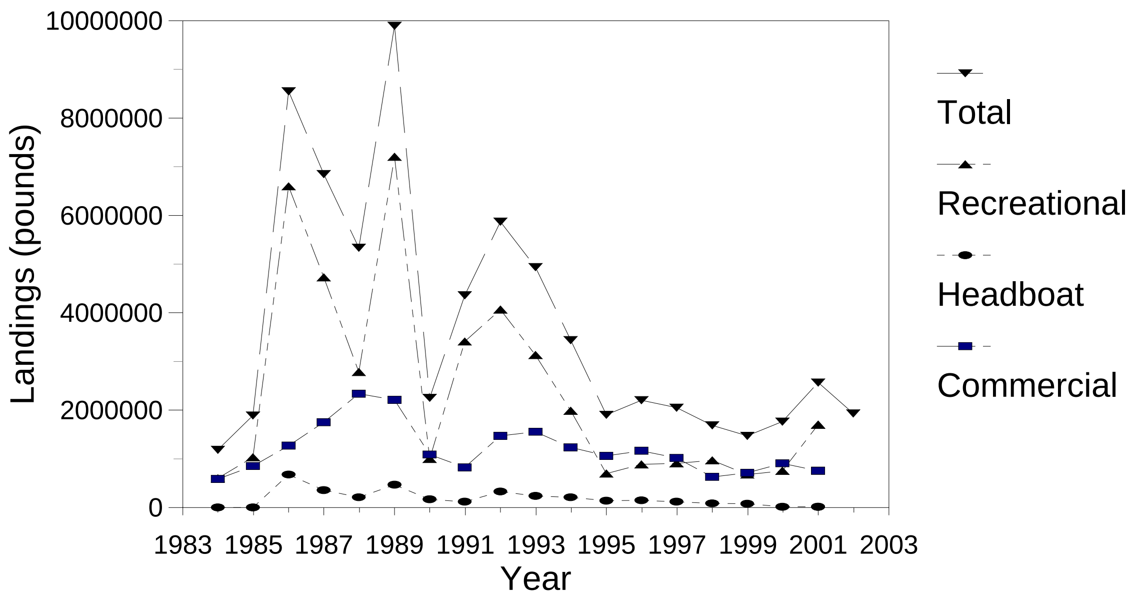

Figure 1. Landings (pounds) for the Gulf of Mexico greater amberjack fishery. Source of data is from Cummings and McClellan (2000) and Turner and Scott (2002).

[3]National Marine Fisheries Service, Fisheries Statistics and Economics Division, Silver Spring, MD

7.1 Commercial Fishery

Greater amberjack are not a primary target species of the commercial reef fish fishery that primarily targets grouper and snapper species (Waters, 1996; Waters et al., 2001). Commercial landings have ranged from 5,615 pounds (1965) to 2.3 mp (1988) between 1962 and 1998 (Cummings and McClellan, 2000; Figure 1). Between 1993 and 2000, greater amberjack had an annual dockside value ranging from 0.8 to 1.1 million dollars. Landings were highest during the mid-1980s when greater amberjack were used by restaurants as a substitute for red drum. Commercial landings of red drum were severely curtailed by regulatory actions due to overfishing concerns during this time period. Additionally, changes in snapper and grouper regulations may have increased fishermen's interest in amberjack. Between 1986 and 1998, most amberjack were landed in Florida (53.32-69.87 percent), followed by Louisiana (19.25-31.13 percent), Texas (3.42-21.41 percent), Mississippi (0.51-5.30 percent), and Alabama (0.26-4.87 percent). Landings were generally limited to the west coast of Florida (statistical grids 5-10) prior to 1990, however effort has shifted to the western Gulf to statistical grids 13 and 18 (Figure 3). Most amberjack (>50 percent) are caught with hook-and-line gear (Figure 4) and are caught between May and September (51 percent)(Figure 5).

Cummings and McClellan (2000) report that prior to 1990, a large amount of the commercial catch was less than 16 inches FL when landed. After 1990, the size of fish landed increased substantially with the implementation of the 36 inch FL minimum size and were primarily longer than the minimum length. Catches pooled over all years where length data are available showed a bimodal distribution in landings for the handline fishery (a primary peak at 37 inches FL and a secondary peak at 16 inches FL). The bottom longline fishery generally landed larger fish with a peak in the length distribution at 40 inches FL.

As stated above, handlines have accounted for most of the commercial catch in recent years (Cummings and McClellan, 2000; National Marine Fisheries Service, personal communication[3]). Landings data available from NMFS for 1997 to 2000 indicate that between 565,000 and 802,000 pounds were landed annually by this segment of the fishery and had an annual value of between 624,000 and 864,000 dollars. On average, there were 894 vessels using hand line gear from 1993-2000 and these vessels cumulatively took an average of 7,600 trips per year (National Marine Fisheries Service, personal communication[3]). Longline gear accounted for 39,000 to 57,000 pounds of the annual greater amberjack landings from 1997 to 2000 and had an estimated annual value between 38,000 and 59,000 dollars. On average, there have been 165 bottom longlining vessels taking an average of 1,400 trips per year from 1993-2000 (National Marine Fisheries Service, personal communication[3]). The only other segment of the reef fish fishery that has consistently landed greater amberjack is the spearfish fishery. Between 1997 and 2000, annual landings have ranged between 5,500 and 16,500 pounds valued between 6,300 and 19,300 dollars.

The economic and social characteristics of the participants and the vessels in the reef fish fishery have been described in previous studies (cited below). Most of the studies focused on either the commercial sector or the recreational sector of the fishery.

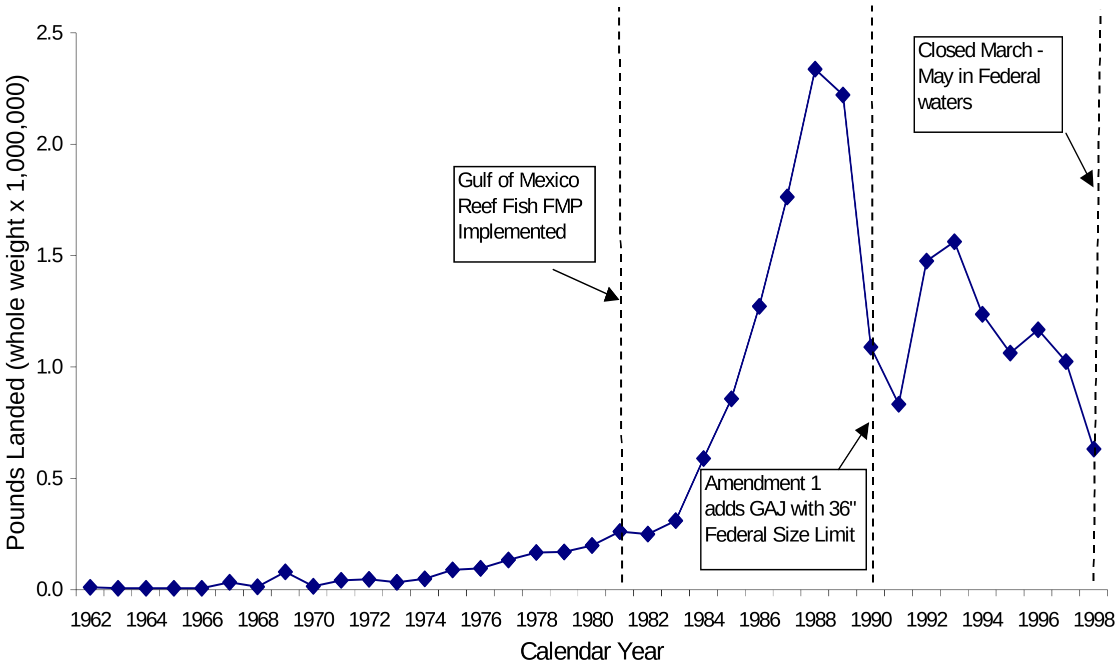

Figure 2. Reported commercial landings by calendar year for the Gulf of Mexico greater amberjack stock in the southeastern United States, 1962-1998 (from Cummings and McClellan, 2000).

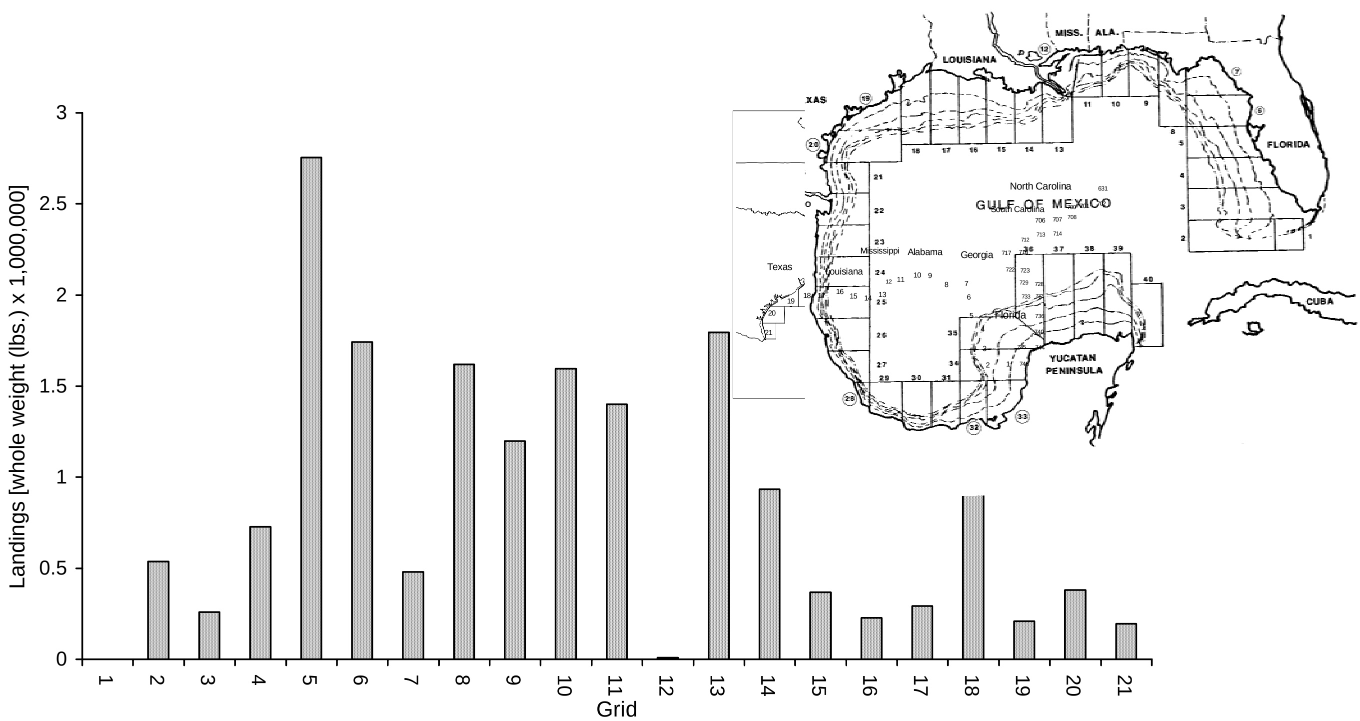

Figure 3. Spatial distribution of the reported commercial landings of the Gulf of Mexico greater amberjack stock in the southeastern United States, 1977-1998 (from Cummings and McClellan, 2000).

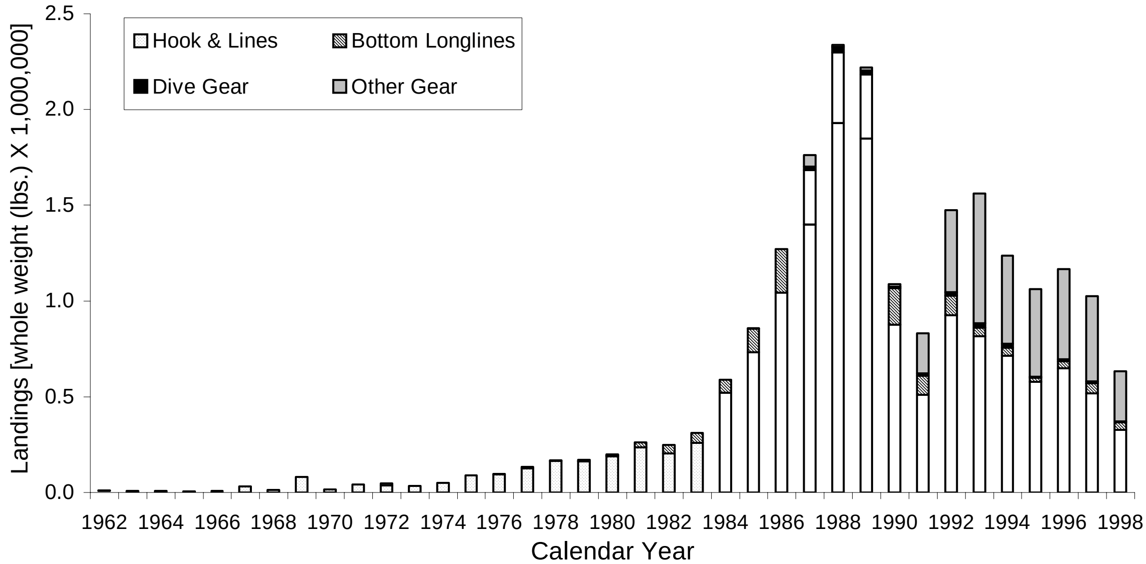

Figure 4. Reported commercial landings by gear type and calendar year for Atlantic Ocean greater amberjack in the Gulf of Mexico, 1962-1998 (from Cummings and McClellan, 2000).

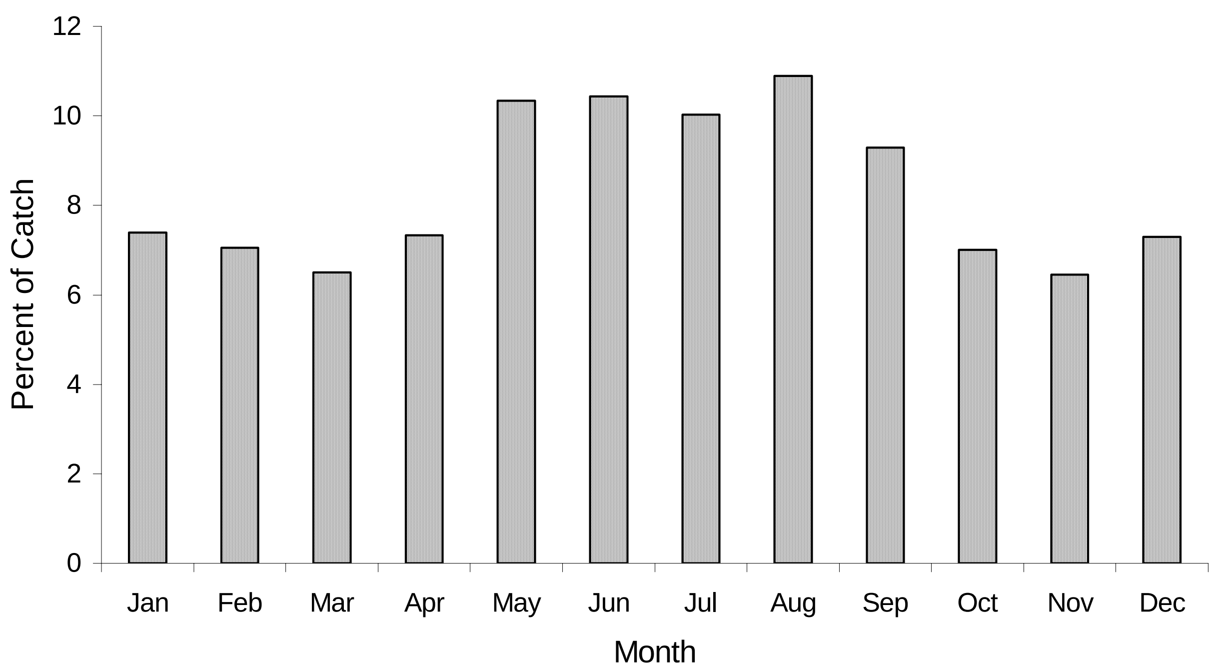

Figure 5. Reported commercial landings (percent) from the Gulf of Mexico stock of greater amberjack in the southeastern United States, 1977-1998 combined (from Cummings and McClellan, 2000).

Cato and Prochaska (1977) interviewed fishermen on 20 Florida-based reef fish vessels fishing for snapper and grouper in the GOM to analyze financial performance of the vessels in 1974-75. Vessels in their study used manually powered or electrically powered rod and reels. They were separated into those vessels fishing the northern Gulf (Panama City to Pensacola, Florida) and those fishing the southeastern Gulf (Tarpon Springs to Madeira Beach). The vessels' fishing operations ranged from Texas and the Campeche Shelf (Mexico) to along the west Florida shelf. The data for 1974 showed relatively smaller vessels with smaller crews fishing out of the southeastern Gulf ports than those out of the northern Gulf ports. Data on costs and net returns by vessel size in both areas indicated that the determinants of net revenues to captain and crew were the mix of species in the catch (e.g. snappers in the northern areas and grouper in the southeastern areas) and differentials in cost variables such as docking fees, insurance and interest rates.

Waters (1996) updated and extended the socioeconomic profile of the commercial reef fish fishery in the GOM with a vessel survey of 196 vessel owners and crew based on data from 1993. Fishermen from each state along the GOM were interviewed: 139 from Florida, 4 from Alabama, 1 from Mississippi, 22 from Louisiana and 30 from Texas. The survey included: 1) more respondents using gear types such as bottom longlining and fish traps which had been under represented in earlier surveys; 2) vessels from around the Gulf: Collier County, Florida to Cameron County, Texas; and 3) demographic information on the fishermen.

The survey conducted by Waters (1996) divided the vessels into high volume and low volume depending on whether or not they landed enough pounds to be in the top 75 percentile of all vessels with a particular gear type in the fishery. The survey included vessels that reported using multiple types of gear. "Fishermen that primarily used fish traps for reef fishes tended to cite the use of fish traps, stone crab traps, rods and reels and gill nets, among others. Respondents with vertical hooks and lines in the eastern Gulf used bandit reels, electric reels and rods and reels. Respondents that primarily used bottom longlines for reef fishes also tended to cite experience with vertical hook and line gear" (Waters, 1996). The survey asked vessel owners to report on their two most important kinds of trips for reef fish, even if a non-reef fish alternative contributed more to the annual revenues of the boat. Comparisons were drawn between high volume and low volume boats within each category and between those in the northern Gulf and the eastern Gulf.

In the northern Gulf, catches differed by gear with vessels using vertical lines catching primarily snapper (red and vermilion) and vessels using bottom longlines catching primarily yellowedge grouper. Vessels in the eastern Gulf used bottom longlines, vertical lines, and fish traps; they caught primarily groupers. The vessels with vertical lines in the northern Gulf were longer on average (50 feet) than those in the eastern Gulf (38 feet). Longline vessels averaged about 42-44 feet in length and vessels using fish traps averaged about 38 feet. The average horsepower across gear types was about 280 hp, the lowest with the longliner vessels and the highest with vessels using fish traps. High volume longliner vessels had the highest fuel capacity out of a range of 32-6,000 gallons. Vessels in the survey that had a fuel capacity of less than 1,250 gallons numbered 159. The average fuel capacity was 689 gallons.

Waters' (1996) study also reported demographic characteristics of the commercial Gulf reef fish vessel owners and crew. Respondents reported having lived an average of 25 years in their current county or parish of residence; the overall average age of respondents was about 47 years with the mode at the 40-49 age group; 141 (72 percent) graduated from high school or had more than 12 years of formal education. Household size ranged from 1-9 persons with an average of 3 persons. Household incomes ranged from less than $10,000 to more than $150,000 with approximately 50 percent of the respondents citing household incomes of $30,000 or less. Respondents averaged approximately 44 percent of household income from commercial fishing for reef fishes, 21 percent from other types of commercial fishing and 35 percent from all other sources including incomes earned in non-fishing jobs held by other household members, pensions, investments and other sources. The respondents had an average of 19 years experience fishing, with 13.6 years of that experience in the positions they held at the time of the survey. Only 5 of the 196 respondents reported seasonal employment in other jobs. Typically, respondents from high volume vessels earned between 69-75 percent of household income from commercial fishing while, except for bottom longlining vessels, respondents from low volume vessels earned 25-39 percent of household income from commercial fishing (Waters, 1996). This suggests that fishermen who are catching the most are supplying the most income for their households.

Dokken et al. (1998) assessed several ports along the Texas coastline for economic development potential and employment generation. They estimated that over 250,000 persons were employed in all commercial fishery-related occupations (commercial fishing, processing, wholesaling and retailing) along the GOM. They then allocated this employment to Texas coastal counties and estimated the potential for growth from fishery-related activity for these counties.

Lucas (2001) estimated the economic impact on Madeira Beach, Florida of the one and two-month closure of the grouper fishery; a one-month closure occurred in 2001, and a two-month closure was a potential alternative. While her study did not address greater amberjack in the fishery, it did describe the effects of seasonal closures (current regulations prohibit greater amberjack to be landed for a three month closure) on a reef fishing community. About 135 vessels offloaded in Madeira Beach on a regular basis, landing about $6.7 million in grouper per year. There were an estimated 87 bottom longliner vessels and 48 bandit rigged/vertical line vessels off loading in Madeira Beach. These represented about 60-70 percent of the reef fish bottom longlining fleet and about 6 percent of the vertical line fleet identified by Waters' (1996) survey. Four reef fish dealers, and about 401 fishermen (crew and captains) and 40 office workers were employed in fishery related activity. About 70 percent of all grouper landed in Madeira Beach is consumed within about 40 miles of Madeira Beach while 30 percent is sent to other parts of Florida, out of state and to Canada. Closure of the grouper fishery for one month (February 15-March 15) has been estimated to reduce catches by about 10 percent to this market and to reduce annual revenues by about 10 percent. A two-month closure would result in a 17-22 percent reduction in annual landings and a 19-23 percent reduction in annual revenues. Estimates were based on using landings and revenues in 1999 and 2000 as proxies for 2001 landings and revenues annually. Based on Lucas' (2001) analyses, if the one month closure remains permanently, there would be 73 full time jobs lost and as many as 400 full time jobs lost annually in Pinellas County and the State of Florida. However, it should be noted that in 2001, the number of trips of bandit and longline vessels increased over 1999 and 2000 levels so that landings increased, possibly mitigating the effects of the closure.

Appendix G of the Gulf Council's Generic SFA Amendment (GMFMC, 1999) contains community related fisheries data for Monroe County Florida.

7.2 Dealers

There are about 227 dealers possessing permits to buy and sell reef fish species. Based on mail address data, most of them are located in Florida (146), with 29 in Louisiana, 18 in Texas, 14 in Alabama, 5 in Mississippi and 15 outside of the Gulf States region. Waters (pers. comm.) reported that between 1993 and 2001, an average of 214 dealers reported landings of greater amberjack (range 186 -231). Most were in Florida (mean 139; range 119-151), followed by Louisiana (mean 38; range 26-51), Texas (mean 30; range 24-35), Alabama (mean 5; range 1-7), and Mississippi (mean 2; range 1-4). In Florida, most of the dealers were located in Pinellas, Monroe, Lee, Bay, and Okaloosa counties. In Louisiana, most dealers were located in Laforche, Vermilion, and Cameron parishes; and in Texas, Galveston, Matagorda, and Aransas counties.

7.3 Recreational

The recreational component of the greater amberjack fishery in the GOM includes charter boats, headboats (party boats), and private anglers fishing from shore or from private or rental boats. Recreational landings of greater amberjack have been highly variable, but in general, landings have increased from 1981 to 1987 (Cummings and McClellan, 2000). After 1987, landings decreased with a dip in 1990 due to the implementation of a 28 inch FL minimum size limit (Fig. 1) Charter boats land the greatest number of fish, followed by private vessels, and then headboats. Most amberjack caught by the recreational fishery (>60 percent) are caught off the west coast of Florida (Cummings and McClellan, 2000). However, this proportion declined following the implementation of minimum size and bag limits. Catches have been lowest during the winter. Cummings and McClellan (2000) indicated that on average, 33 percent and 41 percent of fish caught are released alive for charter boats and private vessels, respectively. However, recent landings data provided by Turner and Scott (2002) indicate that about 50 percent of greater amberjack caught are released.

Length data of fish landed by the recreational fishery are limited. Cummings and McClellan (2000) report that for several years, the charter boat and private boat catches were not very dissimilar and likely a result of pooling catch data for some years when few lengths were sampled. In general, the private vessel catches were broadly distributed having a peak at about 16 inches FL. Charter boat catches pooled over all years had a peak of about 28 inches FL and headboat catches had a bimodal distribution with a primary peak at 32 inches FL and a secondary peak at 7 inches FL. After 1990, fewer greater amberjack were landed that were shorter than the minimum size limit.

7.3.1 Private Anglers

There are about 2.1 million anglers estimated to be fishing for marine species in the GOM. These anglers targeted drum about 35 percent of the time and spotted sea trout about 33 percent of the time. Red snapper is the most common reef fish targeted by approximately 4.5 percent of intercepted anglers. There are over 500,000 anglers (resident and non-resident) with saltwater licenses in counties in Florida where greater amberjack are landed (Bay, Charlotte, Citrus, Collier, Dixie, Escambia, Franklin, Hernando, Hillsborough, Lee, Levy, Manatee, Monroe, Okaloosa, Pasco, Pinellas, Santa Rosa, Sarasota, Taylor, Wakulla and Walton) (Florida Fish and Wildlife Commission, 2001). Recreational landings of greater amberjack are highest in the panhandle counties of Florida (Florida Fish and Wildlife Conservation Commission, 2001). The highest total number of licenses (resident and non-resident) are in Monroe (79,030), Lee (54,777) and Pinellas (49,080) counties.

Social and economic characteristics of private anglers are collected periodically by the Marine Recreational Economics Survey with an economic add-on survey. The following discussion relies heavily on the economic data add-on conducted during 1997-98 and summarized in Holiman (1999) and Holiman (2000). The typical angler in the Gulf region is 44 years old, male (80 percent), white (90 percent), employed full time (92 percent), with a mean annual household income of $42,700. The mean number of years fished in the state was 16 years for GOM anglers. The average number of fishing trips taken in the 12 months preceding the interview was about 38 and these were mostly (75 percent) one-day trips where expenditures on average were less than $50. Seventy-five percent of surveyed anglers reported that they held saltwater licenses, and 59 percent of them owned boats used for recreational saltwater fishing.

Those anglers who did not own their own boat spent an average of $269 per day on boat fees (Holiman, 1999) when fishing on a party/charter or rental boat. About 76 percent of these anglers who did not own their own boat were employed or self-employed and about 23 percent were unemployed, mostly due to retirement.

7.3.2 Charter Boats, Headboats and Party Boats

Within the Gulf States, there are about 1,907 charter boats/headboat/party boats with both permits that allow them to harvest both reef fish and coastal pelagic fish. The majority of these permits are in Florida (1,194), followed by Texas (300), Louisiana (162), Alabama (159) and Mississippi (92) (NMFS permit file as of June 2001).

Most of the discussion below is taken from two recent studies of the industry: "Operation and Economics of the Charter and Headboat Fleets of the Eastern GOM and South Atlantic Coasts" by Stephen M. Holland, Anthony J. Fedler and J. Walter Milon (1999) and "A Cross-Sectional Study and Longitudinal Perspective on the Social and Economic Characteristics of the Charter and Party Boat Fishing Industry of Alabama, Mississippi, Louisiana and Texas," By Stephen G. Sutton, Robert B. Ditton, John R. Stoll and J.Walter Milon (1999). This latter study has been criticized by some charter industry participants, particularly with respect to the financial sections of the study. Some of the criticisms raised concern the underestimation of revenues and cost of engines.

Overall, about 13.7 percent of charter boats reported targeting amberjack in the Florida Gulf in 1998. About 7.0 percent of headboats reported targeting amberjack in the Florida Gulf in 1998. In the Florida Gulf, the species receiving the most effort from charter boats were grouper, king mackerel and snapper. Gag, red grouper, and snapper species received the most effort from the headboats. From Alabama to Texas, 52 percent of charter vessel operators indicated that they targeted greater amberjack; however, the mean time spent targeting this species was 3.2 percent. The species receiving the largest percentage of total effort for both these groups of fishermen was snapper (Holland et al., 1999).

Between 1987 and 1997, several major changes occurred in the Florida charter and headboat industry. The number of charter boats in the Florida Gulf increased about 16 percent to 615 and that in the Florida Keys increased about 12 percent to 230. Most of this growth occurred along the Florida peninsula coast; in contrast, the number of charter boats in the Panhandle region decreased by 8 percent. The number of headboats in the Florida Gulf increased about 20 percent, mostly along the southwest Florida coast. In contrast, the number of headboats in the Florida Keys decreased 11 percent. Charter passenger trips remained stable at about 848,458 passengers on 180,523 trips in 1997 while headboat passenger trips increased to 1,137,362 passengers on 44,655 trips in 1997 (Holland et. al. 1999).

Between 1987 and 1997, a number of changes also occurred in the charter and headboat industry in Alabama, Mississippi, Louisiana and Texas. The number of charter boats increased about 105 percent to 430, with the increase occurring primarily in Alabama, Mississippi and Texas. In contrast, the number of headboats decreased 12 percent to 23 vessels. The number of passenger trips taken on both charter and headboats increased threefold. In 1997, there were 318,716 charter boat passenger trips and 117,990 headboat passenger trips (Sutton et al. 1999).

7.3.3 Florida Charter and Headboat Industry

Holland et al. (1999) estimated there were 615 charter and 53 headboats located along the Florida Gulf in 1998 (excluding the Keys). Of the charter boat operators sampled in 1998, 52.9 percent held Gulf reef fish charter permits, 56.8 percent held coastal migratory pelagic permits, 14.3 percent held South Atlantic snapper/grouper permits, 5.2 percent held swordfish permits, 7.8

percent held shark commercial permits, 26.6 percent held king and Spanish mackerel commercial permits, 6.5 percent held South Atlantic snapper/grouper commercial permits, 13.7 percent held red snapper commercial permits, and 22.1 percent held commercial Gulf reef fish commercial permits. Of the headboat operators sampled, 76.5 percent held Gulf fish reef charter permits, none held Gulf reef fish commercial permits, and 70.6 percent held coastal migratory pelagic charter permits.

Major activity centers for charter boats in Florida are: Destin, Ft Myers, Ft Myers Beach, Islamorada, Key West, Marathon, Naples, Panama City, Panama City Beach, and Pensacola, The average charter boat was 37 feet in length and carried a maximum of 6 passengers. Most (88 percent) had fiberglass hulls, were diesel fueled (76 percent) with single (41 percent) or dual engines (59 percent). Most offered half-day trips and full-day trips. Only 15 percent offered overnight trips. Average boat fees were $348 for half-day; $554 for full-day and $1,349 for overnight trips. Of the total number of Florida trips, 47 percent were half-day, 50 percent were full day and 3 percent were overnight trips. Almost all headboat trips (98 percent) were made to federal waters (Holland et al., 1999).

Major activity centers for headboats in Florida are: Clearwater, Destin, Ft. Myers, Ft. Myers Beach, Islamorada, Key West, Marathon, Panama City and Panama City Beach. The average headboat in Florida was 62 feet in length and carried a maximum of 61 passengers. About 51 percent had fiberglass hulls and are diesel fueled (97 percent) with single (8 percent) or dual (92 percent) engines. Most (86 percent) offered half-day trips and full-day (64 percent) trips but one in the survey offered overnight trips. Average Florida headboat fees were $29 for half-day and $45 for full day trips. Of the total number of trips, 80 percent were half-day and 20 percent were full day. About two-thirds of these trips were in federal waters offshore and 36 percent of the headboats took 100 percent of their trips in federal waters (Holland et. al., 1999).

The mean age of Florida charter boat operators was 46 years with 82 percent between the ages of 31-60. Sixty-three percent were married and 15 percent were divorced. Florida charter boat operators had an average of 13 years of education, with 95 percent having at least 12 years of education and 34 percent with 16 years or more. About 98 percent of the operators were male. Most (90 percent) operate on a full-time basis and about 61 percent reported 100 percent of their household income was from the charter business. Eighty percent have lived in their home port county for more than 10 years and have operated their boat out of their home port county for an average of 15 years. Twenty-four percent of them belonged to their local chamber of commerce, and 34 percent belonged to their local charter boat association (Holland et. al., 1999).

The mean age of Florida headboat operators was 48 years with 84 percent between the ages of 31-60. Seventy-eight percent were married and 11 percent were divorced. Florida headboat operators had an average of 13 years of education, with 100 percent having at least 12 years of education and 22 percent with 16 years or more. About 86 percent of the operators were male. All operate on a full-time basis and about 92 percent reported that 100 percent of their household income was from their headboat business. Ninety-four percent have lived in their homeport county for more than 10 years and operated their boat out of their homeport county for an average of 19 years. Eighty-one percent of them were members of their local chamber of commerce and 44 percent were members of a local headboat association (Holland et al., 1999).

7.3.4 Charter and Headboat Industry in Alabama, Mississippi, Louisiana and Texas

Sutton et al. (1999) estimated there were 430 charter and 23 headboats operating out of the four-state area. Of the charter boat operators sampled in 1998, 85.4 percent held Gulf reef fish charter permits, 83.3 percent held coastal migratory pelagic permits, 5.2 percent held South Atlantic snapper/grouper permits, 4.2 percent held swordfish permits, 6.3 percent held shark commercial permits, 6.3 percent held king and Spanish mackerel commercial permits, 2.1 percent held South Atlantic snapper/grouper commercial permits, 14.6 percent held red snapper commercial permits, and 11.5 percent held commercial Gulf reef fish permits. Of the headboat operators sampled, 100 percent held Gulf reef fish charter permits, 95.2 percent held coastal migratory pelagic fish charter permits, none held South Atlantic snapper/grouper permits or swordfish commercial permits or shark commercial permits or king and Spanish mackerel commercial permits or South Atlantic snapper/grouper commercial permits or red snapper commercial permits, and 9.5 percent held Gulf reef fish commercial permits.

Major activity centers for charter boats in the four-state area are: South Padre Island, Port Aransas, and Galveston/Freeport in Texas; Grand Isle-Empire-Venice in Louisiana; Gulfport-Biloxi in Mississippi; and, Orange Beach-Gulf Shores in Alabama. The average charter boat was 39 feet in length and carried a maximum of 12 passengers. Alabama had the largest charter boats at an average length of 46 feet and an average capacity of 9 passengers while Texas had the smallest charter boats at an average length of 35 feet and an average capacity of 9 passengers. Most had fiberglass hulls (81 percent), were diesel fueled (72 percent) with single (27 percent) or dual engines (73 percent). Most offered half-day trips (63 percent) and full-day trips (98 percent). About 48 percent offered overnight trips. Average boat base fees were $417 for half-day; $762 for full-day and $1,993 for overnight trips. Of the total number of trips taken by operators, 16 percent were half-day, 78 percent were full day and 6 percent were overnight trips. (Sutton et al., 1999).

Major activity centers for headboats in the four-state area are: South Padre Island, Port Aransas, and Galveston/Freeport in Texas and Orange Beach-Gulf Shores in Alabama. The average headboat was 72 feet in length with a total capacity of 60 passengers. Most boats had an aluminum hull (67 percent) and are diesel fueled (100 percent) with dual (100 percent) engines. All boats offered half-day trips, 81 percent offered full-day, and 57 percent offered overnight trips. Average headboat base fees were $41 for half-day trips, $64 for full-day trips and $200 for overnight trips. Of the total number of trips, 25 percent were half-day, 67 percent full-day and 8 percent overnight trips. (Sutton et. al., 1999).

The mean age of charter boat operators in the four-state area was 47 years with 86 percent between the ages of 31-60. Eighty-two percent were married and 8 percent were divorced. Charter boat operators had an average of 14 years of education, with 95 percent having at least 12 years of education and 26 percent with 16 years or more. Most (91 percent) operate on a full-time basis and about 50 percent reported 100 percent of their household income was from the charter business. About 78 percent lived in their home port, and on average they have lived near their home port for 24 years and have operated their boat out of their home port county for an average of 14 years. Forty percent of them belonged to their local chamber of commerce, 60 percent belonged to their local charter boat association, and 61 percent were members of some other fishing-related association. (Sutton et. al., 1999).

The mean age of headboat operators in the four-state area was 49 years with 67 percent between the ages of 31-60. Eighty-one percent were married and none was divorced. Headboat operators had an average of 12 years of education, with 81 percent having at least 12 years of education and 10 percent with 16 years or more. All operated on a full-time basis and about 78 percent reported that 100 percent of their household income was from their headboat business. Ninety-one percent lived near their home port, and on average they have lived near their home port for 26 years and have operated a headboat out of there for 13 years. Eighty-one percent of them were members of their local chamber of commerce, 52 percent were members of a local headboat association, and 44 percent were members of some other fishing-related association. (Sutton et al., 1999).

7.4 Social and Economic Features

"Fishing community" is defined in the M-SFCMA amended in 1996 as "a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community" [M-SFCMA §3(16)]. In addition, the National Standard Guidelines (May 1, 1998; 63FR24211) define a fishing community as a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent service and industries (for example, boatyards, ice suppliers, tackle shops).

This section reviews the literature on fishery-dependent communities and presents a listing of fishing communities that are related to reef fish fishing. From this literature, places previously identified as fishing communities along the GOM are in Florida: Apalachicola, Carrabelle, Cedar Key, Clearwater, Cortez, Destin, Ft. Myers, Ft. Myers Beach, Key West, Madeira Beach, Marathon, Naples, Panacea, Panama City, Pensacola, St. Petersburg, Steinhatchee, Tampa and Tarpon Springs; in other Gulf states: Orange Beach, AL, Biloxi, MS, Freeport, TX, Galveston, TX, Port Aransas, TX, South Padre, TX.

This section also includes a baseline profile for many of the impacted communities. This identification process and the baseline profiles used available data from previous studies as well as NMFS databases on landings, permits, and dockside values, as well as data from the U.S. Census.

7.5 Fishing-Dependent Communities: Previous and Continuing Studies

The literature on fishing-dependent communities addresses three areas: identification of the communities, selection of variables appropriate for assessment, and the assessment method itself. Community identification and selection criteria can be very complex or very simple. A simple first level approach would involve examining social and demographic variables at the county level where some fishing activity occurs. A more complex approach involves attempting to gather data and information on as small an entity as possible that qualifies as a fishing community. As the definition of community moves farther from traditional economic or political entities, less official data are available and more field research is required to complete the baseline profile and include relevant social and cultural value data.

The Pacific Fishery Management Council's web site (www.pcouncil.org) presents some baseline fishery descriptions of the West Coast Marine Fishing Communities. These communities are counties where any activity related to Council regulated fisheries occurs. These descriptions provide U.S. Census, county level statistical and demographic data on communities engaged in federally or state regulated fisheries in California, Oregon, and Washington. These data include recent and projected populations, age structure, ethnic and racial characteristics, educational attainment, employment characteristics, labor and proprietor income information, export bases, landings data, and ex-vessel revenue information.

Jacob et al. (2001) developed a protocol for defining and identifying fishing-dependent communities in accordance with National Standard 8 of the M-SFCMA through a project titled "Defining and Identifying Fishing-Dependent Communities: Development and Confirmation of a Protocol," funded by the Marine Fisheries Initiative (MARFIN) program. The project used central place theory to identify communities. A central place is where services, goods and other needs are met for the residents in the central place, as well as for those in surrounding neighborhoods (Richardson, 1979). It differs from using an administrative unit such as county boundaries, which may distort smaller communities or locality data as they are aggregated. The authors believed central place theory works well for defining and identifying fishing-dependent communities or localities as it provides a geographic basis for including multiplier effects that capture forward and backward linkages. In most fishing communities, forward linkages include those businesses that handle the fish once it is brought to the dock, such as fish houses, wholesalers, exporters, and seafood shops and restaurants. Backward linkages are the goods and services that fishermen depend upon such as boat building and repair; net making and repair; marinas; fuel docks; bait, tackle and other gear venders.

Jacob et al. (2001) compiled data for Florida from the U.S. Census, Florida Fish and Wildlife Conservation Commission, NMFS, Bureau of Economic Analysis, and Bureau of Labor Statistics by zip code, then aggregating the zip code data by population centers and their surrounding neighborhoods into central places. They conducted personal interviews with key informants in a subset of possible fishing-dependent communities in order to evaluate the usefulness of combining central place theory with the zip code based empirical approach. The authors expected that their approach would produce a typology of commercial and recreational fishing-dependent communities. This typology could be used to generate development strategies for these communities as they adjust to changes in management, the environment, and demographics.

Using their protocol of defining fishing-dependent communities, Jacob et al. (2001) initially determined 5 communities as commercially fishing dependent and 7 communities as recreationally fishing dependent. Further investigations resulted in validating 5 communities as commercially fishing dependent. The authors expressed little confidence in the data used and indicators developed based on such data to confirm the other communities as recreationally fishing-dependent communities. The five commercially fishing-dependent communities are: Steinhatchee, Apalachicola, Panama City, Ochopee/Everglades City, and Panacea.

Kusel's (1996) approach is to define a forest-dependent community as a place with a traditional geographical sense, but combine that definition with a measure of place identity. That is, how do people in that place relate to the natural resource base beyond economic or social measures found in the U.S. Census (e.g., population, education achievement, poverty)? Kusel (1996) examined six forestry regions in California. They used community workshops to involve local expert knowledge. They began with census block groups and built up to the county levels and then explored the levels of identity that various groups had with particular definitions of community. One of their major findings was that socioeconomic data were not a good predictor of community identity.

Dyer and Griffith (1996) conducted a baseline study of communities dependent on the multispecies groundfish fishery (MGF) in New England and the mid-Atlantic. The study examined the deterioration of social, human and cultural capital that would occur with a complete collapse of the MGF. Dyer and Griffith (1996) drew on the concept of Natural Resource Community (NRC) as a basis of their definition of a fishery-dependent community. NRCs exist where individuals have dependence on a "renewable natural resource and are rooted in local history and local traditions and derive social and cultural identity from a sense of place whose life rhythms rise and fall with populations of fish, seasonal conditions at sea and the increasingly complex regulatory environment entangling their tradition." They also consider that this fishing activity may be embedded in wider communities and towns contributing to the cultural diversity of those communities and towns (Dyer and Griffith, 1996).

Dyer and Griffith (1996) researched major MGF communities as well as smaller ports. The research areas were initially selected using licensing data, vessel tonnage listings, permit data and information from key informants such as state enforcement personnel, NMFS port agents and local industry members. Additional social and economic data were collected during community visits.

In order to compare the various fishing communities, Dyer and Griffith (1996) developed a Fishery Dependence Index using measures of infrastructure and support related to fishing such as: numbers of repair and supply facilities, fish dealers and processors; the presence or absence of religious and secular art and architecture dedicated to fishing; and numbers of MGF permits and vessels. Variations in fishery dependency both between and within ports were assessed. Ports that were more isolated and less flexible in terms of using other fish stocks and gear types were more fishery dependent; ports where particular classes of fishermen within the industry were not well integrated into other fisheries or economic entities (e.g. tourism) were ranked more dependent on the MGF fishery. Ports with historical and cultural indicators of reliance on fishing (mariner museums etc.) were ranked more dependent. Competition and conflict amongst participants reflected perceptions that the resource was scarce and therefore the participants more dependent on it (Dyer and Griffith, 1996).

Wilson et al. (1998) conducted a social and cultural impact assessment of the Highly Migratory Species (HMS) Fishery Management Plan (FMP) and the amendment to the Atlantic Billfish FMP. This report combines baseline descriptions of demographic, social, cultural and economic aspects of affected fishing communities with an analysis of potential impacts--both quantitative and qualitative--on these communities. The study selected a sample of fishing communities in Puerto Rico, Louisiana, Florida, North Carolina, New Jersey and Massachusetts to illustrate the range of potential impacts of the proposed regulatory changes. The communities were selected partly by examining landings data, but with a recognition that the fishing fleets employing particular gears are dispersed geographically; this is to say that concentrated landing sites and the location of non-centralized fishing communities often are not identical. The existence of previous studies and the suggestions of HMS and Atlantic Billfish industry Advisory Panels also influenced the choice of which communities were studied.

Wilson et al. (1998) outlined three categories of impacts on their selected communities: those that "affect the volume of money that is going through the community;" those that "affect the flexibility of the fishing operations;" and those that "impose direct costs on fishing operations." The following table summarizes the categories of regulatory impacts:

	Category of impact on fishery operation:		
	Volume	Flexibility	Direct Costs
Type of regulation:	Quotas Size limits Bycatch limits	Derby organization of quota systems Time closures Area closures Controls on soak time Gear prohibitions and restrictions	VMS Permits Reporting Industry-financed observers

In order to measure social and cultural impacts, they refer to the "economic vulnerability" of the fishery in terms of competition faced in supply and marketing and the extent of social capital or community networks available. Social capital are those aspects of a community's social structure that allow people with little financial capital to accumulate the symbolic and material means to participate in an economic activity. Social capital consists of trust, relationships and support institutions such as churches and other means that enable economic capital to make necessary connections (Wilson et al., 1998).

Wilson et al. (1998) measured fishery dependence with demographic variables, percentage of employment in fishery related industries, income for those industries, landings by species, fishing related businesses (marinas, boat rental shops, dive shops, boat dockage and repair facilities, tackle and bait shops, tourism related to fishing). He also documented the social capital of the fishing community with numbers of recreational or commercial fishing associations the fishermen belonged to or at which the fishermen met. Wilson's study identified several fishing-dependent communities along the Gulf coast.

Griffith (1996) categorized fishermen's dependence on resources in North Carolina by examining: 1) motivation for fishing (e.g., income, recreation, subsistence); 2) percentage of income derived from fishing; 3) time commitment (months/years of experience); 4) flexibility index, from low to high, measuring the numbers of gears, fisheries and species with which the fisherman is engaged; 5) number of different kinds of vessels; 6) number of crew involved in fishing operations; 7) relationship to the seafood marketing/processing sector; 8) principal social problems; 9) principal biological issues; 10) most desired regulations; and 11) most disruptive regulations. Using this system, fishermen were grouped into 7 categories on a continuum from full time, owner operator commercial fisherman to affiliated recreational fisherman (angler). This classification scheme goes beyond simple ranking by income earned from the fishery and introduces economic relationships with crew and market. Ethnographic data also were included in this analysis, including investigations of fishermen's main social and biological concerns related to fishing; these data contributed to an evaluation of how the various categories of fishermen would be affected by a range of proposed licensing systems.

Griffith (1996) also used cultural mapping of fishing locales throughout North Carolina, by using questionnaires, in-depth interviews, and focus groups. Secondary sources also were consulted, such as fishery organization membership lists and data collected by the N.C. Department of Marine Fisheries. Among the respondents were recreational anglers, charter boat captains and other personnel, commercial fishermen and families, seafood processing employees, and employees and collaborators of regulatory agencies in North Carolina and other states. To reduce bias introduced by conflicting political perspectives on given topics, Griffith (1996) also triangulated the qualitative data that were collected. This is a process by which the researcher confirms data by hearing it reported from more than one interviewee.

McCay (2000) suggests that assessments of regulatory impacts on fishing-dependent communities consider not only geographic definitions of communities and economic characteristics therein, but also the level of vulnerability or resilience, of fishing communities and operations. That is, questions of fishing dependence and "sustained participation" in fisheries must consider how able participants in a given fishery can move among fishery sectors, and how able they are to move out of the fishery altogether into alternative employment opportunities. The studies reviewed took into account not only the economic characteristics but also the demographic and social characteristics of the areas where fishing activity occurs. Several of them developed strategies for assessing and or ranking these characteristics and variables. The following table summarizes the various measures of fishing dependence.

Social, Cultural and Economic Indicators of Fishing Dependence

Measures of fishing dependence from Wilson et al. (1998):

- Economics, including percent employment in fishery-related industries, and unemployment levels, and income
- Fisheries characteristics, including landings by species by various sectors
- Fishing-related businesses, for example numbers of marinas, rentals, snorkel and dive shops, boat dockage and repair facilities, tackle and bait shops, fish houses, and lodgings related to recreational fisheries industry
- Fishing-related activities, such as fishing tournaments and seafood festivals
- Presence of organizations, such as recreational or commercial fishing associations.

Measures of fishing dependence from Dyer and Griffith (1996):

- Numbers of permits compared to operational vessels
- Numbers of suppliers of equipment
- Numbers of dealers/ processors
- For seafood handling sectors (icing, shipping, processing), percentage of business derived from the fishery in question, and average employment per plant
- Isolation or integration of the fishery into alternative economic sectors. Do the fishers represent a political-economic enclave or are they integrated into the community?
- Vessel types (large, small, mixed?)
- Percent of population in fishery or fishery-related industry
- Level of competition within a port between different components of the MGF fishery

Measures of fishing dependence from Griffith (1996):

- Motivation for fishing (income, subsistence, recreation)
- Percentage of income derived from fishing
- Time commitment (number of months per year, and number of years of experience, etc.)
- Flexibility index (number of species able to fish, gears/vessels, territories, etc.)
- Number of different kinds of vessels
- Number of others (e.g. crew) involved in fishing operations
- Relationship to the seafood marketing/processing sector
- Seasonal variation in fishing activity
- Vessel sizes and sizes of crew by port/ dockage site
- Diversity of species targeted, gear, type and size and vessel by port/ dockage site
- Diversity/ flexibility of individual fishermen
- Degree of localization; i.e., commitment to a particular dockage site and landing facility
- Nature of a fishing site's "cultural foci." These foci are instrumental in "anchoring, directing, and orienting fishing behaviors in ways that both confine fishermen to specific territories and fishing practices and provide them with opportunities to expand those fishing practices" (Griffith, 1996)

  Examples of "cultural foci":
  - fish houses (icing and packing of seafood)
  - processing establishments
  - clusters of fishing vessels and gear, usually near launching facilities
  - private family fishing locations
- Spatial patterns and organizational features (Are fishing operations concentrated around processing/marketing facilities, or dispersed? Are fishing operations household-organized or organized by seafood dealers and processors?). These features will affect fishing behaviors and responses to new regulations.

7.6 Status of the Stock

The first assessment of the GOM greater amberjack stock was conducted in 1996 (Cummings, 1996; McClellan and Cummings 1996) and was reevaluated in August 2000 (Turner et al., 2000). The most recent stock assessment was reviewed by the RFSAP and used a calibrated virtual population analysis (VPA) to obtain estimates of population abundance and mortality rates using data through 1998 (GMFMC 2000a; Turner et al., 2000). Inputs to the assessment were obtained from data on catch at age and selectivity (Cummings and McClellan 2000), from an index of abundance from private and charter boats (Cummings 2000), and from indices of abundance from the headboat and handline fisheries (Turner 2000a, 2000b). Sensitivity analyses included examination of various combinations of the three indices available for tuning, truncation of the time series for the three indices to a period in which size limits were generally constant, examination of alternatives for the fishing mortality (F) ratios for the terminal age group (fixing or estimating F), examination of two alternative stock-recruitment relationships, and an examination of the assumed level of M (0.15, 0.25, 0.35).

The RFSAP was presented with a variety of assessment options of which the RFSAP chose four combinations to consider (GMFMC, 2000a). Those were: 1) using all three tuning indices in conjunction with the F ratio fixed at 1 and the hockey stick recruitment function; 2) using two indices in conjunction with F ratio fixed at 1 and the hockey stick recruitment function; 3) using one index in conjunction with F ratio fixed at 1 and the hockey stick recruitment function; and 4) pooled outputs from the three tuning options in conjunction with F ratio fixed at 1 and the hockey stick recruitment function. The RFSAP received estimates for yield, spawning stock biomass (SSB)/SSB_{MSY}, SSB/MSST, $F/F_{30\% SPR}$, and $F/F_{40\% SPR}$ for the years 1987-98 and projected estimates for 1999 and 2000 under current fishing.

All four combinations indicated that the greater amberjack stock was overfished in 1998 based on the MSST (GMFMC, 2000a). The best estimate of stock size (i.e., using the median value) in 2000 showed that the stock is at less than one-half of MSST (using the default control rule) (Figure 6). Although some of the combinations indicated that overfishing was occurring (projected for 2000 as 14 percent above $F_{30\% SPR}$ (3 indices), 54 percent below (2 indices), 67 percent above (1 index) and equal to $F_{30\% SPR}$ (joint distribution)), the RFSAP concluded that the best available information was based on the 3 index option because there was no reason to discount any of the tuning indices. The assessment results also indicated that reductions in fishing mortality were required to eliminate overfishing. However, the assessment did not take into account recent management actions. The RFSAP recognized that the most recent (as of 1997) estimates of F may not represent the full effects of the closed season (started in 1998) and bag limit on greater amberjack, and bag and minimum size limits that are presently in place for lesser amberjack/rudderfish (often mistaken for greater amberjack). The RFSAP believed that these measures were adequate to achieve the required reductions in F. Therefore, they concluded that the stock may be overfished but may not be experiencing overfishing if these recent regulations have reduced fishing mortality. Turner and Scott (2002) did some updated projections of the stock using data through 2000. Their analysis indicated that overfishing had been halted (the median estimate of $F/F_{30\% SPR} < 1.0$; Figure 7).

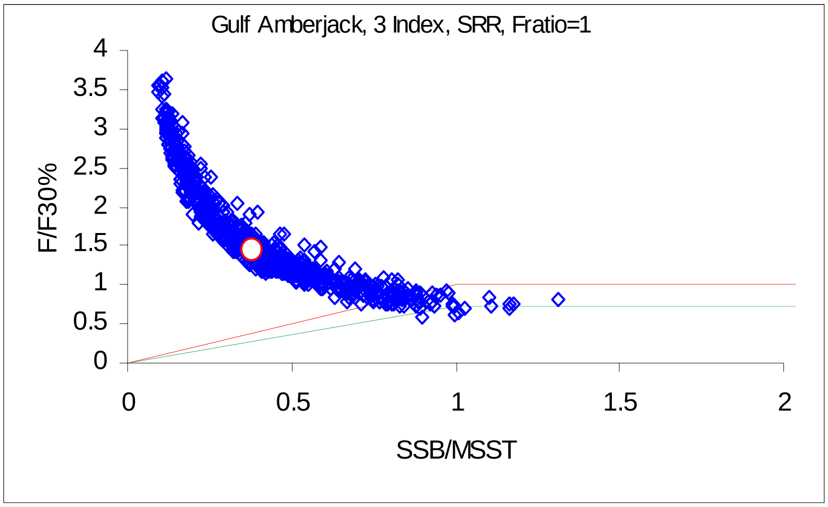

Figure 6. Dispersion of projected status of Gulf greater amberjack at the start of 1999 with respect to possible management control rules. The smaller points are individual bootstrap results and the larger point is the median. Source of plot is from Turner and Scott (2002).

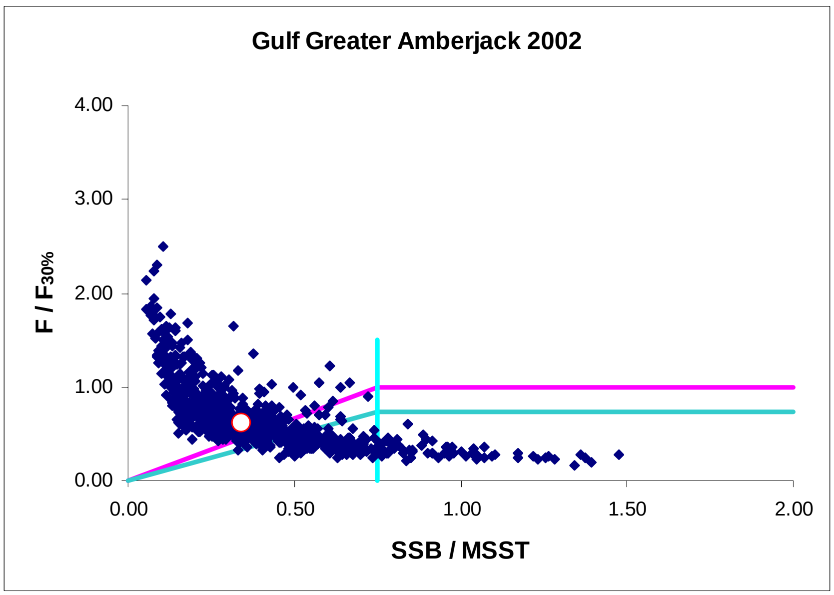

Figure 7. Dispersion of projected status of Gulf greater amberjack at the start of 2003 with respect to possible management control rules. The smaller points are individual bootstrap results and the larger point is the median. Source of plot is from Turner and Scott (2002).

8.0 ALTERNATIVES INCLUDING PROPOSED ACTIONS - Greater Amberjack Rebuilding Plan

8.1 Introduction

In 1996, Congress passed the Sustainable Fisheries Act (SFA) that implemented new requirements for marine fisheries managed by the Gulf Council and other regional management councils. The Council had responded to this by developing the Generic SFA Amendment that included among other actions, the specification of higher standards for overfishing and overfished criteria that would restore fishery stocks to maximum sustainable yield (MSY) levels. However, since the time the amendment was submitted to the NMFS, the NMFS had determined that biomass-based proxies for MSY, optimum yield (OY), and minimum stock size threshold (MSST) were superior to fishery mortality-based reference points such as spawning potential ratio (SPR) that were used in Council's amendment. Therefore, the NMFS disapproved the Council's SPR-based reference points of MSY, OY, and MSST. However, SPR-based thresholds that the Council chose to define overfishing (with the exception of red snapper) were allowed by the NMFS.

In order to understand how overfishing and overfished criteria are developed, it is important to understand MSY. According to the National Standard Guidelines (NSG) developed by NMFS, MSY is defined as the "largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions." Associated with MSY is a stock size (biomass at MSY or B_{MSY}) that is the "long term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate (F) is constant." The MSY control rule means a harvest strategy that would be expected to result in a long-term average catch approximating MSY and maintain the stock at B_{MSY}.

The MSST and the maximum fishing mortality threshold (MFMT) are two important parameters dictated by the NSGs for use in the MSY control rule regarding overfished and overfishing status for a stock, respectively. These two parameters are called status determination criteria in the NSGs. If the current stock size is below MSST, then the stock is overfished. If the current F is above MFMT, then overfishing is occurring on the stock.

In selecting a MSST, NMFS NSGs advise that "to the extent possible, the stock size threshold should be set equal to whichever of the following is greater: one-half the MSY stock size (B_{MSY}), or the minimum stock size at which rebuilding to the MSY level would be expected to occur with 10 years if the stock or stock complex were exploited at the MFMT." NMFS technical guidance for the precautionary approach to the setting of OY has recommended setting MSST so that it is related to the natural mortality rate (M) of a stock. This guidance suggests that MSST should be equal to $0.5 * B_{MSY}$ or $(1-M) * B_{MSY}$; whichever yields the largest biomass value. The theory behind using M as an indicator of what level to set MSST is that a stock fished at F_{MSY} (the F that will achieve MSY) should fluctuate around B_{MSY} on a scale related to M (i.e., populations with small values for M are generally more stable, but less productive than populations that have higher values of M). As an example of how these measures could be applied, the Gulf of Mexico greater amberjack stock has an estimated value of M equal to 0.25 (Turner et al., 2000). Therefore, the MSST value recommended by NMFS technical guidance would be 1-M or $0.75 * B_{MSY}$ because this MSST level is greater than $0.5 * B_{MSY}$. For a species like dolphin where M is greater than 0.5 (estimated M between 0.68 and 0.80; Prager, 2000), the MSST value recommended by NMFS technical guidance would be $0.5 * B_{MSY}$.

The other parameter needed for the status determination of a stock is MFMT. This is a fishing mortality threshold that should not exceed F_{MSY}. Fishing at a level above MFMT for a period of one or more years would constitute overfishing. In general, MFMT is set at F_{MSY} or some proxy of F_{MSY}. MFMT values for reef fish (with the exception for red snapper) were approved by NMFS in the SFA Generic Amendment and were associated with the F that would generate a yield associated with a certain SPR level thought to approximate MSY. For Gulf of Mexico greater amberjack, the MFMT value is the F value needed to maintain a population at 30 percent static SPR ($F_{30\%\ SPR}$).

The other reference point needed for a stock or stock complex as a result of the SFA is OY. Optimum yield is a target reference point that should be set no higher than MSY (a limit reference point). OY could be set through either an analysis of the risk associated with various yield levels and selecting the appropriate risk averse strategy, or by selecting a particular yield level where the probability of exceeding the limit (or MSY) is below some level. One method recommended in NMFS Technical Guidance is to set OY at the yield corresponding to the F value that is 75 percent of F_{MSY} (i.e., 0.75 * F_{MSY}) (Restrepo et al., 1998). An analysis of the corresponding OY associated with fishing at this F value found that OY would be 94 percent or better of MSY once the stock has achieved equilibrium. Because F refers to the proportion of fish that are removed by fishing each year, the proportion of fish being removed from the stock at F_{OY} (0.75 * F_{MSY}) is less than the proportion removed at F_{MSY}. At this lower harvest rate, the stock size could increase above B_{MSY}. Therefore, OY could be more than 75 percent of MSY because the stock has a chance to build to a level higher than B_{MSY} [B_{OY} was estimated to be between 125-131 percent of B_{MSY} in Restrepo et al.'s (1998) analyses].

Greater amberjack stocks were declared overfished by the NMFS and the SFA requires that the stock be rebuilt to B_{MSY}. Under current NMFS recommendations, there are three scenarios that could be used to rebuild stocks to non-overfished levels. The constant catch scenario holds catch at a constant level so that over the length of the rebuilding period, enough fish escape the fishery and add to the stock size until it reaches B_{MSY}. This method is advantageous in that the initial harvest level needed for the rebuilding plan is higher than that set in other strategies. However, as the stock increases in size, catch-per-unit-effort (CPUE) may increase to a level where the needed harvest could be filled within a very short time period and the fishery would need to be closed. Additionally, as the stock size increases, the participants in the fishery may want an increase in harvest because fish are observed to be abundant and the participants may wish regulations to be relaxed. The second scenario (constant F) holds F constant at a level that would allow a stock to rebuild within the required time period. Under this scenario, harvest is set as a constant proportion of the stock that could be removed. Unlike the constant catch scenario, as the stock size increases, so could the expected harvest (i.e., as the stock size approaches B_{MSY}, the expected harvest will be approaching MSY and OY). The main disadvantage to this scenario is that early in the rebuilding plan, the needed harvest level may need to be at a very low level and possibly at a point where the economic viability of a fishery is severely affected. The final scenario is a combination of the constant catch and constant F scenarios. In this scheme, catch is initially held constant until a point where any drop in harvest needed to get to a constant F scenario is minimized. The advantage of this type of scenario is that it would minimize the initial low harvest for the fishery early in the rebuilding program (as could occur in the constant F scenario) and would allow the harvest for the fishery to increase during the later part of the rebuilding period as the stock size increases.

Rebuilding plans listed in Section 8.2.2 are consistent with the preferred targets and thresholds that are presented in Section 8.2.1. Alternatives 1-5 in Section 8.2.2 are based on MSY and

OY proxies equal to the yield associated with $F_{30\%SPR}$ and $F_{40\%SPR}$, respectively and are the Preferred Alternatives in Sections 8.2.1.1 and 8.2.1.2. For those rebuilding plans managed for yields consistent with $F_{30\%SPR}$, this would mean that the OY proxy is equal to the MSY proxy. However, this proxy is less than the 20 percent SPR OY proxy that is currently in place from Reef Fish Amendment 1. Harvest levels associated with a lower level of F ($F_{40\%SPR}$) were recommended by the RFSAP (GMFMC, 2000a) until the rebuilding target is achieved. Currently, the estimated value of $F_{40\%SPR}$(=0.18) is 72 percent of the estimated value of $F_{30\%SPR}$ (=0.25). While these levels of F are quite different, the expected decrease in harvest is less severe and in line with NMFS guidance. In the NMFS Technical Guidance document on National Standard 1 (Restrepo et al. 1998), a precautionary fishing mortality target set at 75 percent of F_{MSY} gave yields of approximately 94 percent or higher of MSY. This occurs because the stock biomass is able to build to between 125 percent and 131 percent of the stock biomass associated with MSY level. In the case of greater amberjack, the yield derived from a $F_{40\%SPR}$ is 89 percent of the yield derived from fishing at F_{MSY} ($F_{30\%SPR}$) after the stock is rebuilt (Table 1).

The M-SFCMA specifies that rebuilding plans should specify a time period for ending overfishing and rebuilding the fishery. This time period should "be as short as possible, taking into account the status and biology of any overfished stock, the needs of the fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock of fish within the marine ecosystem." The time period should also "not exceed 10 years except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise."

Turner et al. (2000) estimated that it would take six years to rebuild greater amberjack in the absence of fishing mortality. However, because the stock status has improved somewhat since 1998 (the last year of data used in the 2000 stock assessment) based on updated projections by Turner and Scott (2002), the time period in which the stock could be rebuilt in the absence of fishing mortality is probably less than six years. This conclusion is based on alternative rebuilding schedules provided by Turner and Scott (2002) that are able to rebuild the stock to B_{MSY} within six to ten years with some harvest. These alternatives are considered in Section 8.2.2. Harvest limits based on the yield associated with F_{OY} would rebuild the stock more rapidly than by using yields associated with F_{MSY}.

In rebuilding the greater amberjack stock, the Council's main control instruments are total allowable catch (TAC) (implicit or explicit) and associated regulatory measures to constrain harvests to the chosen TAC. In developing a TAC, the Council may adopt either a constant catch or constant F strategy. Under a constant catch strategy, a TAC is generally maintained at the same level over the rebuilding period whereas under a constant F strategy, a TAC is generally set at lower levels at first and gradually adjusted upwards. Under either a constant catch or constant F strategy, a TAC may be considered explicit or implicit. An explicit TAC, also known as "hard" TAC, is binding in the sense that the commercial or recreational sector is closed once their respective allocations are reached. A recent court opinion highlighted some the negative aspects of hard TACs (Conservation Law Foundation vs. Donald Evans, Civil Action No. 00-1134, United States District Court for the District of Columbia, Remedial Order Opinion). These were: 1) that a hard TAC program must have access to real time catch data so that harvest can be halted once a quota is reached; 2) that a hard TAC system may actually increase discard mortality of a species in a multispecies fishery because the species the TAC is applied to will still be caught after the quota is filled; 3) that a poorly planned TAC may put fishermen's lives in jeopardy because fishermen would feel compelled to catch as many fish as possible prior to the quota being filled (race to fish) regardless of weather or vessel safety conditions; and 4) that in the above race to fish, fishing effort may be concentrated during critical periods in a species survival (e.g., the spawning season). An implicit TAC, also known as "soft" TAC, does not require closure of the commercial or the recreational fishery when their respective allocations are reached. An implicit TAC requires only an adjustment of regulatory measures that are deemed to effectively constrain both the commercial and recreational sectors to their respective allocations.

Once a TAC is established, it is generally allocated among the various user groups, mainly the commercial and recreational sectors. Similar to TAC, an allocation may be either explicit ("hard") or implicit ("soft"). An explicit allocation is considered a quota, and generally the fishery is closed when that quota is reached. Current rules for commercial/recreational allocation in the reef fish fishery stipulate the use of proportional commercial/recreational sectors' landings for the period 1979-1987 as the basis for allocation, but these rules can be modified by the Council through a plan amendment (see Amendment 1 to the Reef Fish FMP).

Explicit and implicit TACs and allocations have been used in Gulf fisheries. For example, explicit TACs have been adopted for red snapper and king mackerel fisheries; on the other hand, an implicit TAC has been adopted for the shallow-water and deepwater grouper fisheries. The red snapper and king mackerel TACs are explicitly allocated between the commercial and recreational sectors, but due to the difficulty of real time monitoring of recreational catches, only the commercial red snapper and king mackerel sectors are now subject to quota closures. The recreational component of the red snapper fishery is subject to fixed time closure while the recreational component of the king mackerel fishery is mainly controlled through bag (and minimum size) limits. These regulations for the recreational red snapper and king mackerel fisheries have been determined to control harvests to the sector's allocation. For the shallow-water and deepwater grouper fisheries, the implicit TAC is explicitly allocated only to the commercial sector, which is subject to quota closure. The recreational sector is mainly controlled through minimum size and bag limits.

At present, there is neither an implicit/explicit TAC nor a commercial/recreational allocation established for greater amberjacks in the Gulf. However, both the commercial and recreational sectors are subject to regulations that are designed to control harvest. A recent stock assessment (Turner and Scott, 2002) indicates that current regulations appear to be effectively constraining the harvest of greater amberjack such that the harvests in the last three years (1999-2001) are each below the first year's recommended harvest level for the most conservative rebuilding strategy. To a great extent, maintaining current regulations appear to be sufficient to rebuild the stock. At this time then, adoption of additional regulations particularly in the form of an explicit TAC and allocation is not needed. For this reason, the rebuilding plan proposed in this amendment only provides for an implicit TAC. It should be noted, however, that if future stock assessments indicate the need for additional regulations, the Council will impose those regulations, which may include an explicit TAC. One issue that needs to be addressed when considering an explicit TAC is the appropriate commercial/recreational allocation. The fishery has undergone substantial change over time such that using the 1979-1987 landings history may no longer be appropriate as the basis for allocating an explicit TAC between the commercial and recreational sectors. Consideration of an appropriate allocation is probably better addressed when harvest in the fishery significantly deviates from a chosen rebuilding path such that an explicit TAC is needed.

To minimize confusion regarding the use of various types of TAC and allocations, the succeeding discussions adhere to the use of certain terminologies. The terms "harvest goal" (HG), "commercial harvest goal" (CHG), and "recreational harvest goal" (RHG) will be used to respectively refer to implicit TAC, implicit commercial allocation, and implicit recreational allocation. The terms "TAC" and "allocation" will be used to respectively refer to explicit TAC and explicit allocation, unless otherwise clearly noted.

8.2 Management Measures

8.2.1 MSY, OY, MFMT (overfishing), and MSST (overfished) Alternatives for Greater Amberjack

8.2.1.1 MSY Alternatives

Preferred ==> **Alternative 1: Maximum Sustainable Yield (MSY) for greater amberjack is the yield associated with $F_{30\%\ SPR}$ (proxy for F_{MSY}) when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{30\%\ SPR}$ to be 9.5 million pounds (mp).**

Alternative 2: MSY for greater amberjack is the yield associated with $F_{25\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{25\%\ SPR}$ to be 9.9 mp.

Alternative 3: MSY for greater amberjack is the yield associated with $F_{35\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{35\%\ SPR}$ to be 9.0 mp.

Alternative 4: MSY for greater amberjack is the yield associated with $F_{40\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{40\%\ SPR}$ to be 8.5 mp.

Alternative 5: Status quo - no action, do not establish a MSY for greater amberjack.

Discussion: MSY is defined as the largest long-term average catch or yield that could be taken from a stock or stock complex under prevailing ecological and environmental conditions. In the Council's generic SFA amendment, MSY was set for greater amberjack at 30 percent static SPR. This value was determined by the Council to be the appropriate value for this stock based on the best available scientific information and on the recommendations of the Reef Fish Stock Assessment Panel (RFSAP) and Ad Hoc Finfish Stock Assessment Panel (FSAP) (GMFMC 1998; 2000a). The use of higher SPR levels was felt to underestimate MSY and would result in more restrictive management measures than are necessary. The use of lower SPR levels was felt to overestimate MSY and not maintain the condition of the stock at the optimum level. However, the NMFS rejected this portion of the amendment because the definition of MSY was not expressed in biomass units.

In the generic SFA amendment, the 30 percent static SPR level was chosen for MSY based on general recommendations by Mace (1994). From these recommendations, the Council's Finfish Stock Assessment Panel (FSAP) recommended that species such as greater amberjack be managed with an MSY and B_{MSY} SPR proxy level of 30 percent, provided there is a minimum size limit of at least the size at 50 percent maturity, unless certain life history characteristics or management strategies warrant a more precautionary approach. Cummings and McClellan (2000) summarized size and age maturation data for greater amberjack. They reported that 50 percent of greater amberjack are mature by 33 inches FL and that all are mature by 38 inches FL. The commercial size limit for greater amberjack of 36 inches FL is above the 50 percent maturity level, while the recreational size limit of 28 inches FL is below the size at first maturity (32 inches FL). However, it should be noted that when the three-fish recreational bag limit was put in place, the reduction in the recreational harvest was estimated to be 45 percent (GMFMC, 1989). Recreational harvest was further reduced with the bag limit reduction to one fish. The estimated reductions in harvest ranged from 26 percent in the headboat fishery to 78 percent in the charter boat fishery (GMFMC, 1995). Therefore, escapement rates from the recreational fishery by fish smaller than the size at 50 percent maturity (32 inches FL) have increased and still allow for the recommended 30 percent SPR level.

Table 1. Median equilibrium management reference point statistics and ratios for Gulf of Mexico greater amberjack (from Turner, 2002). F is the fishing mortality rate. Yield (Y) associated with a particular F value is in millions of pounds (mp) and spawning stock biomass (SSB) is in mp of mature fish.

F	F value	Y	$Y/Y_{30\%SPR}$	SSB	$SSB/SSB_{30\%SPR}$
$F_{25\%SPR}$	.30	9.9 mp	1.04	19.1 mp	0.67
$F_{30\%SPR}$	.25	9.5 mp	1.00	28.4 mp	1.00
$F_{35\%SPR}$	.21	9.0 mp	0.95	33.0 mp	1.16
$F_{40\%SPR}$	.18	8.5 mp	0.89	37.8 mp	1.33
$0.65*F_{30\%SPR}$	.16	8.2 mp	0.86	40.4 mp	1.42
$0.75*F_{30\%SPR}$	.19	8.7 mp	0.92	36.3 mp	1.28
$0.85*F_{30\%SPR}$	.21	9.0 mp	0.95	32.8 mp	1.15
$0.90*F_{30\%SPR}$	.22	9.2 mp	0.97	31.2 mp	1.10

Alternative 5, or no action, would not define a MSY value for greater amberjack, but would include amberjack in the MSY value defined for the reef fish complex in the initial Reef Fish FMP. This is inconsistent with the current proposed definition of MFMT of $F_{30\%\ SPR}$ and would not define MSY as a biomass measure as required by current NMFS standards.

The Preferred Alternative, Alternative 1, describes the yield that would be associated with the F value needed to maintain a population at 30 percent SPR in equilibrium conditions and so is consistent with recommendations made to the Council about this species for setting MSY in the generic SFA amendment (GMFMC, 1998; 2000a). It is also consistent with the current MFMT threshold that has been approved by NMFS of $F_{30\%\ SPR}$ In the most recent stock assessment, the yield estimated from fishing at $F_{30\%\ SPR}$ was 9.5 mp (Table 1) (Turner, 2002).

Alternative 2 sets MSY as the yield associated with fishing at a $F_{25\%\ SPR}$ when the stock is at equilibrium. This alternative is less precautionary than the other alternatives because the F value needed to achieve this yield is the highest of the alternatives presented above and also has the highest estimate of MSY (9.9 mp; Table 1). Based on recommendations by the FSAP and RFSAP (GMFMC 1998; 2000a), this level of fishing effort is higher than dictated by amberjack life history (see above). Fishing at this higher F could reduce the stock size and lead to growth or recruitment overfishing.

Based on the most recent stock assessment and assessment update (Turner et al., 2000; Turner and Scott, 2002), the yield associated with Alternative 4, or fishing at $F_{40\%\ SPR}$, is 8.5 mp (Table 1). This is a reduction in yield of 11 percent of what could be achieved if fishing at $F_{30\% SPR}$. This alternative's proxy for MSY is more precautionary to the stock than Alternative 1 (Preferred Alternative) and would provide a measure of protection to long-term harvest should $F_{30\% SPR}$ underestimate F_{MSY}. However, there would be a loss in the potential harvest by the fishery if this alternative were selected. The yield associated with fishing at an $F_{40\% SPR}$ has been recommended by the FSAP and RFSAP as a proxy for F_{OY} (GMFMC, 2000a).

Alternative 3 gives a MSY proxy that is intermediate to Alternative 1 (Preferred Alternative) and Alternative 4. This yield would be 9.0 mp (Table 1). As explained above for Alternative 4, using an MSY proxy at this level of F ($F_{35\% SPR}$), would be more precautionary than Alternative 1, but would result in a loss of potential yield by the fishery (about 5 percent).

Biological Impacts: All the alternatives listed except Alternative 5 (no action) should provide a positive biological benefit because they would raise the MSY proxy to a population level above the current level of 20 percent SPR. Very conservative estimates (low MSY and F_{MSY} and high B_{MSY}) would provide greater stability to the resource. More liberal estimates (high MSY and F_{MSY} and low B_{MSY}) would allow more of the exploitable yield to be taken, but at a higher risk of long-term overfishing if the estimates are incorrect. Of the alternatives listed, Alternatives 2 and 5 are the least precautionary (they have the highest Fs associated with them and would result in the lowest stock biomass). Alternative 5 (no action) is the least precautionary alternative because the F associated with no action ($F_{20\% SPR}$) is higher than that recommended by the RFSAP to achieve MSY. Fishing at this level could result in growth or recruitment overfishing to the determent of the stock. Alternative 4 is the most precautionary (it has the lowest F associated with it and would result in the highest stock biomass). Alternative 1 (Preferred Alternative) and Alternative 3 are median MSY proxies. Alternative 1 is consistent with the best available scientific estimate of what MSY should be (Turner et al., 2000). Fishing at or below this recommended level ($F_{30\% SPR}$) to achieve this yield should allow the stock to be fished over the long term and maintain the highest average yield possible.

Socioeconomic Impacts: The setting of MSY, F_{MSY}, and SS_{MSY} parameters does not by itself create socioeconomic impacts. However, it affects the determination of OY targets, MSST, and MFMT and thus the setting of harvest levels and associated management measures. Overly conservative parameters could lead to more restrictive regulation than what is necessary to maintain the stock at sustainable levels over the long term. That, in turn, would result in unnecessary socioeconomic hardship. Conversely, selecting parameters that are not appropriately cautious could result in regulations that provide for an increased yield in the short term. But those regulations could result in a reduced yield over the long term if MSY is overestimated. One major issue, then, associated with the choice of MSY is the balancing of conservation measures with associated socioeconomic impacts. To provide some general insights into this issue, it is instructive to compare the various MSY levels with historical harvests but with some limitations noted below.

It should be noted at this stage that the alternatives specify MSY not in numerical but in functional form. Thus, the specific value of MSY could change depending on the findings of the most recent stock assessment. The numerical values associated with the various alternatives are based on the most recent stock assessment. The higher the SPR level, the lower are the associated F and numerical values for MSY. Thus, MSY levels range from 8.5 mp with $F_{40\% SPR}$ (Alternative 4) to 9.9 mp with $F_{25\% SPR}$ (Alternative 2). Annual average landings from 1984 to 2002 (3.2 mp) are significantly below any of the MSY values. The period of highest landings was 1986-1989 when the annual landings averaged 7.7 mp and peaked in 1989 at 9.9 mp. The most likely reason that the current estimate of MSY is so much higher than historical landings is that, until 1990, there were no minimum size limits on this species. Cummings and McClellan (2000) indicate that prior to 1990, a substantial amount of small (<16 inch FL) fish were landed by the fishery. Therefore, growth overfishing and possibly recruitment overfishing may have been occurring. It was not until 1998 that all the current management measures were implemented and halted overfishing (Turner and Scott, 2002). For the period 1999-2000, total harvests averaged about 2.0 mp annually. This makes it difficult to compare past landings history with current estimates of MSY.

Considering that, with the exception of the 1986-1989 period, all years showed actual landings being significantly below any of the MSY level choices; consequently, any alternative for MSY provides prospects for long-term social and economic benefits in the fishery. Current landings are now low relative to any of the MSY alternatives so that when the stock is fully rebuilt and some level of harvest at or near MSY is allowed with potential accompanying relaxation of some regulations, revenues and profits to the commercial sector and for-hire vessels would increase accordingly. Consumer surplus to recreational anglers may also increase with the potential to harvest more and possibly larger sized fish. With the expansion at the harvest level, social and economic benefits may also ripple through the other market levels and support industries.

If all MSY alternatives have equal probability of promoting the long-term sustainability of the stock, then the one that offers higher potential social and economic benefits may be ranked higher than that which provide lower benefits. In the absence of estimates of the social and economic benefits derived from any of the MSY alternatives, it may only be assumed that higher benefits would be with a higher MSY. In this regard, Alternative 2 would be ranked highest and Alternative 4 lowest. The Preferred Alternative may then be ranked second among the MSY alternatives. If the no action alternative were interpreted to be associated with MSY level of 10.0 mp, then this alternative would be ranked first. However, an explicit MSY specification is not provided under the no action alternative so that it is possible that the alternatives specifying an MSY may still provide better long-term socioeconomic conditions than the no action alternative. In the absence of information on probabilities, one may only consider the qualitative chance of each alternative in promoting the long-term sustainability of the stock. A fishing mortality rate associated with a higher SPR level probably has a higher probability of maintaining the stock's long-term sustainability than one associated with a lower SPR. In this sense, Alternative 4 may be considered to offer a better chance of maintaining the stock's long-term sustainability than others. However, the associated MSY level of Alternative 4 is lower than those of others implying that the alternative's long-term socioeconomic benefits would also be lower. A better balance of stock conservation and socioeconomic benefits is proferred by either Alternative 1 (Preferred Alternative) or Alternative 3. These two alternatives, then, may be ranked higher than the other alternatives for MSY.

The foregoing discussion of the socioeconomic impacts of the various MSY alternatives was undertaken from a long-term perspective. However, some reference to short-term conditions were also made, and the basic conclusion from this perspective is that none of the MSY alternatives imply a total allowable catch that is lower than recent or reasonably foreseeable harvests. Therefore, no economic or social impacts are expected as current harvest operations are accommodated.

8.2.1.2 OY Alternatives

Preferred ===> **Alternative 1: Optimum Yield (OY) for greater amberjack is the yield associated with an $F_{40\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{40\%\ SPR}$ to be 8.5 million pounds (mp).**

Alternative 2: OY for greater amberjack is the yield associated with an $F_{35\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{35\%\ SPR}$ to be 9.0 mp.

<u>Alternative 3</u>: OY for greater amberjack is the yield associated with an $F_{30\% \ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{30\% \ SPR}$ to be 9.5 mp.

<u>Alternative 4</u>: OY for greater amberjack is the yield corresponding to a fishing mortality rate (F_{OY}) defined as: F_{OY}=0.65*F_{MSY} proxy from Section 8.2.1.1 when the stock is at equilibrium. The most recent stock assessment estimated the yield at 0.65*$F_{30\% \ SPR}$ to be 8.2 mp.

<u>Alternative 5</u>: OY for greater amberjack is the yield corresponding to a fishing mortality rate (F_{OY}) defined as: F_{OY}=0.75*F_{MSY} proxy from Section 8.2.1.1 when the stock is at equilibrium. The most recent stock assessment estimated the yield at 0.75*$F_{30\% \ SPR}$ to be 8.7 mp.

<u>Alternative 6</u>: OY for greater amberjack is the yield corresponding to a fishing mortality rate (F_{OY}) defined as: F_{OY}=0.85*F_{MSY} proxy from Section 8.2.1.1 when the stock is at equilibrium. The most recent stock assessment estimated the yield at 0.85*$F_{30\% \ SPR}$ to be 9.0 mp.

<u>Alternative 7</u>: OY for greater amberjack is the yield corresponding to a fishing mortality rate (F_{OY}) defined as: F_{OY}=0.90*F_{MSY} proxy from Section 8.2.1.1 when the stock is at equilibrium. The most recent stock assessment estimated the yield at 0.90*$F_{30\% \ SPR}$ to be 9.2 mp.

<u>Alternative 8</u>: Status quo - retain current OY statement where OY is any harvest level for each species 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 percent spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing.

<u>Discussion:</u> According to NMFS NSGs on the M-SFCMA (50 CFR Part 600.310), OY is based on MSY or MSY as it may be reduced to take into account social, economic, or ecological factors. The guidelines go on to say that Councils should adopt a precautionary approach in specifying OY including reference points set safely below limit reference points and that these targets be "explicitly" risk averse. NMFS technical guidance in setting an OY level suggests that OY should be set at a yield were the fishing mortality rate is 25 percent below the limit fishing mortality rate (i.e., 0.75 * F_{MSY}) (Restrepo et al., 1998). Advantages of setting F at this level are: 1) the probability of exceeding the MFMT is low (20-30 percent), and 2) because the total mortality on the stock is reduced, the stock size is allowed to increase. Restrepo et al. (1998) estimated that by fishing at 0.75 * F_{MSY}, the stock is allowed to build to 125-131 percent of B_{MSY} and that the resultant reduction in yield is only about 6 percent of MSY. Specifically for greater amberjack, fishing at the F_{MSY} proxy (0.75 * $F_{30\%SPR}$) would allow the stock to build to 128 percent of the spawning stock biomass at MSY (SSB_{MSY}), with the resultant yield of about 92 percent of MSY (Table 1; values based on Turner, 2002).

The Preferred Alternative (Alternative 1) defines OY as the yield associated with an $F_{40\% \ SPR}$ when the stock is at equilibrium, and is actually more conservative than what is recommended by NMFS. According to Turner (2002), the estimated value of $F_{40\% \ SPR}$ is 72 percent of $F_{30\% \ SPR}$ (the proxy they used for F_{MSY}). Based on estimates of yield at $F_{40\%}$ (8.5 mp) and at $F_{30\%}$ (9.5 mp), the OY yield from Alternative 1 would be 89 percent of the Preferred Alternative for MSY (the yield associated with an $F_{30\%}$; see Section 8.2.1.1) (Table 1). Alternative 1 also is in step with NMFS recommendations for OY in the generic SFA amendment that OY should correspond with a stock at 40 percent static SPR. NMFS disapproved this definition of OY in the Generic SFA amendment because it was described as a percent SPR rather than a biomass value.

Alternatives 2 and 3 set higher levels of F to achieve OY than would be managed for by the Preferred Alternative. Alternative 3 sets this level at $F_{30\% SPR}$ and is equal to the level set for the Preferred Alternative for MSY (Section 8.2.1.1). NMFS guidance suggests that "the most important limitation on the specification of OY is that the choice of OY and the conservation and management measures proposed to achieve it must prevent overfishing" (50 CFR §600.310(b). Alternative 3 sets OY equal to MSY and would allow for the probability that overfishing occurs in any given year to be 50 percent. Alternative 2 would decrease this probability, but not the extent that it would be decreased by the Preferred Alternative.

Assuming that Alternative 1 from Section 8.2.1.1 is selected as the proxy for MSY, the Preferred Alternative in this section is between Alternatives 4 and 5. As stated above, $F_{40\% SPR}$ is about 71 percent of $F_{30\% SPR}$ and sets F_{OY} between 65 and 75 percent of $F_{30\% SPR}$ (Alternatives 4 and 5 respectively). If fishing at 75 percent of F_{MSY} reduces the probability that F would be above MFMT to 20-30 percent (Alternative 5), then fishing at the Preferred Alternative level ($F_{40\% SPR}$) or at 65 percent of $F_{30\% SPR}$ should be more precautionary. Alternatives 6 and 7 would reduce the yield to below MSY levels. However, the percent chance that F would be above MFMT would be higher than 20-30 percent.

Alternative 8 (no action) would keep the current definition of OY for the Reef Fish FMP which is any harvest level for each species 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 percent spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing. This OY definition is not consistent with the current definition of MFMT ($=F_{30\% SPR}$). In addition, NMFS disapproved a previous definition of OY in the Generic SFA amendment that was described as a percent SPR (similar to percent SSBR) rather than described as a biomass value. Based on an analysis of F values and their associated equilibrium yield values, Turner (2002) estimated that the yield from fishing at $F_{20\% SPR}$ would be 10.0 mp.

Biological Impacts: The recommended default target for OY in the NMFS technical guidance (Restrepo et al., 1998) is the yield associated with a fishing mortality rate of $0.75*F_{MSY}$ (Alternative 5). The estimated OY from fishing at this level for greater amberjack is about 92 percent of the yield achieved from fishing at F_{MSY} and the estimated stock biomass is estimated to be 128 percent of what the biomass would be if the stock was fished at F_{MSY} (Table 1). An additional benefit to fishing at this level is that the probability that harvest would exceed MSY for a particular year is only 20-30 percent. The Preferred Alternative of setting OY equal to the yield associated with an $F_{40\% SPR}$ when the stock is at equilibrium is actually more precautionary than NMFS technical guidance because $F_{40\% SPR}$ is actually about 72 percent of the F_{MSY} proxy ($F_{30\% SPR}$). Of the alternatives listed in this section, only alternative 4 ($F_{OY} = 0.65*F_{MSY}$) is more precautionary than the Preferred Alternative.

Alternative 3 is the least precautionary alternative. It sets OY equal to MSY if $F_{30\% SPR}$ is chosen as the proxy for F_{MSY} in Section 8.2.1.1. While this OY level would maximize the yield from the stock, the stock biomass would be lower than what would be achieved through the Preferred Alternative. Additionally, the probability that landings would exceed MSY in any given year is 50 percent if OY is equal to MSY, compared to 20-30 percent if OY is based on an $F_{OY} = 0.75*F_{MSY}$. Should the stock experience a recruitment poor period, the stock would be at greater risk of over harvest.

Alternatives 2, 6, and 7 are intermediate to Alternative 3 (the least precautionary alternative) and Alternative 5 (NMFS recommended). Harvesting at these respective F levels should produce yields that are less than MSY and should produce stock biomass levels that are larger than B_{MSY} Additionally, the probability that the yields exceed MSY would be lower than 50 percent. However, the probability would be greater than that associated with the Preferred Alternative.

Alternative 8 (no action) would keep the current definition of OY for the Reef Fish FMP which is any harvest level for each species 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 spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing. It is not consistent with NMFS NSGs that require a biomass value. Setting an OY too high could result in overfishing or the stock becoming overfished because fishing could occur at or near MSY as discussed above.

Socioeconomic Impacts: As currently worded, the specification of OY under each alternative is based mainly on biological (or perhaps ecological) considerations. Absent then is the consideration of a process that would lead to the maximization of net social and economic benefits to the nation from a given harvest yield bounded upward by MSY. From a purely economic standpoint, the process may be described as moving from MSY to a lower level such that net economic benefits from the greater amberjack fishery are maximized. This lower level is termed maximum economic yield (MEY). However, achieving MEY is generally embedded in the management regime adopted. A management regime that reduces effort in the fishery, such as an IFQ program, offers a higher likelihood of achieving MEY than other management regimes. When other than purely economic factors, such as the employment, historical and cultural importance of a fishery to certain communities, are also considered in the determination of OY, the associated harvest level would be different from MEY. For example, if employment promotion is introduced into the process of determining OY, the resulting harvest level may be higher than MEY but as prescribed by the M-SFCMA should not exceed MSY. As with MEY, a management regime would have to be developed to insure that a certain specified level of employment is achieved. Should MEY or another yield associated with achievement of other social goals (e.g. employment) equal one of the OY alternatives, such occurrence is mainly accidental.

Given the foregoing discussion, the ability to describe the socioeconomic implications of the various OY alternatives is reduced to describing the socioeconomic status of the fishery at various harvest levels associated with each choice of OY.

In general, the higher the allowable yield, the better would be the socioeconomic outcome. But this outcome has to be modified by the long-term sustainability of the stock at a chosen OY and the type of management regime adopted for the fishery. Among the alternatives, the Preferred Alternative is one of the more conservative from a biological standpoint. It would result in a smaller but also more stable yield. It would also have one of the lowest likelihoods (only Alternative 4 is lower) that a recovered stock biomass would drop below MSST forcing a recovery plan. Alternatives 2, 3, 5, 6, and 7 would allow a greater harvest, but also have a greater risk of the stock biomass dropping below MSST. Alternative 8 (no action) does not specify any OY, and thus presents interesting implications noted below.

The Preferred Alternative sets OY at 8.5 mp. Alternative 3 sets OY at 9.5 mp while Alternatives 5,6, and 7 set OY somewhere between 8.5 and 9.5 mp. Similar to MSY, OY could change depending on the findings of future stock assessments. For the current purpose, however, the mentioned OY ranges are assumed to remain the same after the rebuilding period. For the period 1986-2000, the combined commercial and recreational landings averaged 3.2 mp annually, with peak of 9.9 mp in 1989. Average annual catches of 3.2 mp are substantially lower than those associated with the MSY and OY values proposed in this amendment. As previously explained in the Socioeconomic Impacts discussion under Section 8.2.1.1 (in the context of MSY), this difference is attributed to the overharvest of small fish prior to the implementation of minimum size limits. This difference between landings and OY is similar to the discussion in the Socioeconomic Impacts for MSY (Section 8.2.1.1) and is likely due to the overharvest of small fish prior to size regulations. This implies that not only would there be short-term negative socioeconomic impacts, but such negative impacts would also be experienced in the long-term even if the stock is fully recovered. Herein fits the different perspective offered by the no action alternative. This alternative may be interpreted in two ways. First, OY is not currently specified but would be set after the stock is fully recovered or when it is nearing full recovery. In this case, the possibility exists that socioeconomic information may be available as to be explicitly included in the specification of OY. Second, a specific OY would not be set even when the stock is fully recovered but would be simply stated as any harvest within the specified MSY. Under an open access system, OY would likely be equal to MSY, provided total harvest is effectively controlled not to exceed MSY. But under a controlled access system, particularly of the individual fishing quota (IFQ) type, OY (at least from an economic perspective) would fall below MSY.

A biological specification of OY is instructive in terms of at least knowing the yield target of managing the fishery, but specifying management solely on the basis of a biological definition of OY may not trace a path that provides the best socioeconomic results. For example, open access management measures may force the fishery to produce at the biologically specified OY, but the economic status of the fishery may be worse off than that achieved under a controlled access type of management even at lower yield levels. Unless then in this particular example, an OY is specified, implicitly or explicitly, with accompanying general management approach that would allow the fishery to be economically efficient, none of the alternatives may be considered superior over any other alternatives. If social factors are also considered, then another OY will have to be specified, with accompanying general management approach that would allow the fishery to achieve those social goals.

Although each OY alternative is specified mainly on biological grounds, socioeconomic factors can be influenced by the selection of a specific OY. As noted earlier, each OY alternative is associated with a different harvest level such that choosing one alternative over another would yield its own unique socioeconomic consequences. It is in this nature that socioeconomic factors are considered in the Council's choice of OY. One other issue to note here is that the alternative specifications of OY will accommodate current and reasonably foreseeable harvest, and therefore no economic or social impacts are expected as current operations are accommodated.

Further discussions of the economic implications of the various numerical OY alternatives are found in Section 9.0. In essence, the various numerical values of OY do not significantly differ from one another with respect to economic effects in terms of net present values.

8.2.1.3 Overfishing Threshold Alternatives (MFMT)

Preferred===> **Alternative 1: Set MFMT = $F_{30\%\ SPR}$ ($F_{30\%\ SPR}$ is currently estimated at 0.25); The greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{30\%\ SPR}$ is:**

Preferred===> **A. greater than 50 percent.**
B. greater than 40 percent.
C. greater than 30 percent.

<u>Alternative 2:</u> Set MFMT = $F_{25\%\ SPR}$ ($F_{25\%\ SPR}$ is currently estimated at 0.30); The greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{25\%\ SPR}$ is:

A. greater than 50 percent.
B. greater than 40 percent.
C. greater than 30 percent.

<u>Alternative 3</u>: Set MFMT = $F_{35\%\ SPR}$ ($F_{35\%\ SPR}$ is currently estimated at 0.21); The greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{35\%\ SPR}$ is:

A. greater than 50 percent.
B. greater than 40 percent.
C. greater than 30 percent.

<u>Alternative 4</u>: Status Quo - no action, retain the current definitions.

<u>Discussion:</u> NMFS approved the MFMT for greater amberjack that was proposed by the Council in the Generic SFA amendment for greater amberjack as the fishing mortality rate equivalent to 30 percent static SPR ($F_{30\%SPR}$). This fishing mortality rate was recommended by NMFS and by the FSAP (GMFMC, 1998). The rationale for this selection was based on general recommendations by Mace (1994). From these recommendations, the Council's FSAP recommended that species such as greater amberjack be managed with an MSY and B_{MSY} SPR proxy level of 30 percent, provided there is a minimum size limit of at least the size at 50 percent maturity, unless certain life history characteristics or management strategies warrant a more precautionary approach. Cummings and McClellan (2000) summarized size and age maturation data for greater amberjack. They report that 50 percent of greater amberjack are mature by 33 inches FL and that all are mature by 38 inches FL. The commercial size limit for greater amberjack of 36 inches FL is above the 50 percent maturity level, while the recreational size limit of 28 inches FL is below the size at first maturity (32 inches FL). However, it should be noted that the recreational bag limit was reduced to one fish and has likely lowered fishing mortality on this segment of the fishery. Therefore, the escapement rate from the fishery of fish smaller than the size at 50 percent maturity (32 inches FL) has probably increased. The Council believes that an SPR level greater than 30 percent would overestimate MFMT (e.g., Alternative 3) and result in more restrictive management measures than are necessary to rebuild the stock within the required time frame. Alternatively, an SPR proxy level less than 30 percent (Alternative 2) would underestimate MFMT and not maintain the stock at the optimum level.

While the definition of MFMT was approved by NMFS (Alternative 4, no action), no specification was given for the probability level that the estimate of the current F ($F_{current}$) is greater than MFMT. In stock assessments, there is a degree of variability around the estimate of $F_{current}$. If $F_{current}$ is above the MFMT, then the stock is considered undergoing overfishing. But if the estimate of $F_{current}$ is equal to MFMT, then this implies that there is an even chance that the stock is either undergoing overfishing or is not undergoing overfishing. One risk averse method is to decrease the probability that the actual $F_{current}$ may have been underestimated and is actually greater than MFMT. This requires that the variation around the estimated $F_{current}$ be examined (e.g., see Figures 6 and 7) to see what F value encompasses the 50, 60, or 70th percentile of the variation (dependent on the subalternative). In the alternatives above, subalternatives B and C are more risk averse than subalternative A because they call for a lower estimate of F to be selected when estimating MFMT. For the Preferred Alternative, Alternative 1 A, the estimate of $F_{current}$ is equal to MFMT (i.e., is risk neutral) because there is an even chance that the stock would be undergoing overfishing or not undergoing overfishing. For subalternatives B and C, should the estimate of $F_{current}$ be equal to MFMT, then the stock would be considered overfished because the probability that $F_{current}$ is above MFMT is too high. However, it should be noted that once the stock is rebuilt to OY levels (assuming that MSY and OY are based on F values of $F_{30\%\ SPR}$ and $F_{40\%\ SPR}$, respectively), the chance that the F would exceed MFMT should be 20-30 percent or lower (see Section 8.2.1.2 on OY).

Biological impact: MFMT provides a reference point to limit F at a point that insures a stock is fished at a sustainable level or does not undergo overfishing. The effect of long term overfishing is that a stock becomes overfished and cannot maintain MSY. Conservative estimates of F_{MSY} (resulting in low MSY and high B_{MSY}) would provide greater stability to the resource. However, they may underestimate the yield that can be exploited without compromising the long-term sustainability of the stock. More liberal estimates of F_{MSY} (resulting in high MSY and low B_{MSY}) would allow for a higher yield, but would also result in a greater risk of long-term overfishing. Of the alternatives listed for defining MFMT, Alternative 2 is the least precautionary (resulting in the highest F but lowest stock biomass), and Alternative 3 is the most precautionary (resulting in the lowest F but highest stock biomass). Alternative 1 (Preferred Alternative) is a median MFMT level and is consistent with the most recent stock assessment's estimate of what F_{MSY} should be (Turner et al., 2000). Fishing at or below this recommended level ($F_{30\%\ SPR}$) should allow the stock to be fished over the long term and to maintain the highest average yield possible. This level is also consistent with recommendations made by the FSAP and the RFSAP based on the life history of greater amberjack.

NMFS approved the Preferred Alternative for defining MFMT as $F_{30\%\ SPR}$ in its partial approval of the Council's Generic SFA Amendment. However, no level of risk that the actual fishing mortality rate is above MFMT has been assigned. For each alternative, there are three levels of risk. These are that the greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than F_{MSY} is greater than either 50 percent, 40 percent, or 30 percent. To reduce the probability that MFMT is exceeded, the estimate of F would need to be below F_{MSY} and so the biomass would be greater than B_{MSY}. Therefore, subalternatives B and C for each alternative are the most precautionary for the stock. However, if the stock is managed for OY rather than MSY (as dictated by current fishery management standards), then the probability that F would exceed MFMT is reduced as discussed above.

Socioeconomic Impacts: Depending upon the selection of MFMT, Alternative 1A and B, and Alternative 3 require a reduction in harvest, and consequent reduction in short-term socioeconomic benefits, consistent with a rebuilding plan. Upon recovery, the Preferred Alternative would allow a fishing mortality rate at the MSY level. Alternative 2 would allow a significantly higher yield, but would increase the likelihood that the stock would again become overfished and forced into a rebuilding plan. Alternative 3 is the most conservative alternative. Of the three probability levels set for determining if $F_{current}$ is greater than F_{MSY}, subalternatives A would allow the MSY to be the highest under each alternative and subalternative C would allow the least because subalternatives A constrains F the least in the probability of exceeding F_{MSY}. Under this subalternative, it is likely that the stock, once recovered, would remain healthy. Alternative 4 (no action) would essentially be the same as the Preferred Alternative, but would not include a probability criterion.

8.2.1.4 Overfished Threshold Alternatives (MSST)

Preferred===> **Alternative 1: Set the minimum stock size threshold (MSST) to (1-M)*B_{MSY} or 75 percent of B_{MSY}. Using the proxy of F_{MSY} being $F_{30\%\ SPR}$, B_{MSY} is estimated to be 28.4 mp. Greater amberjack stocks in the Gulf of Mexico will be considered overfished if the probability that $B_{current}$ is less than MSST is:**

Preferred ==> **A. greater than 50 percent.**
B. greater than 40 percent.
C. greater than 30 percent.

Alternative 2: Set the minimum stock size threshold (MSST) to (1-0.5)*B_{MSY}. Using the proxy of F_{MSY} being $F_{30\%\ SPR}$, B_{MSY} is estimated to be 28.4 mp. Greater amberjack stocks in the Gulf of Mexico will be considered overfished if the probability that $B_{current}$ is less than MSST is:

A. greater than 50 percent.
B. greater than 40 percent.
C. greater than 30 percent.

Alternative 3: Set the minimum stock size threshold (MSST) to (1-0.35)*B_{MSY}. Using the proxy of F_{MSY} being $F_{30\%\ SPR}$, B_{MSY} is estimated to be 28.4 mp. Greater amberjack stocks in the Gulf of Mexico will be considered overfished if the probability that $B_{current}$ is less than MSST is:

A. greater than 50 percent.
B. greater than 40 percent.
C. greater than 30 percent.

Alternative 4: Status Quo - no action, retain the current definitions.

Discussion: NMFS guidelines indicate that status determination criteria must include a minimum stock size threshold (MSST) or a reasonable proxy thereof. The MSST should be expressed in terms of spawning biomass or other measure of productive capacity. It should be, to the extent possible, equal to whichever is greater - one half of the MSY stock size (B_{MSY}), or the minimum stock size at which rebuilding to B_{MSY} would be expected to occur within 10 years if the stock or stock complex were exploited at the MFMT (Restrepo et al., 1998). If stock size falls below MSST, it is considered to be overfished.

As stated above, in choosing an MSY control rule for MSST, NMFS technical guidance recommends that MSST be set at either 0.5 * B_{MSY} or (1-M) * B_{MSY}, whichever is the largest value. The reasoning behind this recommendation is that natural mortality (M) is generally tied to the productivity of a stock. Short-lived, fast-growing stocks (e.g., dolphin) generally have high values of M, and long-lived, slow-growing stocks (e.g., greater amberjack) generally have low values of M. As stated by the FSAP in their report (GMFMC, 1998) to the Council, "Such a rule of thumb for MSST is intuitively appealing because one would expect stocks with a higher M to recover faster, on average, than stocks with a lower M."

The Preferred Alternative (Alternative 1) is the most precautionary alternative for MSST in Section 8.2.1.4 because the MSST value would be higher than that required by Alternatives 2 and 3.

Because the estimate of M for greater amberjack is about 0.25 (Turner et al., 2000) and is less than 0.5, NMFS technical guidance suggests that the most precautionary level to set MSST should be (1-M)* B_{MSY} (Restrepo et al., 1998). Therefore, the Preferred Alternative, Alternative 1, is consistent with the NMFS technical guidance. In the most recent stock assessment, SSB_{MSY} was estimated to be 28.4 mp; therefore, MSST would be 0.75*28.4 mp or 21.3 mp.

Alternative 2 represents the lowest level that MSST could be set at (0.5*B_{MSY}) based on NMFS technical guidance. However, this level is recommended for species whose estimated M is greater than 0.5. Because the estimated M of greater amberjack is 0.25, this alternative would set MSST at a level where it would become more difficult for the stock to recover should fishing pressure reduce the stock biomass a level below MSST. In this case, MSST would be 14.2 mp based on the 28.4 mp SSB_{MSY} estimated by the most recent stock assessment. This value is lower than the 21.3 mp MSST given in the Preferred Alternative.

Alternative 3 is intermediate to the Preferred Alternative (Alternative 1) and Alternative 2. In this case, the multiplier of 0.65 is between 0.75 (1-M) and 0.5. While this value is more precautionary than Alternative 2, it is still below the level recommended by NMFS technical guidance that states that MSST should be (1-M)* B_{MSY} if M is less than 0.5. Using the $F_{30\%SPR}$ as the MSY proxy used in the most recent stock assessment (and consistent with the preferred MSY alternative), MSST would be 18.5 mp (0.65*28.4 mp).

In the Generic SFA Amendment, the MSST was to be implemented through framework as estimates of B_{MSY} and MSY became available. Therefore, had this portion of the SFA amendment been approved, Alternative 4 (no action) would require that MSST be developed through a regulatory amendment rather than a Secretarial amendment. However, in order to rebuild the greater amberjack stock (Section 8.2.2), some rebuilding target is necessary. Therefore, selection of this alternative would be contrary to developing the rebuilding plan proposed in this amendment.

No specification has been given for the probability level that the estimate of the current biomass ($B_{current}$) is greater than MSST. In stock assessments, there is a degree of variability around the estimate of $B_{current}$. If $B_{current}$ is below the MSST, then the stock is considered overfished. But if the estimate of $B_{current}$ is equal to MSST, then this implies that there is an even chance that the stock is either overfished or is not overfished. One method to decrease the level of risk is to decrease the probability that the actual $B_{current}$ may have been overestimated and is actually less than MSST. In the alternatives above, Subsections B and C are more risk averse than setting the value at 50 percent (Subsection A) because they constrain the estimate of the $B_{current}$ to a higher probability that the stock is at or above MSST. Subsection A is risk neutral because, should the estimate of $B_{current}$ be equal to MSST, there would be an even chance that the stock would be considered to be overfished. However, it should be noted that once the stock is rebuilt to the OY level (assuming that MSY and OY are based on a reliable proxy of B_{MSY}), the likelihood that the B would be below MSST should be low (e.g., if the stock is fished at 75 percent of F_{MSY}, the stock size should be 125-131 percent of B_{MSY}; Restrepo et al., 1998). Through this Secretarial amendment, the Gulf Council is instituting a greater amberjack rebuilding plan that, if achieved, would rebuild the stock to B_{OY} (the Preferred Alternative that would rebuild the stock to $B_{40\% SPR}$), so the selection of a probability level of 50 percent should not compromise the precaution needed to maintain the stock above MSST. The current estimate of $B_{40\% SPR}$ in the most recent stock assessment is 37.8 mp and so is 16.2 mp greater than the Preferred Alternative for MSST (21.6 mp).

<u>Biological impacts:</u> The Preferred Alternative (Alternative 1) specifies MSST as (1-M)* B_{MSY} or 0.75* B_{MSY} and is based on the recommended NMFS technical guidance. This alternative would result in a minimum biomass level of 21.3 mp, and is larger than the MSST of 14.2 and 18.5 mp

associated with Alternative 2 and 3, respectively. Managing the stock at this larger minimum biomass threshold would better protect the stock from becoming overfished.

Alternative 2 specifies MSST as 50 percent of B_{MSY}. This is the lowest MSST level that is allowed by NMFS technical guidance. Thus this alternative would provide the least protection of the stock. Fishing the stock at a rate that would maintain stock biomass at or near this level for an extended amount of time could put the stock at risk of falling below B_{MSY}.

Alternative 3 specifies that MSST be set at a point intermediate to the Preferred Alternative and Alternative 2. While maintaining a stock size at this level would be more precautionary than Alternative 2, it would not maintain the stock at a level as high as that associated with the Preferred Alternative. Should the stock be reduced to a level below MSST, it would take a longer time to rebuild the stock to B_{MSY} than if the MSST specified in the Preferred Alternative 1 were utilized.

Alternative 4 (no action) would not specify a MSST for greater amberjack. Without MSST, no level by which the stock could be evaluated as to its stock status would be available.

Socioeconomic Impacts: MSST is basically a biological concept, but the current choices for MSST have significantly different socioeconomic implications when taking into account the associated management measures. Given the current greater amberjack spawning stock size (<50 percent SS_{MSY}), the stock would be considered overfished under all the alternatives listed except Alternative 4 (no action). Lower MSST thresholds, such as Alternative 2 and 3, would generally allow a larger harvest, which produces larger short-term socioeconomic benefits. However, such thresholds would also increase the risk of a possible future stock collapse and may eventually require a gradual reduction in the allowable harvest, with the attendant socioeconomic disruption. Setting MSST at a relatively high level, such as the case with Alternative 1, would produce stability in year-to-year harvest, but could also result in large negative short-term socioeconomic impacts from the relatively large forgone yields.

Although the general implications of the various alternatives for MSST have been pointed out, the choice of which alternative provides the best balance between conservation benefits and adverse socioeconomic impacts cannot be ascertained. This lack of clear choice is partly a function of the lack of probability with each MSST alternative that at that level the stock would be "actually" overfished and the associated rebuilding strategy would be successful in meeting the target MSY. For example, if all MSST alternatives have an equal probability of being "correct" such that the associated rebuilding paths would successfully rebuild the stock within 10 years, a lower MSST level which, as discussed above, associated with lower adverse socioeconomic impacts would be economically superior over others. As implied, however, in the "Biological Impacts" discussion, it appears that a higher MSST level has a higher probability of protecting the stock, whereas a lower MSST level is associated with a lower probability of protecting the stock. In this case, it would no longer hold true that a lower MSST level, which is associated with lower adverse socioeconomic impacts, would be economically better than a higher MSST level, since it is associated with lower probability that future benefits would accrue.

8.2.2 Greater amberjack rebuilding plan

Alternative 1: Limit the harvest of greater amberjack to the yield associated with

Option a: $F_{30\%\ SPR}$ (Rebuild the stock in 10 years).
Option b: $F_{40\%\ SPR}$ (Rebuild the stock in 7 years).

Expected harvest for $F_{30\%}$ and $F_{40\%}$yield streams for Option a and b of Alternative 1.

Year	Yield at $F_{30\% SPR}$	Yield at $F_{40\% SPR}$
2003	4.0 mp	2.9 mp
2004	4.6 mp	3.6 mp
2005	5.4 mp	4.3 mp
2006	6.3 mp	5.2 mp
2007	7.1 mp	5.9 mp
2008	7.7 mp	6.5 mp
2009	8.1 mp	7.0 mp
2010	8.5 mp	7.4 mp
2011	8.8 mp	7.7 mp
2012	9.0 mp	7.9 mp

Preferred => **Alternative 2: Limit the harvest of greater amberjack for 3-year intervals with the expected harvest set at the yield associated with**

Option a: $F_{30\%}$ for the first year of each interval (Rebuild the stock in 10 years).

Preferred => **Option b: $F_{40\%}$ for the first year of each interval (Rebuild the stock in 7 years).**

Option c: $F_{30\%}$ for the second year of each interval (Rebuild the stock in 10 years).

Option d: $F_{40\%}$ for the second year of each interval (Rebuild the stock in 7 years).

Expected harvest for three-year intervals for each of the 4 options in Alternative 2. The Preferred Alternative is highlighted in gray.

	Option a	Option b	Option c	Option d
Interval (years)	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, second year	$F_{40\%}$, second year
2003-2005	4.0 mp	2.9 mp	4.6 mp	3.6 mp
2006-2008	6.3 mp	5.2 mp	7.1 mp	5.9 mp
2009-2011	8.1 mp	7.0 mp	8.5 mp	7.4 mp
2012	9.0 mp	7.9 mp	9.0 mp	7.9 mp

Alternative 3: Limit the harvest for greater amberjack during the first 5 year interval with the expected harvest level being 4 mp and for the second five year interval the expected harvest level would be

Option a. 7.5 mp for years 2008-2012 (Rebuild the stock in 7 years).
Option b. the yield associated with $F_{40\%}$ (Rebuild the stock in 7 years).

Expected harvest for 5-year intervals for each of the 2 options in Alternative 3.

Year	Option a	Option b
2003-2007	4.0 mp	4.0 mp
2008	7.5 mp	6.8 mp
2009	7.5 mp	7.2 mp
2010	7.5 mp	7.4 mp
2011	7.5 mp	7.7 mp
2012	7.5 mp	7.8 mp

Alternative 4: Limit the harvest of greater amberjack to the yield associated with a constant catch rebuilding schedule.

Option a. 4.0 mp or the highest yield which could be achieved without exceeding $F_{30\%SPR}$ in any year (Rebuild the stock in 6 years).

Option b. between 4.0 and 7.5 mp (mid-point 5.75 mp) at a constant yield that can be removed from the stock and still achieve rebuilding targets (Rebuild the stock in 6 to 7 years).

Alternative 5: Limit the harvest of greater amberjack for years 2003-2005 at 4.0 mp: For years 2006-2012 the expected harvest would be the yield associated with $F_{40\%}$ (Rebuild the stock in 7 years).

Annual expected harvest for Alternative 5.

Year	Yield at $F_{40\% SPR}$
2003	4.0 mp
2004	4.0 mp
2005	4.0 mp
2006	5.2 mp
2007	5.9 mp
2008	6.5 mp
2009	7.0 mp
2010	7.4 mp
2011	7.7 mp
2012	7.9 mp

Alternative 6: No action.

Discussion: For all the rebuilding plans presented above, the expected harvest that would rebuild the fishery based on either $F_{30\%SPR}$ or $F_{40\%SPR}$ yield streams were derived from updated projections from the most recent stock assessment (Turner and Scott, 2002). For these plans to be enacted, the Council would need to ask NMFS to present annual updates on the greater amberjack harvest. These updates would cover each calender year and be presented as soon as the information can be properly collated. The purpose of these updates would be to insure that the annual harvest by the recreational and commercial fisheries was not exceeding the expected annual harvest needed for the rebuilding plan. Current fishing regulations are keeping the harvest under the expected harvests needed by each of the alternative rebuilding plans. Total harvest for years 1999, 2000, and 2001 were 1.5 mp, 1.8 mp, and 2.6 mp, respectively, and the projected harvest for 2002 is 1.9 mp (Turner and Scott, 2002). The most conservative rebuilding plans (Alternative 1, Option b and Alternative 2, Option b) call for an expected harvest for the first year of the plan at 2.9 mp before increasing in following years. That level of harvest is above that which is currently being landed in the fishery. However, changes in the harvest practices by the fisheries, or increasing CPUE in response to an increasing stock size as the stock rebuilds, could have the effect of increasing the harvest above the levels that would be required to maintain the rebuilding plan. If this should occur, then the Council would need to initiate further management measures to cap the harvest at or below the harvest required for the rebuilding plan. Measures the Council could employ to further restrict harvest would be changes in size limits, bag limits, and seasonal closures; or the institution of a quota management system. The latter measure would require an allocation of the harvest to the recreational and commercial sectors.
An additional requirement for all the rebuilding plans is the need for periodic stock assessments. Greater amberjack are a long-lived species and so changes in the population occur relatively slowly. Therefore, while annual updates in harvest are required to make sure the harvest required for the rebuilding plan are not exceeded, annual assessments of species like the greater amberjack are not needed and could occur at three to five year intervals (GMFMC, 1999). These assessments would be requested as needed by the Council when the Council and NMFS's Southeast Regional Office (SERO) develop the yearly operations plan, and would be subject to the availability of funds to conduct the assessment. Because the Preferred Alternative holds the expected harvest constant at 3-year intervals, the logical time frame for these stock assessments to occur would be at 3-year intervals just prior to when the harvest level is expected to be increased in the rebuilding plan (e.g., 3 years for the Preferred Alternative). This would insure that projections about the stock condition are still valid. If the assessment reveals that yield projections needed to rebuild the stock have changed (they either have increased or decreased), then management measures discussed in the previous paragraph would be employed, as needed, to adjust the harvest accordingly. It should be noted that the three year interval for stock assessments are not meant to replace the scheduled review by the Secretary of Commerce of rebuilding plans/regulations of overfished fisheries required under §304(e)(7) of the M-SFCMA that is to occur at least every two years to ensure adequate progress toward stock rebuilding and ending overfishing.

Based on annual updates on the harvest or on projected stock status from the stock assessments, the Council may need to take management action because the amberjack harvest exceeds, or is expected to exceed, the harvest required by the rebuilding plan. As mentioned above, the actions that the Council could employ to further restrict harvest would be changes in size limits, bag limits, and seasonal closures; or the institution of a quota management system. The Council has four options available to it for implementing these measures. The first is to amend the Reef Fish FMP to include new information and management actions. Recent plan amendments put forth by the Council have taken between two and three years from conception to implementation. The second method is a regulatory amendment based on the framework established in Amendments 1 and 4 of the Reef Fish FMP to set TAC. Appropriate regulatory changes that may be implemented through framework include: 1) setting the TAC's for each stock or stock complex to achieve a specific level of ABC; and 2) bag limits, size limits, vessel trip limits, closed seasons or areas, gear restrictions, and quotas designed to achieve the TAC level (GMFMC, 1989; 1991). However, TAC and catch limits may be set only each time a new stock assessment is completed. Recent regulatory amendments have taken between 9 months and two years from conception to implementation.

The other two management actions are an emergency action or an interim measure. The M-SFCMA states in section §305(c)(2) that "if a Council finds that an emergency or overfishing exists or that interim measures are needed to reduce overfishing for any fishery within its jurisdiction, whether or not a fishery management plan exists for such fishery--

(A) the Secretary shall promulgate emergency regulations or interim measures under paragraph (1) to address the emergency or overfishing if the Council, by unanimous vote of the members who are voting members, requests the taking of such actions; and

(B) the Secretary may promulgate emergency regulations or interim measures under paragraph (1) to address the emergency or overfishing if the Council, by less than a unanimous vote, requests the taking of such action."

Emergency actions and interim measures only remain in effect for 180 days after the date of publication of the rule and may be extended by publication in the Federal Register for one additional period of not more than 180 days provided the public has had an opportunity to comment on the emergency actions and interim measures. The M-SFCMA goes on to say that when a Council requests that an emergency action and interim measure be taken, the Council should also be actively preparing regulations that address the emergency on a permanent basis.

What type of rule making vehicle the Council decides to select should harvests exceed those needed for the rebuilding plan is difficult to predict. Actions would be dictated by the severity of overages in harvest and time frame needed to implement a regulatory change. If the overage in harvest is small, but would still allow the stock to recover within the maximum time frame required by NMFS guidance, the Council would likely institute a change in existing management measures to reduce harvest through a plan or regulatory amendment. Should the overage be severe, the Council would ask for an emergency action or interim rule that would severely restrict or halt the harvest of greater amberjack while the Council explores management measures that would bring the harvest to levels consistent with those needed for the rebuilding plan.

It should be noted that bycatch mortality is taken into account in stock assessments and in projections of recommended harvest limits. For the commercial fishery, the reporting rule for the FMP (52 FR 35717, 9/28/87) provided authority for the SEFSC Director to require logbooks with reporting forms for each trip for all commercial vessels. In 1990, logbooks were required for 25 percent of the fleet and by 1993, all of the fleet. The logbook forms had fields for recording incidental catches and bycatch. They also had fields for recording catches of coastal migratory species; highly migratory species (including sharks, tunas and billfish); and a space to record miscellaneous species commonly caught or discarded when targeting reef fish. But after 1995, the fields were subsequently discontinued due largely to poor compliance with entering discard data (Poffenberger, personal communication[4]). In August, 2001, NMFS SEFSC re-established the reporting of bycatch species discarded dead or alive. The SEFSC Director randomly selected 20 percent of Gulf and South Atlantic reef fish and coastal migratory pelagic vessels (about 500 vessels) to report these data. For the recreational fishery, most catch and landings information are collected by the NMFS Marine Recreational Fisheries Statistics Survey (MRFSS). The MRFSS has collected information on bycatch for all states except Texas since it was initiated in 1979. It includes data by species for fish released dead, which are counted as part of the harvest, and data

[4]John Poffenberger, National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, Florida

on fish released alive (discards), most of which are likely to be regulatory discards composed of undersized fish. Options for bycatch reporting requirements and ways to reduce bycatch in the reef fish fishery are being developed in Amendment 18 to the Reef Fish FMP which is currently under development. The Gulf States Marine Fisheries Commission is also developing a bycatch reporting module for GOM fisheries in their Fishery Information Network programs.

The Preferred Alternative (Alternative 2, Option b) is based on a constant F rebuilding strategy where the $F_{40\%SPR}$ yield streams are used to set the expected harvest for 3-year intervals (Turner and Scott, 2002). An advantage to this step-wise rebuilding plan is that it assumes constant catches over short time intervals that gives stability to the fishery while expected harvest may increase as the stock rebuilds. Of the options for a rebuilding plan listed in this alternative, preferred Option b is the most precautionary. As stated in Section 8.1, the $F_{40\%SPR}$-based yield streams are more precautionary than the $F_{30\%SPR}$-based yield streams in a rebuilding strategy. By using this lower fishing mortality rate, the stock is estimated to be rebuilt in a time period of around 7 years (i.e., when $SSB/SSB_{MSY} > 1.0$; Table 2). However, the total catch harvested over the entire ten-year time period results in a loss of 11 to 13 mp between the $F_{30\%SPR}$ and $F_{40\%SPR}$ harvest strategies (Table 3). Trajectories of spawning stock biomass (SSB) under an $F_{40\%SPR}$ regime indicate that SSB could be rebuilt to $SSB_{30\%SPR}$ (SSB_{MSY}) in about 7 years and under an $F_{30\%SPR}$ regime, SSB could be rebuilt to $SSB_{30\%SPR}$ (SSB_{MSY}) in 10 years (Table 2; Figure 8). Alternative 2, Option b is additionally more precautionary in how the harvest level is anticipated for each 3-year interval. In this alternative there are two methods used to determine the harvest in each 3-year period. These are either using the yield for the first or second year of each 3-year period based on yields derived from the constant F rebuilding strategy listed in Alternative 1 (i.e., using yields from years 2003, 2006, and 2009 or using yields from years 2004, 2007, and 2010, respectively; Table 3). Therefore, estimating the yield from the first year of the interval (Options b and d) is more precautionary than using the middle year (year 2) of each 3-year interval (Options a and c) because it is the lower value.

Current management measures are expected to maintain catches within the recommended harvest limit of 2.9 mp for the first three years of the rebuilding plan defined in Alternative 2, Option b. These include a reduction in the recreational bag limit from three to one fish (GMFMC, 1995) and a 3-month seasonal closure in the commercial fishery (GMFMC, 1997). These actions were undertaken to stabilize the greater amberjack stocks that were estimated to be at about a transitional SPR of 34 to 36 percent. The RFSAP (GMFMC, 2000a) believed these measures were enough to stop overfishing on the stock and an updated analysis of the stock indicates that the stock is no longer undergoing overfishing (Turner and Scott, 2002). Presently annual landings are less than the 2.9 mp harvest limit defined in the Preferred Alternative. Thus, no decrease in catch would be required to meet the rebuilding goals set forth in this alternative. As previously stated, if catches increase to levels greater than 2.9 mp within the first three years, or to levels exceeding established harvest limits in any subsequent year, and those overages are determined to compromise the stock's ability to rebuild to a non-overfished level within the scheduled time frame, the Council would implement additional management measures to reduce fishing effort and/or catch.

Table 2. Estimated median spawning stock biomass (SSB) ratio for years 2003-2012 for different rebuilding plans. When SSB/SSB_{MSY} is above 1.0, the stock is considered rebuilt. Information from Turner (2002).

Year	Alternatives 1and 2		Alternative 3		Alternative 4
	$F_{30\% SPR}$	$F_{40\% SPR}$	Option a	Option b	Option a
	SSB/SSB_{MSY}	SSB/SSB_{MSY}	SSB/SSB_{MSY}	SSB/SSB_{MSY}	SSB/SSB_{MSY}
2003	0.36	0.37	0.36	0.36	0.36
2004	0.42	0.46	0.42	0.42	0.42
2005	0.48	0.55	0.50	0.50	0.50
2006	0.56	0.66	0.62	0.62	0.62
2007	0.65	0.79	0.79	0.79	0.79
2008	0.73	0.90	0.90	0.91	0.93
2009	0.78	0.99	0.97	1.02	1.11
2010	0.83	1.06	1.02	1.07	1.25
2011	0.86	1.12	1.06	1.11	1.38
2012	0.89	1.18	1.12	1.15	1.52

Alternative 1 uses a constant F rebuilding strategy with $F_{30\%SPR}$ (Option a) and $F_{40\%SPR}$ (Option b) yield streams (Turner and Scott, 2002). As stated above, the $F_{40\%SPR}$ yields are more precautionary than the $F_{30\%SPR}$ yields. Alternative 1 differs from Preferred Alternative 2 in that yields would change annually rather than being constant for 3-year intervals. Based on current management measures, yield should not be affected by either choice of Alternative 1 or 2. However, from a strategy perspective, Alternative 2 would be more logical in that it coincides with the time interval under which greater amberjack stock assessments are conducted. A further disadvantage to the constant F strategy is that annual yields would constantly change making it more difficult for fishermen to plan for the future.

Alternative 3 is similar to the Preferred Alternative except that this alternative uses five-year periods as interim management goals rather than 3-year periods (Turner and Scott, 2002). For both option a and b, the expected harvest for the first five-year period could not exceed a constant level of 4 mp, or the highest expected harvest allowed at the beginning of the rebuilding period using the $F_{30\%SPR}$ (F_{MSY} proxy) yield stream. During the second five-year period, catch could not exceed a level of 7.5 mp (Option a) or could increase annually (Option b). The major advantage of this alternative over the Preferred Alternative is that for the first 5 years, fishermen would have an interval where landings would be at a constant level, as opposed to a 3-year interval proposed in the Preferred Alternative. This plan would give the fishery greater stability and fishermen would be able to plan accordingly for future fishing activities. Both these plans would rebuild the stock to a non-overfished level within six to seven years, and would rebuild the stock to the level needed to sustain OY in ten years (Table 2, Figure 8).

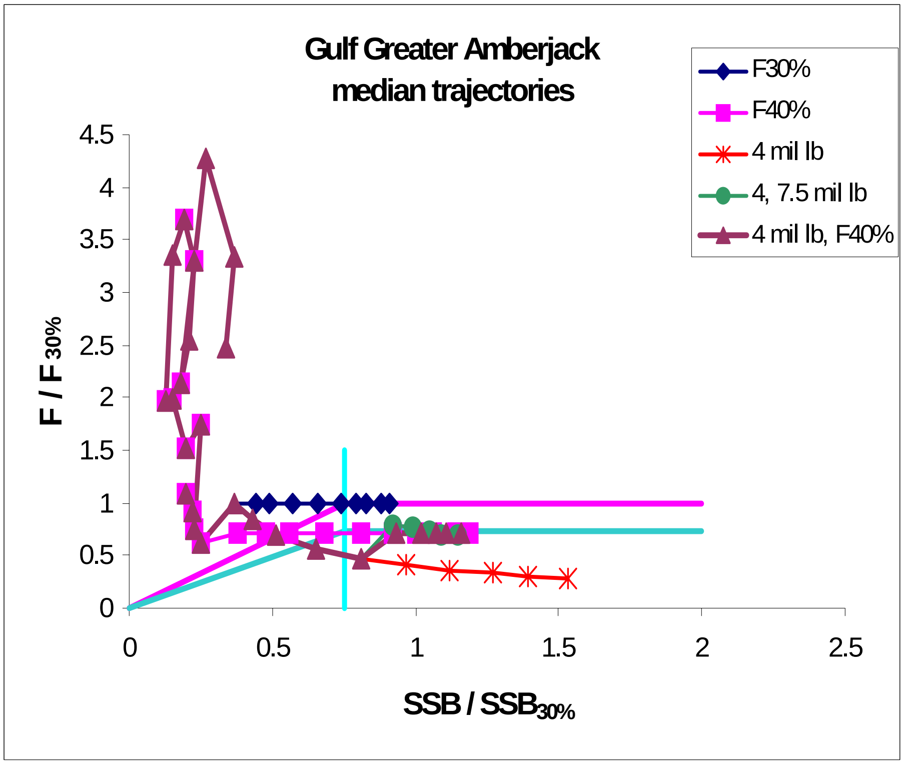

Figure 8. Spawning stock biomass (SSB) and fishing mortality rate (F) relative to the SSB and F which would produce $SPR_{30\%}$ (the MSY proxy) under the selectivity pattern of 1996-1998. Possible control rules and the MSST level associated with the M considered most likely are shown. Source of plot is from Turner and Scott (2002).

Table 3. Possible greater amberjack rebuilding schedules for each alternative. The Preferred Alternative is highlighted in gray.

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\% SPR}$	Yield at $F_{40\% SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	3.991 mp	2.917 mp	3.991 mp	2.917 mp	4.647 mp	3.600 mp	4.0 mp	4.0 mp	4.0 mp	5.75 mp	3.991 mp
2004	4.647 mp	3.608 mp	3.991 mp	2.917 mp	4.647 mp	3.600 mp	4.0 mp	4.0 mp	4.0 mp	5.75 mp	3.991 mp
2005	5.439 mp	4.320 mp	3.991 mp	2.917 mp	4.647 mp	3.600 mp	4.0 mp	4.0 mp	4.0 mp	5.75 mp	3.991 mp
2006	6.326 mp	5.162 mp	6.326 mp	5.162 mp	7.127 mp	5.945 mp	4.0 mp	4.0 mp	4.0 mp	5.75 mp	5.162 mp
2007	7.127 mp	5.945 mp	6.326 mp	5.162 mp	7.127 mp	5.945 mp	4.0 mp	4.0 mp	4.0 mp	5.75 mp	5.945 mp
2008	7.707 mp	6.527 mp	6.326 mp	5.162 mp	7.127 mp	5.945 mp	7.5 mp	6.823 mp	4.0 mp	5.75 mp	6.527 mp
2009	8.142 mp	7.014 mp	8.142 mp	7.012 mp	8.499 mp	7.401 mp	7.5 mp	7.175 mp	4.0 mp	5.75 mp	7.014 mp
2010	8.499 mp	7.401 mp	8.142 mp	7.012 mp	8.499 mp	7.401 mp	7.5 mp	7.409 mp	4.0 mp	5.75 mp	7.401 mp
2011	8.762 mp	7.683 mp	8.142 mp	7.012 mp	8.499 mp	7.401 mp	7.5 mp	7.714 mp	4.0 mp	5.75 mp	7.683 mp
2012	9.973 mp	7.919 mp	8.973 mp	7.919 mp	8.973 mp	7.919 mp	7.5 mp	7.844 mp	4.0 mp	5.75 mp	7.919 mp
Total	70.613 mp	58.496 mp	66.166 mp	53.192 mp	69.792 mp	58.757 mp	57.500 mp	56.965 mp	40.0 mp	57.5 mp	59.624 mp

Alternative 4 uses a constant catch strategy to rebuild amberjack stocks (Turner and Scott, 2002). The constant catch strategy would maintain the expected harvest at a constant level so that over the length of the rebuilding period, enough fish escape the fishery and add to the stock size until it reaches a non-overfished level. The advantages of this type of strategy are discussed in Section 8.1. In the first alternative, the expected harvest is not to exceed 4.0 mp, or the highest harvest that could be allowed at the beginning of the rebuilding period using the $F_{30\%SPR}$ (F_{MSY} proxy) yield stream. This option is the most precautionary of all the alternatives and would rebuild the stock to its equilibrium level when fished at MSY in approximately 6 years (Table 2, Figure 8). The second option allows the harvest at the highest level that, when held constant, would rebuild the stock within 10 years. At this time, this harvest has not been estimated; however, it should be between 4 and 7.5 mp (midpoint 5.75 mp) based on projections by NMFS (Turner and Scott, 2002) for a 5-year interval step-wise rebuilding plan (see Alternative 3). However, Turner (personal communication[5]) has indicated that it is likely that this value would be near 5 mp.

Alternative 5 is a combination constant F and constant catch rebuilding plan (Turner and Scott, 2002). During the first three years of the plan (2003-2005), the catch is allowed to be constant at no more than 4.0 mp or the yield for 2003 from the $F_{30\%SPR}$ yield stream. After the first three years, the plan then transitions to the annual yields associated with the $F_{40\%SPR}$ yield streams. This plan was put forward by the RFSAP as their recommended rebuilding strategy, but the basis of this plan was from projected yields from the 2000 stock assessment (Turner et al., 2000) rather than the updated projected yields given by Turner and Scott (2002). In the 2000 stock assessment, the beginning year in the constant $F_{30\%SPR}$ rebuilding plan had an associated yield of 2.2 mp. This was similar to the yield estimated for the second year of the constant $F_{40\%SPR}$ rebuilding plan and was comparable to the most recent annual landings (1999 and 2000) for greater amberjack in the Gulf. The RFSAP (GMFMC, 2000a) felt that the step system using expected annual harvests from the $F_{30\% SPR}$ yield stream transitioning to the $F_{40\% SPR}$ yield stream seemed to be the best management approach because it minimized any landings reductions the fishery might sustain. However, with the updated projections of the greater amberjack stock provided by Turner and Scott (2002), expected harvests under the $F_{40\%SPR}$ yield stream for year one of the plan (2.9 mp) are greater than current landings, so any advantage provided for by this alternative has become moot. The rebuilding plan time frame for this alternative should be between 7 years (fishing at $F_{40\%}$) and 10 years (fishing at $F_{30\%}$) because the initial fishing mortality rate is higher and so rebuilding would be slower (Table 2, Figure 8).

Alternative 6 (no action) could only be adopted if the stock were not determined to be overfished. §303(a)(10) of the M-SFCMA states the when a fishery has been determined to be overfished, conservation and management measures need to be put in place to end overfishing and begin to rebuild the stock. Because NMFS has identified that greater amberjack are overfished, a rebuilding plan must be established for this species.

Biological Impacts: All the alternatives in this section, with the exception of Alternative 6 (no action), established harvest limits that are consistent with rebuilding greater amberjack to B_{MSY} within a 10-year period. Greater amberjack are currently believed to be overfished based on a NMFS stock assessment; however, because of management actions taken by the Council (minimum size limits, a 3-month commercial closure, and 1 fish recreational bag limit), the stock assessment indicates that this species is not undergoing overfishing (GMFMC, 2000a). If yield streams based on $F_{40\%SPR}$ rather than $F_{30\%SPR}$ are used as a basis for the rebuilding plan, greater protection of the stock would be achieved because effective harvests would be less. The Preferred Alternative (Alternative 2, Option b) is one of the more precautionary rebuilding scenarios proposed in the amendment. Not only does it maintain yields consistent with $F_{40\%SPR}$, but the expected harvest for

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[5]Steve Turner, National Marine Fisheries Service, Southeast Fisheries Science Center, Miami, Florida

each 3-year period is based on the yield associated with year one of that period from the constant $F_{40\%SPR}$ yield stream. This means that the expected harvest for years two and three of the time interval would be less than that given by the constant $F_{40\%SPR}$ yield stream. Alternative 6 would not be beneficial to the stock because it does not set a rebuilding plan for stock recovery.

While all of the alternatives except no action would establish plans to rebuild the greater amberjack stock to at least the B_{MSY} level, they do have different degrees of risk depending on the strategy employed. Alternative 1 (using a constant F strategy) puts much of the recovery at the beginning of the program, so that if poor year classes or other negative events occur later in the recovery they would have less of an impact on the recovery. Alternative 4 (using a constant catch strategy) puts much of the recovery toward the end of the program and would be more susceptible to negative events occurring at the beginning of the recovery period. For this reason, this could be considered the most biologically risk-prone alternative, particularly Option b.

The Preferred Alternative (Alternatives 2, Option b), because it uses the first year of each 3-year interval, provides more rebuilding up front than Alternative 1 because the catch is not expected to increase for years 2 and 3 of each interval. Alternative 3 contains measures that are of intermediate in risk. It includes an initial period of stability (5 years) before catches could increase; however, the initial expected harvests are higher than Alternatives 1 and 2 so that the initial gains in the stock as it rebuilds would be less. Alternative 6 (no action), based on the 2000 greater amberjack stock assessment, would probably result in a continuing increase in the stock because current regulations have reduced F to a level below the current MFMT of $F_{30\%SPR}$.

<u>Socioeconomic Impacts</u>: Each of the rebuilding paths shown in Table 3 provides for harvest goals (HG) during the rebuilding period. At present, there is no intent to impose a hard TAC or change any regulations that would exogenously change the harvest patterns in the commercial and recreational sectors of the fishery. In terms of immediate impacts on fishery participants, all alternatives may be considered identical to one another and even to the no action alternative, although this latter is not an appropriate rebuilding alternative. However, there are potential differences in the near-term and long-term impacts of the various alternatives, as discussed below.

Each of the rebuilding path alternatives differs from the no action alternative in the explicit specification of a harvest path. Although there is no change in management measures that are currently associated with any of the rebuilding paths, annual harvests will be monitored to insure that succeeding years' harvest levels do not significantly exceed the HG. Under a rebuilding path, management measures in succeeding years may be altered to correct any projected significant upward deviation from a given path. This is especially the case if a recent stock assessment has determined that harvest performance in the fishery has significantly deviated from a chosen rebuilding path.

To the extent that there are no immediate changes in management measures from the adoption of a rebuilding path, there is expected to be no immediate socioeconomic impacts attributable to any of the alternatives. The likelihood for any management changes in the near future depends on whether future harvests under existing regulations will significantly deviate from any of the rebuilding path HGs. Although the fishery experienced high level of harvests in the past (e.g., 1986-1989), the more relevant harvest scenario in the next 2 to 3 years is likely the one that occurred more recently, specifically since 1998. There are several reasons that support this contention. First, total harvests leveled off at around 2.0 mp since 1995, and in addition it was in 1997 for the recreational sector and 1998 for the commercial sector that current more restrictive regulations were implemented. These more recent regulations could only add a downward pressure on harvests that already started to decline before the implementation of these regulations. Second, the commercial sector, which in more recent years has accounted for close to half of total harvests, may continue to experience lower profit incentive for harvesting greater amberjack. Some fishermen have indicated they lost some markets for greater amberjack due to fishery restrictions that resulted in less steady supply of the fish. They attributed this effect mainly to the 3-month closure in the commercial greater amberjack fishery. Without any changes in present regulations, particularly the 3-month closure, it is unlikely for those lost markets to be recovered, and thus commercial harvest would likely be constrained to current levels, at least in the short-run. Given this condition, adoption of any of the rebuilding paths would not likely result in any more restrictive measures for the fishery in the next 2 to 3 years. It may be noted, though, that the paths that provide for lower harvest levels need to be more closely monitored than others to ensure that the fishery does not significantly deviate from the rebuilding path. In this case, Alternative 2(b) (Preferred Alternative) and Alternative 1(b) would be subject to such requirement, with particular emphasis on Alternative 2(b) since its associated harvest level is kept at a relatively low level for 3 years.

Beyond the first 2 to 3 years of the rebuilding period, there is a good possibility that harvests could significantly deviate from a given rebuilding path. The deviation can be on either the upside or downside of a given HG. Since it is not possible to exactly determine which of the two possibilities is likely to occur, the following two paragraphs simply discuss the implications of either an upside or downside deviation of harvests from a given HG.

An increase in harvest could be due to an increase in abundance from a recovering stock, and if on top of that effort also increases, then harvest could further increase. An increase in fishing effort is probably a likely event. An increase in fishing effort by the recreational fishery appears to be good possibility because: 1) the population of anglers is increasing, particularly in coastal areas and 2) as the economy rebounds from its current depressed condition, anglers will have more income to spend on fishing. On the commercial side, an increase in fishing effort may be forthcoming from longline vessels that may convert to vertical line gear if the proposed 50-fathom line ban on longlines becomes effective. Forgone landings of greater amberjack from longline vessels are likely to be outweighed by increases in landings from vertical line vessels, because longline vessels currently land less than one percent of that of vertical line vessels. A possibly worst case scenario in the commercial sector occurs if the market for greater amberjack does not expand, because any additional increase in landings will only further depress prices from their current low levels. In the event that harvests significantly overshot the HG, more restrictive measures, possibly including a hard TAC, would have to be adopted , with accompanying adverse socioeconomic impacts such as depressed ex-vessel prices, longer closure, and further loss in the market for domestic greater amberjack. Among the alternatives, the HG that would most likely be exceeded is that for Alternative 4(a) and the least to be exceeded are these for Alternative 1(a) and Alternative 2(c). The Preferred Alternative falls somewhere in the middle of these two extremes.

If, on the other hand, current regulations are restrictive enough to force total harvests to remain below the HG of a given rebuilding path for a longer period of time, socioeconomic considerations, in terms of higher vessel revenues and profits and possibly higher employment, appear to favor relaxing current regulations. It should be stressed here that easing of regulations is warranted from a socioeconomic standpoint only if harvests remain well below the HG for a good number of years, say, 3 to 5 years. More uncertainty on the part of fishery participants would be created if regulations were eased one year only to be followed by more stringent regulations the next year. Among the rebuilding path alternatives, Alternative 1(a) and Alternative 2(c) are likely to demand more easing of fishing regulations, with Alternative 4(a) as the least likely to demand such easing of regulations. As with the upside deviation, the Preferred Alternative falls in between the two extremes for relaxing regulations.

Taking into consideration both the short-term and long-term implications of the rebuilding paths, the more important issue becomes that of determining the quality of the various rebuilding paths from the standpoint of both the speed and likelihood of stock recovery and socioeconomic implications. If speed of recovery were the deciding factor, then Alternative 4(a) would be ranked highest since the stock can recover in 6 years while Alternative 1(a), Alternative 2(a), and Alternative 2(c) would be ranked lowest since each of them requires 10 years for the stock to recover. The underlying assumption here is that a shorter recovery period is associated with a higher likelihood of a successful stock recovery. The Preferred Alternative, together with the rest of those that provide a 7-year stock recovery, falls in between the two extremes. The ranking of alternatives would change if socioeconomic factors were the deciding consideration. As discussed in Section 9, if all rebuilding paths have equal probability of successfully rebuilding the stock within 10 years, the paths associated with the largest net present values are generally those that rebuild the stock in 10 years. The only exception to this generalization is Alternative 4(b), which is associated with the third overall highest net present values but rebuilds the stock in 7 years. It should be noted that the calculation of net present values takes into account the possibility of increasing HG to OY once the stock is rebuilt. The largest net present value belongs to Alternative 1(a). If both speed of stock recovery and socioeconomics are jointly considered as the deciding factors, it appears that alternatives that fall in the middle of the two extremes would be the better choices. Among these alternatives, it appears that Alternative 4(b) is the best, because it provides for the largest net present values among those that rebuild the stock in 7 years. If a higher probability of success can be attributed to those paths that rebuild the stock in 7 years in a more conservative fashion, then those paths traced by $F_{40\%SPR}$ may be considered to offer a higher probability of successfully rebuilding the stock. Among such paths, the best is Alternative 2(d), because it is associated with the largest net present value. This alternative provides for a higher likelihood of successfully rebuilding the stock and allows for HGs that are less likely be exceeded in the short-term under current fishing regulations. Ranked close to but lower than this alternative are Alternative 1(b) and Alternative 2(b) (Preferred Alternative). Each of these two alternatives traces a rebuilding path at $F_{40\%SPR}$, similar to Alternative 1(b), but provides for lower HGs (and net present values) overall and for each 3-year interval.

Because there are no expected changes in regulations that would require a reduction in the harvest of greater amberjack, no consequent adverse short-term impacts on various participants and communities would ensue from the choice of a rebuilding path. Over time as the stock is rebuilt, participation can also increase provided regulations are relaxed. The extent of such relaxation, however, has to consider potential increases in catchability due to an increasing biomass and potential increases in fishing effort.

Commercial participation in the greater amberjack fishery is distributed among the various 5 Gulf states. Based on logbook records (Waters 2002), Florida (west coast) is by far the largest participant accounting for as much as 443,033 pounds of commercial landings in 2000. Louisiana is the second largest participant, accounting for 181,325 pounds of commercial landings in 2000. The other states have relatively low participation, with 52,332 pounds for Texas, 8,088 pounds for Mississippi, and 5,792 pounds for Alabama. It is likely that current restrictive regulations must have proportionally affected these states, and there is good reason to expect that future benefits from a fully rebuilt greater amberjack stock would be proportionally shared by these states.

Among Florida counties, Pinellas stood out as the county with the largest commercial landings of 219,461 pounds in 2000, followed by Bay with 80,980 pounds in 2000. The other counties that accounted for a fair amount of commercial landings are Okaloosa (37,494 pounds), Monroe (32,692 pounds), and Escambia (28,752 pounds). Each of the other Florida counties showing commercial landings of greater amberjack registered less than 15,000 pounds of landings in 2000. From the standpoint of potential impacts on fishing communities, Bay County is particularly important since Panama City, which has been determined as a fishing-dependent community (Jacob et al. 2001), is located in that county. Possibly also important from the standpoint of impacts on fishing communities is Franklin County. Although this county landed only 13,571 pounds of greater amberjack in 2000, another fishing-dependent community (Apalachicola) is located in that county. In Louisiana, the top 3 parishes in terms of commercial landings of greater amberjack are Laforche (94,270 pounds), Cameron (57,661 pounds), and Plaquemines (13,638 pounds). In Texas, the top three counties are Brazoria (22,079 pounds), Harris (15,215 pounds), and Galveston (10,755 pounds). Baldwin and Mobile in Alabama and Jackson in Mississippi are the only counties in those states that showed commercial landings of greater amberjack in 2000.

Based on MRFSS data (Holiman 2002), Florida accounted for the most landings of recreationally caught greater amberjack, with 674,602 pounds in 2000. This was followed by Louisiana with 173,101 pounds and Alabama with 162,352 pounds landed in 2000. Texas landed 13,073 pounds or 880 fish in 1999 based on NMFS Headboat Survey data and additional 311 fish based on Texas Parks and Wildlife Survey data (Holiman 2002). Although there is no community presently determined as recreationally fishing dependent, some of the major activity centers noted by Holland et al. (1999) for Florida and Sutton et al. (1999) for the other Gulf states can serve as a starting point for further study (see Sections 7.3.3 and 7.3.4). Also, Jacob et al. (2001) initially determined 7 communities in Florida as potential recreationally fishing-dependent communities. These are Horseshoe Beach, Steinhatchee, Ochopee, Punta Gorda, Placida, Bokeelia and Carrabelle. Note that both Steinhatchee and Ochopee have been determined as commercially fishing-dependent communities. It should also be noted that Jacob et al. (2001) expressed less confidence in their data and indicators to consider the mentioned 7 communities as recreationally fishing-dependent communities. At any rate, these mentioned areas are possibly the ones that may directly benefit from rebuilding the greater amberjack stock or continue to experience slowdown in activities if the greater amberjack stock is not fully recovered.

9.0 REGULATORY IMPACT REVIEW

9.1 Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way.

The RIR also serves as the basis for determining whether the proposed regulation is a "significant regulatory action" under certain criteria provided in Executive Order 12866, and provides some basic information in determining whether the proposed regulation would have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act of 1980 (RFA).

This RIR analyzes the potential impacts that the alternatives in this Secretarial amendment to the Reef Fish FMP would have on participants in the reef fish fishery.

9.2 Problems and Issues in the Fishery

The specific problems addressed by this proposed plan amendment are enumerated and discussed in Section 3.0 and are incorporated here by reference. The major issues identified for this Secretarial amendment are the development of SFA criteria and a rebuilding plan for greater amberjack.

9.3 Objectives

Section 4.0 discusses the specific need for this Secretarial amendment and is incorporated here by reference.

9.4 Description of the Fishery

A description of the fishery is contained in Section 7.0 and is incorporated here by reference.

9.5 Impacts of Greater Amberjack Sustainable Fishing Parameters: Maximum Sustainable Yield, Minimum Stock Size Threshold, Maximum Fishing Mortality Threshold, and Optimum Yield

Except for Optimum Yield (OY), the discussions in Sections 8.2.1, 8.2.3, and 8.2.4 are deemed to be sufficient. For purposes of economic impact analysis, these sets of measures have more relevance by way of affecting the choice of MSY and OY. The following discussions on the choice of OY are considered to apply also to the choice of MSY.

There are seven alternatives specifying OY for greater amberjack that range from just less than 8.2 mp (Alternative 4) to 9.5 mp (Alternative 3). (Note: Alternative 4 specifies OY as the yield corresponding to fishing at $0.65*F_{30\%SPR}$ and is just less than the yield of 8.5 mp that is derived from fishing at $F_{40\%SPR}$ which is estimated to be equal to $0.72*F_{30\%SPR}$.) An OY set at the yield derived from fishing at $F_{40\%SPR}$ is the Council's Preferred Alternative (Alternative 1). From a biological standpoint, the lower the OY from MSY, the more conservative would be the choice.

Any value within the chosen OY range may be adopted as the allowable harvest after the rebuilding period. The rebuilding period is considered to vary across the various rebuilding paths on the basis of the number of years it takes to rebuild under each rebuilding path. As previously noted, Alternative 1(a), Alternative 2(a) and Alternative 2(c) would recover the stock in 10 years; Alternative 4(a) would recover the stock in 6 years; and, all other alternatives would recover the stock in 7 years. It must be recalled, as discussed in Section 8.2.2, that the OY options in this amendment do not take into account socioeconomic factors, so that the analysis here proceeds by considering OY as a level of harvest and determining the economic implications of that harvest level.

On the assumption that all paths can successfully rebuild the stock within 10 years, one major analytical issue relative to the economic outcome of the possible OY levels relates to the determination of net present value over a 20-year period, which provides for at least 10 years of harvesting at OY after the stock has fully recovered. Under this assumption, the path that yields the highest net present value would be preferred over those that provide lower values. The implicit objective function here is one of maximizing net present values subject to a successful rebuilding of the stock. Within this analytical framework, the two major aspects that differentiate one rebuilding path from another are the level of harvest (and accompanying net present value) allowed during the rebuilding period and the speed at which such harvest would be increased to a level at a specified OY

If, on the other hand, the various paths differ in their probabilities of achieving the rebuilding target within 10 years, a mere focus on net present valuation would not be sufficient. If such probabilities were available, they can be used to weight the resulting net present values to arrive at "expected" net present values for the various rebuilding paths. These expected net present values would be the relevant figures to use in comparing the economic implications of the various rebuilding paths, including OY. In the absence of such probabilities, the discussion on net present valuation would be modified to account for some qualitative description of such probabilities. In the present case, the general assumption taken is that a path that provides for a shorter rebuilding period has a higher probability of achieving the rebuilding target.

To conduct the analysis of the various OY levels, certain simplifying assumptions are made. First, once an OY is chosen, it is kept constant throughout the post-rebuilding period. Second, most of the features characterizing the recreational and commercial sectors during the rebuilding period are considered to remain the same throughout the post-rebuilding period. The only major change is the level of allowable harvest which is increased from what it was on the last year of the rebuilding period for each rebuilding path to OY. Third, during and after the rebuilding period, regulations are adjusted upward or downward to allow the fishery to match harvest with the allowable harvest.

9.6 Impacts of Rebuilding Scenarios

9.6.1 Introduction

The general approach the Council considers in this amendment is to select a harvest goal (HG) for greater amberjack during the rebuilding period. Over the rebuilding period, the economic issue for the greater amberjack fishery may be characterized as a tradeoff in value of catches over time. A larger HG now would yield greater commercial and recreational benefits in the short-term, but probably with a cost of a slower stock recovery. Conversely, a smaller HG now would generate fewer short-term benefits, but likely would also lead to a faster realization of the benefits of a larger greater amberjack resource in the future made possible by a faster recovery of the fish stock. The net present value approach is useful in this particular situation.

Net present value is calculated as a weighted sum of annual net benefits expected to be received over time. The weighting factor is determined by the discount rate and declines exponentially over time. The choice of a discount rate plays an important role, especially when net present valuation is done over a longer period. A higher discount rate would favor a rebuilding period that generates more short-term benefits. Conversely, a lower discount rate would favor a rebuilding period with larger benefits in the long-term. In general, a 7 percent discount rate is mandated for net present valuation in fisheries in the U.S. A bioeconomic model would be highly appropriate as an analytical approach. In its absence only some quantitative generalizations coupled with qualitative discussions may be attempted. In addition, available information is not sufficient to establish net benefit values for both the commercial and recreational sectors, so that for the current purpose the annual HG for each rebuilding path is simply multiplied by one dollar to arrive at "economic" values associated with a given rebuilding path. For the recreational sector, existing demand studies in other fisheries do not provide the level of specificity as to be useful for greater amberjack. In their consideration of the rebuilding plan for red grouper, the SEP (2002) concluded that existing demand studies do not provide enough information to create willingness to pay function which is needed to provide valuation in the recreational fishery. On the commercial side, existing information is also not sufficient to come up with at least net profitability in the greater amberjack fishery. The fishing vessels prosecuting greater amberjack have not been adequately characterized from a cost and return perspective, partly because of the possibility that only few vessels do target the fish. Generating this information would take more time and effort and would entail cost that is probably not worth the expected benefits.

Ideally, a TAC has to be established and allocated to the commercial and recreational sectors in order to determine the economic implications of a rebuilding strategy for greater amberjack. The need for a commercial/recreational allocation is premised on the difference in economic valuation between the two sectors. Given that, as previously noted, the general management approach considered in this amendment is the provision of an HG, the distribution of such HG between the commercial and recreational sectors may be considered commercial harvest goal (CHG) and recreational harvest goal (RHG). Several commercial/recreational distribution ratios are explored below to elicit certain economic implications of the various rebuilding paths on the commercial and recreational fishing participants.

9.6.2 Harvest Goals

Table 3 presents 11 possible greater amberjack rebuilding alternatives corresponding to the five alternatives, excluding the no action, presented and discussed in Section 8.2.2. At present (Alternative 6-no action), there is no specific TAC for greater amberjack, but several management measures are currently in effect to protect the stock. For the first year of the rebuilding, the HGs range from 2.917 mp (Alternative 1, Option b and Alternative 2, Option b) to 5.75 mp (Alternative 4, Option b). For the entire rebuilding period, total HGs range from 40.0 mp (Alternative 4, Option a) to 69.792 mp (Alternative 2, Option c). If all alternatives have equal probability of rebuilding the stock within 10 years and assuming the same management regime adopted for each alternative, it is probably not necessary to calculate the net present values to conclude that Alternative 1, Option a would provide the greatest economic benefits given this alternative has the highest total HG. It may be noted, however, that each alternative would rebuild the stock at different times, with the most initially restrictive HG likely to provide the shortest time for rebuilding. This condition is important as it would change the assumption of the same management regime, since once the stock is rebuilt, restrictions imposed on the fishery may be relaxed. The shorter then is the period for the stock to recover to the target level, the earlier would be the timing in relaxing fishing regulations.

If current landings, which hover around 2.0 mp, are maintained at that level through at least 2003 and/or through the first few years of the rebuilding period, the adoption of an HG under any alternative would not result in short-term required reductions in total harvest. The lowest HG for 2003 is 2.917 mp (Alternative 1, Option b and Alternative 2, Option b) and is well above most recent landings in the fishery. The possibility of a required total harvest reduction under Alternative 5, which sets an HG of 3.991 mp from 2003 to 2005, is even more unlikely, and thus short-term negative economic impacts on the fishery would not ensue. This raises then the issue of whether there is a need to relax current regulations on greater amberjack without necessarily setting the fishery off the rebuilding path. Economic gains are likely to be gained by relaxing regulations. But in the absence of a TAC and quota closures, there is no assurance that a given HG would not be exceeded if regulations were relaxed. This is particularly more important when the chosen rebuilding path, such as Option b of Alternative 1 or Option b of Alternative 2, provides for relatively low HGs than when the chosen rebuilding path, such as Alternative 4, provides for higher HGs. It should be noted, though, that the alternatives that provide for higher HGs also require a longer rebuilding period and possibly provide for the lowest probability of achieving the rebuilding target within 10 years.

For the purpose of determining the economic implications of a given HG on the commercial and fishing participants, such HG has to be allocated between the two sectors. Several alternatives exist in making such allocation. One alternative is the allocation provided under

Amendment 1 to the Reef Fish FMP which uses the landings history of both sectors for the period 1979-1987, resulting in a 14 percent commercial and 86 percent recreational allocation. Another alternative would be the proportion of commercial and recreational landings in more recent years. The ratio would be 43 percent commercial and 57 percent recreational if based on 2001 data, or 48 percent commercial and 52 percent recreational if based on average landings/harvests for 1999-2001. As previously noted, the resulting commercial sector's share of HG may be termed CHG and that for the recreational sector, RHG.

Tables 4a and 4b show the CHGs under each rebuilding alternative using a 14 percent and 48 percent share, respectively. Commercial landings have generally been maintained at 1.0 mp to 1.5 mp. For the period 1999-2000, commercial landings averaged around 690,000 pounds. Under a 14 percent commercial share of HG (Table 4a), only Alternative 4 could accommodate the more recent landings history of the commercial sector. Under all other alternatives, the commercial sector is likely to exceed the CHG, at least within the first few years of the rebuilding period. On the other hand, if the assumed commercial share of HG is 48 percent (Table 4b), practically all alternatives could accommodate the more recent landings history of the commercial sector.

Tables 5a and 5b present the RHGs under each alternative using 86 percent and 52 percent recreational share, respectively. For the period 1999-2000, recreational harvest averaged around 748,000 pounds. Regardless of the percentage share used, recent harvest levels of the recreational sector can be accommodated by all alternatives. The lowest RHG for 2003 of 1.52 mp (Alternative 1, Option b and Alternative 2, Option b) is well above the recent (1998-2000) harvest. Hence, no short-run adverse impacts on the recreational fishery may be expected from any of the rebuilding alternatives.

In estimating net present values, the HG under each rebuilding path is assumed to be that shown in Table 3 up through the time the stock is rebuilt. After the stock is rebuilt, the HG is assumed to equal OY. Additionally, the analysis extends the time horizon to 20 years in order to flush out the difference in economic values of rebuilding paths that differ not only in allowable harvests but also in the speed of stock recovery.

Table 6 shows the 20-year yield streams (HGs) for each rebuilding alternative, using an OY of 8.50 mp. Among the alternatives, Alternative 1(a) provides for the largest total HG for the 20-year period while Alternative 2(b) (Preferred Alternative) has the smallest total HG. It is interesting to note that Alternative 4(a), which allows the stock to recover in the shortest time possible, has the second lowest total HG. The OY level of 8.5 mp is apparently low enough as to not offset low HGs in the early years. Alternative 2(b), which has the largest total HG, shows a rather odd case where the allowable harvest is reduced after the stock has fully recovered. As previously noted, a 10-year recovery period may be associated with lower probability of successfully recovering the stock than a 6- or 7-year recovery period. Of the alternatives that provide for a 7-year recovery, the paths traced by $F_{40\%SPR}$ may be considered to offer a higher probability of success. Among the paths traced by $F_{40\%SPR}$, Alternative 2(d) is associated with the largest total HG over the 20-year period.

Table 7 presents net present values associated with each rebuilding path. The largest sum of values over the 20-year period is associated with Alternative 1(a) while the smallest is associated with Alternative 2(b), which is the Preferred Alternative. The second lowest sum of values is associated with Alternative 4(a), indicating that even if OY level is the allowable harvest starting after 6 years, the discounting process has kept low the economic valuation of this alternative relative to that of the other alternatives. Among the paths traced by $F_{40\%SPR}$, Alternative 2(d) shows the largest overall economic values. It appears then that a combination of speed of stock recovery (together with the likelihood of success) and economic values, Alternative 2(d) may be adjudged as the best rebuilding path.

Given the assumption that all paths have equal probability of rebuilding the stock within 10 years, the best rebuilding path is Alternative 1(a) because it is associated with the largest net present value. Under the same criteria, the worst rebuilding path is Alternative 2(b), which is the Council's Preferred Alternative. Considering that the various rebuilding path alternatives differ in the years it takes to rebuild the stock, there is good reason to expect that they differ in their probabilities of successfully rebuilding the stock. In the absence of actual probability estimates, it is perhaps not unrealistic to assume that those paths that can rebuild the stock within a shorter time period have higher probabilities of success than those that require a longer period. Under this assumption, the domain of rebuilding path alternatives would be limited to those that achieve the rebuilding target within 7 years. If it is assumed that all such alternatives have equal probability of success, Alternative 4(b) may be ranked highest because it is associated with the largest net present value. The lowest ranking still belongs to the Preferred Alternative (Alternative 2(b)). It should be noted that these alternatives with shorter rebuilding periods differ, with some using constant catch strategy and others using constant F strategy. Those using constant F strategy may also be subdivided into rebuilding paths traced by $F_{40\%SPR}$ and those traced by $F_{30\%SPR}$. It is not readily obvious that the probability of success differs between a constant F and constant catch strategies. However, in the case of constant F strategy, it is likely that paths traced by $F_{40\%SPR}$ may be associated with a higher probability of success, since those paths are more conservative than those traced by $F_{30\%SPR}$. Within this subset of alternatives, the best rebuilding path is Alternative 2(d) as it is associated with the largest net present values. The Preferred Alternative (Alternative 2(b)) is still the lowest ranked alternative.

It is worth noting at this stage that the calculation of net present values assumed, among others, that total harvests exactly match the HGs. If current harvest levels persist throughout the rebuilding period such that they consistently fall below any given HG, then it is not possible to differentiate, for economic ranking purposes, one rebuilding path from another. Without relaxing current regulations, there is a good possibility that total harvests may remain at their current low levels at least within the next 3 years. But beyond 3 years, there is a good possibility that, even maintaining current regulations, total harvests may increase due to an increase in catchability from an increasing biomass and due to an increase in fishing effort. If by then total harvests exceed a given HG, some changes in regulations may have to be adopted to keep on track the stock rebuilding strategy. Since the general approach taken in this amendment is to keep track of harvests and stock status on a yearly basis, there may occur some delay in ensuring that the rebuilding target is on track. Under this condition, the path that allows the best chance for ensuring the rebuilding target is on track is one that provides the lowest HGs, which in the present case is the Preferred Alternative. If the HG under this path is exceeded one year, adjusting regulations for the succeeding years offers a better chance of keeping the rebuilding plan on track than if a relatively higher HG under a different path is exceeded. It is probably along this line that the Preferred Alternative may be considered to be associated with the highest probability of success in rebuilding the stock. But whether this probability is significantly higher than that associated with other paths traced by $F_{40\%SPR}$,such as Alternative 1(b) or Alternative 2(d), cannot be determined.

Although there are 7 alternatives for OY, there are actually only six different values, which in descending order are: 9.5 mp, 9.2 mp, 9.0 mp, 8.7 mp, 8.5 mp, and 8.2 mp. Table 8 shows the sum of values over the 2003-2022 period under various OY levels. It is rather intuitive to say that the higher are the OY values the greater will be the economic outcome regardless of the rebuilding path chosen. A perusal of Table 8 confirms this assertion.

Table 4a. Commercial harvest goal (14 percent) under each path during the rebuilding period, 2003-2012. The Preferred Alternative is highlighted in gray.

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\%\ SPR}$	Yield at $F_{40\%\ SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	0.55874	0.40838	0.55874	0.40838	0.65058	0.504	0.56	0.56	0.56	0.805	0.55874
2004	0.65058	0.50512	0.55874	0.40838	0.65058	0.504	0.56	0.56	0.56	0.805	0.55874
2005	0.76146	0.6048	0.55874	0.40838	0.65058	0.504	0.56	0.56	0.56	0.805	0.55874
2006	0.88564	0.72268	0.88564	0.72268	0.99778	0.8323	0.56	0.56	0.56	0.805	0.72268
2007	0.99778	0.8323	0.88564	0.72268	0.99778	0.8323	0.56	0.56	0.56	0.805	0.8323
2008	1.07898	0.91378	1.13988	0.72268	0.99778	0.8323	1.05	0.95522	0.56	0.805	0.91378
2009	1.13988	0.98196	1.13988	0.98168	1.18986	1.03614	1.05	1.0045	0.56	0.805	0.98196
2010	1.18986	1.03614	1.13988	0.98168	1.18986	1.03614	1.05	1.03726	0.56	0.805	1.03614
2011	1.22668	1.07562	1.13988	0.98168	1.18986	1.03614	1.05	1.07996	0.56	0.805	1.07562
2012	1.25622	1.10866	1.25622	1.10866	1.25622	1.10866	1.05	1.09816	0.56	0.805	1.10866
Total	**9.74582**	**8.18944**	**9.26324**	**7.44688**	**9.77088**	**8.22598**	**8.05**	**7.9751**	**5.6**	**8.05**	**8.34736**

Table 4b. Commercial harvest goal (48 percent) under each path during the rebuilding period, 2003-2012. The Preferred Alternative is highlighted in gray.

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\%\ SPR}$	Yield at $F_{40\%\ SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	1.91568	1.40016	1.91568	1.40016	2.23056	1.728	1.92	1.92	1.92	2.76	1.91568
2004	2.23056	1.73184	1.91568	1.40016	2.23056	1.728	1.92	1.92	1.92	2.76	1.91568
2005	2.61072	2.0736	1.91568	1.40016	2.23056	1.728	1.92	1.92	1.92	2.76	1.91568
2006	3.03648	2.47776	3.03648	2.47776	3.42096	2.8536	1.92	1.92	1.92	2.76	2.47776
2007	3.42096	2.8536	3.03648	2.47776	3.42096	2.8536	1.92	1.92	1.92	2.76	2.8536
2008	3.69936	3.13296	3.90816	2.47776	3.42096	2.8536	3.6	3.27504	1.92	2.76	3.13296
2009	3.90816	3.36672	3.90816	3.36576	4.07952	3.55248	3.6	3.444	1.92	2.76	3.36672
2010	4.07952	3.55248	3.90816	3.36576	4.07952	3.55248	3.6	3.55632	1.92	2.76	3.55248
2011	4.20576	3.68784	3.90816	3.36576	4.07952	3.55248	3.6	3.70272	1.92	2.76	3.68784
2012	4.30704	3.80112	4.30704	3.80112	4.30704	3.80112	3.6	3.76512	1.92	2.76	3.80112
Total	**33.41424**	**28.07808**	**31.75968**	**25.53216**	**33.50016**	**28.20336**	**27.6**	**27.3432**	**19.2**	**27.6**	**28.61952**

Table 5a. Recreational harvest goal (86 percent) under each path during the rebuilding period, 2003-2012. The Preferred Alternative is highlighted in gray.

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\% SPR}$	Yield at $F_{40\% SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	3.43226	2.50862	3.43226	2.50862	3.99642	3.096	3.44	3.44	3.44	4.945	3.43226
2004	3.99642	3.10288	3.43226	2.50862	3.99642	3.096	3.44	3.44	3.44	4.945	3.43226
2005	4.67754	3.7152	3.43226	2.50862	3.99642	3.096	3.44	3.44	3.44	4.945	3.43226
2006	5.44036	4.43932	5.44036	4.43932	6.12922	5.1127	3.44	3.44	3.44	4.945	4.43932
2007	6.12922	5.1127	5.44036	4.43932	6.12922	5.1127	3.44	3.44	3.44	4.945	5.1127
2008	6.62802	5.61322	7.00212	4.43932	6.12922	5.1127	6.45	5.86778	3.44	4.945	5.61322
2009	7.00212	6.03204	7.00212	6.03032	7.30914	6.36486	6.45	6.1705	3.44	4.945	6.03204
2010	7.30914	6.36486	7.00212	6.03032	7.30914	6.36486	6.45	6.37174	3.44	4.945	6.36486
2011	7.53532	6.60738	7.00212	6.03032	7.30914	6.36486	6.45	6.63404	3.44	4.945	6.60738
2012	7.71678	6.81034	7.71678	6.81034	7.71678	6.81034	6.45	6.74584	3.44	4.945	6.81034
Total	**59.86718**	**50.30656**	**56.90276**	**45.74512**	**60.02112**	**50.53102**	**49.45**	**48.9899**	**34.4**	**49.45**	**51.27664**

Table 5b. Recreational harvest goal (52 percent) under each path during the rebuilding period, 2003-2012. The Preferred Alternative is highlighted in gray.

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\%\ SPR}$	Yield at $F_{40\%\ SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	2.07532	1.51684	2.07532	1.51684	2.41644	1.872	2.08	2.08	2.08	2.99	2.07532
2004	2.41644	1.87616	2.07532	1.51684	2.41644	1.872	2.08	2.08	2.08	2.99	2.07532
2005	2.82828	2.2464	2.07532	1.51684	2.41644	1.872	2.08	2.08	2.08	2.99	2.07532
2006	3.28952	2.68424	3.28952	2.68424	3.70604	3.0914	2.08	2.08	2.08	2.99	2.68424
2007	3.70604	3.0914	3.28952	2.68424	3.70604	3.0914	2.08	2.08	2.08	2.99	3.0914
2008	4.00764	3.39404	4.23384	2.68424	3.70604	3.0914	3.9	3.54796	2.08	2.99	3.39404
2009	4.23384	3.64728	4.23384	3.64624	4.41948	3.84852	3.9	3.731	2.08	2.99	3.64728
2010	4.41948	3.84852	4.23384	3.64624	4.41948	3.84852	3.9	3.85268	2.08	2.99	3.84852
2011	4.55624	3.99516	4.23384	3.64624	4.41948	3.84852	3.9	4.01128	2.08	2.99	3.99516
2012	4.66596	4.11788	4.66596	4.11788	4.66596	4.11788	3.9	4.07888	2.08	2.99	4.11788
Total	**36.19876**	**30.41792**	**34.40632**	**27.65984**	**36.29184**	**30.55364**	**29.9**	**29.6218**	**20.8**	**29.9**	**31.00448**

Table 6. Harvest goals under each path for the period, 2003-2022. The Preferred Alternative is highlighted in gray. (Million Pounds)

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\% SPR}$	Yield at $F_{40\% SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	3.991	2.917	3.991	2.917	4.647	3.600	4.000	4.000	4.000	5.750	3.991
2004	4.647	3.608	3.991	2.917	4.647	3.600	4.000	4.000	4.000	5.750	3.991
2005	5.439	4.320	3.991	2.917	4.647	3.600	4.000	4.000	4.000	5.750	3.991
2006	6.326	5.162	6.326	5.162	7.127	5.945	4.000	4.000	4.000	5.750	5.162
2007	7.127	5.945	6.326	5.162	7.127	5.945	4.000	4.000	4.000	5.750	5.945
2008	7.707	6.527	6.326	5.162	7.127	5.945	7.500	6.823	4.000	5.750	6.527
2009	8.142	7.014	8.142	7.012	8.499	7.401	7.500	7.175	8.500	5.750	7.014
2010	8.499	8.500	8.142	8.500	8.499	8.500	8.500	8.500	8.500	8.500	8.500
2011	8.762	8.500	8.142	8.500	8.499	8.500	8.500	8.500	8.500	8.500	8.500
2012	9.973	8.500	8.973	8.500	8.973	8.500	8.500	8.500	8.500	8.500	8.500
2013	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2014	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2015	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2016	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2017	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2018	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2019	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2020	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2021	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
2022	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Total	**155.613**	**145.993**	**149.35**	**141.749**	**154.792**	**146.536**	**145.5**	**144.498**	**143**	**150.75**	**147.121**

Table 7. Net present values (7 percent discount rate) under each path for the period, 2003-2022. The Preferred Alternative is highlighted in gray. A $1 per pound of fish is used for the sole purpose of present value calculations.
(Million Dollars)

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
Year	Yield at $F_{30\%\ SPR}$	Yield at $F_{40\%\ SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
2003	3.730	2.726	3.730	2.726	4.343	3.364	3.738	3.738	3.738	5.374	3.730
2004	4.059	3.151	3.486	2.548	4.059	3.144	3.494	3.494	3.494	5.022	3.486
2005	4.440	3.526	3.258	2.381	3.793	2.939	3.265	3.265	3.265	4.694	3.258
2006	4.826	3.938	4.826	3.938	5.437	4.535	3.052	3.052	3.052	4.387	3.938
2007	5.081	4.239	4.510	3.680	5.081	4.239	2.852	2.852	2.852	4.100	4.239
2008	5.135	4.349	4.215	3.440	4.749	3.961	4.998	4.546	2.665	3.831	4.349
2009	5.070	4.368	5.070	4.367	5.293	4.609	4.671	4.468	5.293	3.581	4.368
2010	4.946	4.947	4.739	4.947	4.946	4.947	4.947	4.947	4.947	4.947	4.947
2011	4.766	4.623	4.429	4.623	4.623	4.623	4.623	4.923	4.623	4.623	4.623
2012	5.070	4.321	4.561	4.321	4.561	4.321	4.321	4.321	4.321	4.321	4.321
2013	4.038	4.038	4.038	4.038	4.038	4.038	4.038	4.038	4.038	4.038	4.038
2014	3.774	3.774	3.774	3.774	3.774	3.774	3.774	3.774	3.774	3.774	3.774
2015	3.527	3.527	3.527	3.527	3.527	3.527	3.527	3.527	3.527	3.527	3.527
2016	3.296	3.296	3.296	3.296	3.296	3.296	3.296	3.296	3.296	3.296	3.296
2017	3.081	3.081	3.081	3.081	3.081	3.081	3.081	3.081	3.081	3.081	3.081
2018	2.879	2.879	2.879	2.879	2.879	2.879	2.879	2.879	2.879	2.879	2.879
2019	2.691	2.691	2.691	2.691	2.691	2.691	2.691	2.691	2.691	2.691	2.691
2020	2.515	2.515	2.515	2.515	2.515	2.515	2.515	2.515	2.515	2.515	2.515
2021	2.350	2.350	2.350	2.350	2.350	2.350	2.350	2.350	2.350	2.350	2.350
2022	2.197	2.197	2.197	2.197	2.197	2.197	2.197	2.197	2.197	2.197	2.197
Total	**77.471**	**70.536**	**73.172**	**67.319**	**77.233**	**71.03**	**70.309**	**69.954**	**68.598**	**75.228**	**71.607**

Table 8. Net present values (7 percent discount rate) under each OY level for the entire 2003-2022 period. The Preferred Alternative is highlighted in gray. A $1 per pound of fish is used for the sole purpose of present value calculations.

(Million Dollars)

	Alternative 1		Alternative 2				Alternative 3		Alternative 4		Alternative 5
	Option a	Option b	Option a	Option b	Option c	Option d	Option a	Option b	Option a	Option b	
OY	Yield at $F_{30\% SPR}$	Yield at $F_{40\% SPR}$	$F_{30\%}$, first year	$F_{40\%}$, first year	$F_{30\%}$, 2nd year	$F_{40\%}$, 2nd year	$F_{30\%}$	$F_{30\%}$	Constant Catch	Constant Catch	Constant Catch/F
9.5	81.043	75.743	76.744	72.525	80.805	76.237	75.514	74.860	74.427	80.433	76.812
9.2	79.972	74.181	75.673	70.963	79.734	74.675	73.952	73.299	72.679	78.872	75.251
9.0	79.258	73.140	74.959	69.923	79.020	73.635	72.912	72.258	71.513	77.831	74.210
8.7	78.187	71.579	73.887	68.361	77.949	72.073	71.350	70.697	69.765	76.270	72.649
8.5	77.47	70.54	73.17	67.32	77.24	71.03	70.31	69.66	68.60	75.23	71.61
8.2	76.402	68.977	72.102	65.759	76.164	69.471	68.748	68.094	66.851	73.667	70.046

9.7 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	$35,000
NMFS administrative costs of document preparation, meetings and review	20,000
Permits costs	none
Enforcement costs	none
TOTAL	$55,000

The Council and Federal costs of document preparation are based on staff time, travel, printing and any other relevant items where funds were expended directly for this specific action. There are no permit requirements proposed in this amendment. To the extent that there are no quota closures proposed in this amendment or other regulatory measures, except the setting of TAC, no additional enforcement activity is anticipated. In addition, under a fixed budget, any additional enforcement activity due to the adoption of this amendment would mean a redirection of resources to enforce the new measures.

9.8 Determination of a Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: a) an annual effect on the economy of $100 million or more; b) a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions; c) significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets; or d) 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. The commercial grouper fishery accounts for a major portion of this value (about $18 million). The commercial greater amberjack fishery generated ex-vessel value of $754,000 in 2000, or approximately 1.7 percent of the entire commercial reef fish revenues. Since no explicit TAC and commercial quota are adopted, all the rebuilding paths considered in this amendment would have virtually no effect on ex-vessel revenues. If an explicit TAC and commercial quota were adopted, the adverse impacts on the commercial sector would range from minimal to severe, depending on the allocation ratio adopted. But even in this case, the impacts on the economy are unlikely to meet the $100 million threshold. A similar argument can be made of the recreational sector, with special reference to the for-hire fishery. Since no explicit TAC and recreational quota are adopted, all the rebuilding paths would have no effect on angler trips and thus on for-hire vessel trip and revenues. If an explicit TAC and recreational quota were adopted, the adverse impacts on the for-hire fishery would range from minimal (if the impacts on the commercial sector is severe) to severe (if the impacts on the commercial sector is minimal). The combined impacts of this amendment on both the commercial and recreational business entities are unlikely to meet the $100 million threshold.

Because no explicit commercial/recreational allocation is adopted, none of the rebuilding paths would result in required reductions in harvest. So no major change in cost or prices would occur. In addition, there would be no effects on competition, employment, investment, productivity, innovation, or on the ability of U.S.-based enterprises to compete with foreign-based enterprises, since the operations of these vessels remain unaffected. If an explicit TAC and commercial/recreational allocation were adopted, there would be potential effects on these indicators, but the extent of impacts cannot be quantified. There is the possibility that the effects would be minimal depending on the allocation ratio chosen and the rebuilding path adopted.

Costs to the local and federal governments associated with the measures in this amendment are estimated at $55,000, and are due mainly to the preparation of this amendment.

The rebuilding plans considered in this amendment do not interfere or create inconsistency with an action of another agency, including state fishing agencies, or affect any entitlements, grants, user fees, or loan programs. This is mainly due to the low likelihood that there would be adverse impacts on fishing participants. Adopting a rebuilding plan for an overfished stock does not raise novel legal or policy issues, since this type of plan has been considered in the past and is being considered for other fisheries in the Gulf.

Since none of the indicators listed above would significantly change under this amendment, this regulation, if enacted, would not constitute a significant regulatory action.

10.0 REGULATORY FLEXIBILITY ACT ANALYSIS

Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct an Initial Regulatory Flexibility Analysis (IRFA) for each proposed rule. The IRFA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. In addition to analyses conducted for the Regulatory Impact Review (RIR), the IRFA provides: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for, the proposed rule; (3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; (4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and, (5) an identification, to the extent practicable, of all relevant Federal rules, which may duplicate, overlap, or conflict with the proposed rule.

The succeeding analysis is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities."

Description of the reasons why action by the agency is being considered: The need and purpose of the actions are set forth in Section 4 of this document. This particular section is incorporated here by reference.

Statement of the objectives of, and legal basis for, the proposed rule: The specific objectives of this action are found in Section 4 of this document, and this section is incorporated here by reference. The M-SFCMA, 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: In 1992 when the moratorium on the issuance of new commercial permits first began, 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. GOM. In 2000, there were 1,204 active permits while others were in the process of being renewed. Of the commercial reef fish permitted vessels, 782 vessels in Florida and 207 in other Gulf states reported in their logbooks to have landed reef fish using vertical lines in 2000. Also 155 vessels in Florida and 33 in other Gulf states reported to have landed reef fish using longlines in 2000. In the particular case of the greater amberjack fishery in 2000, there were 345 vessels using vertical lines, 110 vessels using longlines, and 5 vessels using powerheads that landed greater amberjack. For the recreational sector in the Gulf in 2000, there were 112 for-hire vessels with reef fish permits only and 1,403 for-hire vessels with both reef fish and coastal migratory pelagic permits. A further description of all these affected vessels is provided below in the sections dealing with the substantial number and significant economic criteria.

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 status criteria and rebuilding plans considered in this amendment do not require additional reporting, record-keeping and other compliance requirements. In the unlikely event that quota closures are adopted for the commercial fishery, additional costs would be expended in monitoring the catch and enforcing the closure. As noted earlier, the enforcement activity under this amendment may be considered part of the routine enforcement activities, given a fixed enforcement budget.

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. This amendment is similar in some respects to those considered or completed for other fisheries in the Gulf.

Substantial Number of Small Entities Criterion

The Small Business Administration (SBA) defines a small business in the commercial fishing activity as a firm with receipts of up to $3.5 million annually. The SBA also defines a small business in the charter boat activity as a firm with receipts of up to $6 million per year.

According to a survey of commercial reef fish fishermen in the Gulf (Waters 1996), fishing vessels in the reef fish fishery have the following gross receipts:

High-volume vessels using vertical lines:	
Northern Gulf:	$110,070
Eastern Gulf:	$ 67,979
Low-volume vessels using vertical lines:	
Northern Gulf:	$ 24,095
Eastern Gulf:	$ 24,588
High-volume vessels using bottom longlines:	
Both areas:	$116,989
Low-volume vessels using bottom longlines:	
Both areas:	$ 87,635
High-volume vessels using fish traps:	$ 93,426
Low-volume vessels using fish traps:	$ 86,039

There are about 1,515 for-hire vessels with permits to fish for reef fish only or reef fish and coastal pelagics in the Gulf. Average lengths for charter boats are 47 feet in Alabama, 43 feet in Louisiana, 41 feet in Mississippi, and 35 feet in Texas while that for headboats from Alabama through Texas is 72 feet (Sutton et al., 1999). In Florida, charter boats have an average length of 37 feet and headboats, 62 feet. Based on fees, number of passengers and number of trips, average annual receipts total $68,000 for charter boats and $324,000 for headboats in Florida (Holland et al., 1999).

The foregoing description of the vessels potentially affected by the proposed regulations shows that all the potentially affected businesses fall within the general definition of small business entities. Hence, it may be concluded that the criterion of a substantial number of the small business entities comprising the greater amberjack commercial and for-hire sectors affected by the proposed rule will be met. Therefore, all business entities that operate in the greater amberjack fishery are classified as small business entities. Since all such businesses will be covered, the proposed rule will affect a substantial number of small business entities.

Significant Economic Impact Criterion

The outcome of "significant economic impact" can be ascertained by examining two issues: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All the business entities potentially affected by the proposed rule are considered small entities so that the issue of disproportionality does not arise in the present case. There are, however, some variations among fishing operations in terms of vessel revenues and size, as described above.

Profitability: Do the regulations significantly reduce profit for a substantial number of small entities?

Waters (1996) reported the following net income information from commercial reef fish vessels:

High-volume vessels using vertical lines:	
Northern Gulf:	$28,466
Eastern Gulf:	$23,822

Low-volume vessels using vertical lines:	
Northern Gulf:	$6,801
Eastern Gulf:	$4,479
High-volume vessels using bottom longlines:	
Both areas:	$25,452
Low-volume vessels using bottom longlines:	
Both areas:	$14,978
High-volume vessels using fish traps:	$19,409
Low-volume vessels using fish traps:	$21,025

Sutton et al. (1999) reported net revenue figures of for-hire vessels in the Alabama-Texas area, but there have been some problems associated with those estimates. Holland et al. (1999) provided no estimates for net revenue or profit for the for-hire vessels in Florida.

From discussions on the effects of the rebuilding plans considered in this amendment, it is unlikely that profits of commercial vessels would be substantially reduced, because there would be no potential reductions in revenues and/or increases in costs, particularly because the proposed rule will accommodate current and foreseeable harvest performance in the commercial fishery. To the extent that under any of the rebuilding strategies the recreational sector would not be subject to reductions in harvests, the for-hire fishery would not experience any reductions in profits.

Description of significant alternatives to the proposed rule and discussion of how the alternatives attempt to minimize economic impacts on small entities

Sustainable fishing parameters, namely maximum sustainable yield (MSY), optimum yield (OY), minimum stock size threshold (MSST), and maximum fishery mortality threshold (MFMT) are mainly biological in nature but have relevance to the determination of impacts on fishing participants to the extent that they provide the general benchmark for regulatory measures. These benchmarks, however, are long-term in nature, and thus all alternatives to the various sustainable fishing parameters do not have short-run impacts on small business entities. In this sense, alternatives related to sustainable fishing parameters have little relevance to the Council's decision in minimizing economic impacts on small entities in the short term.

At present, there is currently no specific TAC for greater amberjack (Section 8.2.2, Alternative 6-no action), but several management measures are currently in effect to protect the stock. In this amendment, the general approach employed for rebuilding the greater amberjack stock employed is the provision of harvest goals during the rebuilding period. There are 11 rebuilding paths considered in this amendment. The description of these alternatives found in Section 8.2 is incorporated here by reference. From the standpoint of potential short-term impacts on small entities, these paths differ mainly in the level of harvest goals set for each year of the rebuilding period. For the first year of the rebuilding plan, the harvest goals range from 2.9 mp (Alternative 1, Option b and Alternative 2, Option b) to 5.75 mp (Alternative 4, Option b), and for rebuilding over a 10-year period in which the stock size rebuilds to B_{MSY} or above, total harvest goals range from 40.0 mp (Alternative 4, Option a) to 70.6 mp (Alternative 1, Option a). Among the paths, the Preferred Alternative and Alternative 1, Option b provide for the lowest harvest goal.

It is likely that more recent landings, which hover around 2.0 mp, would extend to at least 2003 and/or the first few years of the rebuilding period. In this case, even the lowest harvest goal, as provided under the Preferred Alternative, would not result in short-term required reductions in total harvest. In addition, there are no further restrictions on the fishery proposed in this amendment. Thus, the Preferred Alternative and all the other rebuilding alternatives are expected not to effect any short-term impacts on small entities.

Conclusion

The proposed regulation is expected to meet the substantial number criterion but not the significant economic criterion. Therefore, it is concluded that the proposed regulation, if adopted, would not have a significant economic impact on a substantial number of small entities. An IRFA is, therefore, not required. The proposed actions do not have any implementing regulations. The Regulatory Flexibility Act Analysis in Section 10 provides full disclosure based on the data currently available. If and when additional regulations are proposed in the future, the analysis of impacts will be done at that time.

11.0 ENVIRONMENTAL CONSEQUENCES

This section reviews and discusses the effects of the proposed actions on the biological, physical, social, and economic environment of the greater amberjack fishery of the Gulf of Mexico. These reviews and discussions, as part of the Environmental Assessment, have been developed to determine whether there is a significant environmental impact on the Human Environment that would result in the need to develop a SEIS. The Human Environment, as defined by §1508.14 of the CEQ regulations is "interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment."

11.1 Biological Environment

The Reef Fish FMP (with FEIS), Amendment 5 (with SEIS) of the Reef Fish FMP, and the Generic EFH Amendment provide a review of the biology and habitat of greater amberjack, and they are incorporated here by reference. A short synopsis of greater amberjack biology is as follows:

The greater amberjack is found throughout the world in tropical and subtemperate waters in association with reefs. This pelagic species occurs along the western Atlantic from Nova Scotia to Brazil and into the Gulf of Mexico (Briggs, 1958; Manooch, 1984). Based on genetic information (mtDNA haplotype frequency data), Gold and Richardson (1998) hypothesized that there are two subpopulations of greater amberjack off the southeastern United States; one in the northern Gulf of Mexico and another along southwest Florida and the U.S. South Atlantic region. Large juveniles and adults are found along deep seaward reefs, but occasionally enter coastal bays and estuaries. Small juveniles are associated with sargassum and flotsam in offshore waters. Juveniles form small schools or are solitary. Eggs and larvae are pelagic. Adults spawn from March through July. Females first become mature at ages two or three or about 34 inches (86 cm) total length (Manooch 1984). Greater amberjack growth is rapid with fish reaching 100 cm in about 5 or 6 years (Burch, 1979; Humphreys, 1986; Thompson et al., 1999). Maximum ages for greater amberjack are at least 15 years (Manooch and Potts, 1997; Thompson et al., 1999) Females reach larger maximum sizes (>140 cm) than males (<140 mm). Greater amberjack feed primarily on fishes such as the bigeye scad. They also feed on benthic invertebrates and cephalopods (Matallanas et al., 1995; Andaloro and Pipitone, 1997). Essential fish habitat for greater amberjack is currently being described in the Council's Generic EFH amendment and is summarized in Appendix 1 and Section 11.2.2 of this document.

The biological impacts of the proposed and rejected actions are discussed immediately following each set of alternatives in Section 8.2 herein and are incorporated here by reference. As discussed in this section, the greater amberjack stock is currently overfished in the Gulf of Mexico. However, due to past management measures, the stock is no longer undergoing overfishing. The target and thresholds discussed in Sections 8.2.1.1 to 8.2.1.4 provide criteria that managers can use to evaluate whether stock biomass and fishing mortality are within sustainable levels. The rebuilding plan discussed in Section 8.2.2 provide alternative harvest limits that are capable of rebuilding the stock to levels consistent with the above management targets and thresholds within a period of 10 years.

In general, the Preferred Alternatives selected in Section 8.2 would provide a positive biological impact on the greater amberjack stocks. Currently, the most recent stock assessment indicates that the best proxy for MSY is the yield associated with $F_{30\%SPR}$. Therefore, alternatives that set MSY, MFMT, and MSST at Fs that are higher than $F_{30\%SPR}$ would have a negative effect because they would reduce the overall population level. Alternatives that set F lower than $F_{30\%SPR}$ would have a positive impact by increasing the population. But while lower F levels would increase the population, it would be at the cost of having lower yields than could be achieved by fishing at $F_{30\%SPR}$. As discussed in Section 8.2.1.2, the Preferred Alternative for OY (yield achieved by fishing at $F_{40\%SPR}$) gives the stock increased protection because the stock size is allowed to build to higher levels and is more risk averse than recommended by NMFS technical guidance.

In Section 8.2.2, alternative rebuilding plans are consistent with the preferred targets and thresholds that are presented in Section 8.2.1 and would provide a positive biological impact. Yields presented are consistent with either a $F_{30\%SPR}$ or a $F_{40\%SPR}$ rebuilding strategies. For those rebuilding plans managed for yields consistent with $F_{30\%SPR}$, this would mean that the OY proxy is equal to the MSY proxy during the rebuilding period. However, this proxy is less than the 20 percent SPR OY proxy that is currently in place from Amendment 1 to the Reef Fish FMP. Once the stock is rebuilt to the level consistent with MSY, then the stock would need to be built up to levels consistent with harvesting OY. Harvest levels associated with a lower level of F ($F_{40\%SPR}$) were recommended by the RFSAP (GMFMC, 2000a) until the rebuilding target is achieved. Currently, the estimated value of $F_{40\%SPR}$(=0.18) is 72 percent of the estimated value of $F_{30\%SPR}$ (=0.25). While these levels of F are quite different, the expected decrease in harvest is less severe and in line with NMFS guidance. In the NMFS Technical Guidance document on National Standard 1 (Restrepo et al. 1998), a precautionary fishing mortality target set at 75 percent of F_{MSY} gave yields of approximately 94 percent or higher of MSY. This occurs because the stock biomass is able to build to between 125 percent and 131 percent of the stock biomass associated with MSY level. In the case of greater amberjack, the yield derived from fishing at $F_{40\%SPR}$ is estimated to be 89 percent of the yield derived from fishing at F_{MSY} ($F_{30\%SPR}$) after the stock is rebuilt (Table 1). The Preferred Alternative (Alternatives 2, option b), because it uses the first year of each 3-year interval, provides more rebuilding up front than other rebuilding plans, protecting the stock size increase should poor recruitment years occur early in the rebuilding period because it is based on a conservative constant F rebuilding scheme (as discussed in 8.2.2). This protection is greater than that derived from constant catch strategies where stock rebuilding occurs later in the plan. Alternative 6 (no action) would, based on the 2000 greater amberjack stock assessment, probably result in a continuing increase in the stock because overfishing is no longer occurring; however, it would not establish a rebuilding schedule.

Because greater amberjack are a top level predator in the reef fish complex, it is possible that as the stock increases, forage species may be adversely affected. However, the interrelationships between reef fish species is not well known. To assess these patterns, complex models would need to be developed. Currently, the only model for the Gulf of Mexico that could address these issues is the Ecopath model being developed by FMRI and NMFS. The development of this model is in the early stages and at present, the precision of the model is low (Mahmoudi, personal communication[6]). The expense of collecting the additional data needed for this model would be exorbitant and the data would need to be collected over years to increase the precision of the results. Therefore, it would be impracticable to apply this model at this time.

11.2 Physical Environment

The alternatives proposed in this amendment should not have a negative impact on the physical environment. Because management measures instituted in the past have ended overfishing on the stock (see Section 2.0, History of Management), current levels of harvest are below those needed to begin the rebuilding process for the stock as outlined in Section 8.2.2 under either the $F_{30\%SPR}$ or $F_{40\%SPR}$ plan. Therefore, there should be no change in fishing practices by fishermen. Even though all the rebuilding plans would allow for increases to occur in greater amberjack harvest over the time period for the plans, as mentioned in Section 7.0 (Description of the Fishery), greater amberjack are not a major component of the fishery, and so fishermen's behavior while reef fish fishing is unlikely to change. Most of the harvest of greater amberjack is conducted with vertical lines (e.g., handline, rod-and-reel, and bandit gear) over natural and artificial reef habitat. Barnette (2001) suggested that this type of gear could cause entanglement and minor degradation of benthic species through line abrasion and weights. He was unsure what the cumulative effects might be from this gear due to lack of research on potential habitat impacts by this gear. Some greater amberjack are captured with longlines. In reviewing effects of longlines on habitat, Barnette (2001) concluded that there is potential damage of bottom longline gear as it sweeps the bottom (particularly during retrieval) and snags on vertical objects such as rocks, corals, and sponges. However, because greater amberjack are an incidental catch in this fishery, measures included in this amendment should have little or no effect on the fishery. Powerheads and spears are also used to catch this species. Barnette (2001) concludes that these gears result in minimal impacts to the hard bottom habitats where greater amberjack are found.

11.2.1 Effect on Wetlands: Based on a review of the documents listed in Section 11.2 and the discussions in Section 8.2, it has been determined that the proposed and rejected alternatives regarding greater amberjack status criteria and stock rebuilding would have no effect on flood plains, rivers, creeks, or other streams and tributaries to the marine environment or their associated wetlands because no actions are proposed in these areas.

11.2.2 Effect on Essential Fish Habitat: The documents listed above in Sections 11.2 and listed in Appendix 1 describe EFH for greater amberjack in the Gulf. Based on a review of these documents, NMFS initial determination is that the proposed action would have no adverse effect on EFH because: 1) greater amberjack are a small component of the reef fish fishery and so management measures should not change overall reef fish fishing practices and; 2) past management measures have stopped overfishing so that current fishing levels for this species do not need to be curtailed. NMFS will confer with their Habitat Conservation Division (HCD) to insure these actions would not have an impact on EFH, and will then make a final determination regarding potential effects to EFH. If the final determination is that the proposed actions would have

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no adverse effects on EFH, then no EFH consultation is required. If after conferring with HCD, NMFS determines that the proposed actions would result in potential adverse effects to EFH, an EFH assessment will be prepared and an EFH consultation will be completed prior to final action being taken.

11.2.3 Mitigating Measures: Based on a review of documents listed in Section 11.2, it has been determined that no mitigating measures related to the proposed action are necessary because the management alternatives to set greater amberjack status criteria and set a rebuilding plan would not result in any harmful affects to the environment.

11.2.4 Unavoidable Adverse Effects: Based on a review of documents listed in Section 11.2, and as discussed in Section 8.0 herein, it has been determined that the proposed action does not create unavoidable adverse effects on the environment as a result of implementing greater amberjack status criteria and set a rebuilding plan. Greater amberjack are a small component of the reef fish fishery and so management measures should not change overall reef fish fishing practices.

11.2.5 Irreversible and Irretrievable Commitments of Resources: There are no irreversible commitments of resources other than costs of administering and enforcing the proposed rule resulting from implementation of this amendment. Implementing greater amberjack status criteria and setting a rebuilding plan should not increase the cost and reduce the revenues of affected vessels/boats, nor change the cost and revenue configurations of affected vessels/boats. The commitment of resources to implement the greater amberjack status criteria and set a rebuilding plan does not involve huge financial considerations that need to be fully recouped over a certain period of time. It should be noted that, as landings increase once the rebuilding plan reaches a point where increases in harvest are allowed, the fishery should see a positive economic affect.

11.2.6 Relationship Between Short-Term Uses and Long-Term Productivity: While the short-term uses of this fishery should not be affected much by the implementation of the status criteria and the rebuilding plan due to previous management actions that have reduced landings, long-term productivity should benefit. As discussed in Sections 8.0, 9.0, and 11.2, the stock size should increase if catches are maintained within recommended harvest levels proposed in the preferred rebuilding plan alternative, and would be maintained at a level that would maximize yield through adherence to the stock status criteria. The long-term productivity for other fisheries is difficult to predict based on the actions in this management plan; however, it is likely that the effects are minimal because greater amberjack are not a primary species in the fishery.

11.2.7 Impacts on Other Fisheries: Based on a review of the alternatives proposed in this amendment as compared with other fisheries and as discussed in Section 8.0, any effects on other fisheries cannot be fully determined at this time. There should be very little if any impacts to managed species in the EEZ because greater amberjack, while a desirable species, are not targeted as much as some other reef fish species (e.g., groupers and snappers). Because greater amberjack are a top level predator in the reef fish complex, it is possible that as the stock increases, forage species may be adversely affected. However, the interrelationships between reef fish species is not well known. To assess these patterns, complex models would need to be developed. Currently, the only model for the Gulf of Mexico that could address these issues is the Ecopath model being developed by FMRI and NMFS. The development of this model is in the early stages and at present, the precision of the model is low (Mahmoudi, personal communication[6]). The expense of collecting the additional data needed for this model would be exorbitant and the data would need to be collected over years to increase the precision of the results. Therefore, it would be impracticable to apply this model at this time.

11.3 Social and Economic Environment

11.3.1 Description of the Fishery: The original FMP and subsequent Amendments 1 through 17, including accompanying EIS, SEIS or Environmental Assessments along with Section 7.0 herein describe the reef fish fishery in the Gulf. See Section 2.0 herein for an overview of the management actions taken in the original Reef Fish FMP and Amendments that pertain to greater amberjack management. Review Section 7.0 for a synopsis of the fishery and how it operates. Additional description of the reef fish fishery is embedded in the socioeconomic impacts sections of this document.

11.3.2 History of Management: See Section 2.0 herein for a review of the management history of greater amberjack in the Gulf of Mexico.

11.3.3 Economic and Social Assessment: The economic and social effects of this amendment are discussed in detail in the discussions following each set of alternatives in Sections 8.0, and are further discussed in Sections 9.0, 10.0, and 11.0. These effects are specific for each set of management alternatives being considered.

11.4 Cumulative Impacts of Past and Proposed Actions

The Council on Environmental Quality (CEQ) regulations (40 CFR 1508.7) define cumulative impacts as "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts could result from individually minor but collectively significant actions taking place over a period of time." Past actions on greater amberjack are summarized in Section 2.0; however, Amendment 1 which set size limits, Amendment 12 that reduced the recreational bag limit from 3 to 1 fish, Amendment 15 that closed the commercial fishery Gulfwide for three months (March, April, and May), and the partially approved Generic Sustainable Fisheries Act Amendment that set MFMT at $F_{30\%\ SPR}$ are particularly germane to cumulative impacts with the actions proposed in this amendment.

The cumulative effects of the proposed actions and the actions already taken for greater amberjack in the Reef Fish FMP should have a positive effect on the stock because they would establish targets and thresholds against which managers can evaluate the sustainability of stock biomass and fishing mortality and would maintain fishing mortality at a level that is consistent with achieving those targets and thresholds. The proposed actions contained in this amendment would: 1) establish harvest limits that are consistent with rebuilding the greater amberjack stock, and 2) set SFA status criteria and associated parameters against which managers can evaluate the sustainablilty of stock biomass and fishing mortality levels. These measures are guiding actions for stock status rather than regulatory actions that affect how fishermen can harvest fish. However, the amendments to the Reef Fish FMP described above, when taken together, are integral to the proposed actions because they have halted overfishing of the stock by effectively reducing harvest levels to that consistent with what is needed to begin even the most conservative of the rebuilding plan alternatives. Total harvest for years 1999, 2000, and 2001 were 1.5 mp, 1.8 mp, and 2.6 mp, respectively, and the projected harvest for 2002 is 1.9 mp (Turner and Scott, 2002). The most conservative rebuilding plan (Alternative 2, option b) calls for an expected harvest of 2.9 mp for the first three years of the plan before increasing.

Therefore, the cumulative impacts of these actions should: 1) allow the stock to become rebuilt, and 2) maintain the stock at a healthy level once rebuilt.

The Secretarial Amendment 1 to the Reef Fish FMP proposes to rescind the commercial grouper closure from February 15 to March 15 (GMFMC, 2002). This means that the 13 to 14 day period (dependent on whether it is a leap year or not) where amberjack harvest is allowed but commercial harvest of grouper was not allowed would not occur. Harvest of greater amberjack by commercial fishermen is not allowed during the months of March, April, and May. Commercial fishermen that might have targeted amberjack during the remainder of February when grouper fishing was not allowed will continue to target grouper. This action should reduce the level of greater amberjack harvest. However, the regulatory amendment that instituted this one month closure of grouper harvest was implemented in June 2000. Because this closure is a recent action, it is difficult to evaluate how this closure will affect the amberjack fishery because there would only be one year (2001) to compare to pre-closure years. Prior to 2001, February commercial landings of greater amberjack have ranged from 66,000 pounds (1998) to 148,000 pounds (1992) for the period 1992 to 2000 (landings were not available for 2001; NMFS, 2002).

While amberjack are a part of the commercial reef fish fishery, they are not as important to the fishery as grouper and snapper species. The Secretarial Amendment 1 proposes to reduce the quota for shallow-water species to 7.5 mp. If this quota is met before the end of the fishing year, commercial fishermen would not be able to target these species and may shift effort towards greater amberjack as long as the amberjack fishery is open (i.e., June through February). This action could raise the commercial amberjack harvest.

The proposed increase in the minimum size limit of red grouper could cause some effort shifting towards greater amberjack. Amberjack and shallow-water grouper (gag, scamp, and red grouper are the primary species) are all a part of the reef fish fishery. If fishermen find it harder to catch legal-sized red grouper, they may focus their effort towards other species. The degree by which this redirection would occur would be dependent upon the availability of legal sized grouper species.

Longline/buoy gear do catch greater amberjack, but they land less than a tenth of the total commercial catch (see Section 7.0). Removal of this gear type from the shallow waters as proposed in Secretarial Amendment 1 would result in slight reduction in the commercial harvest of greater amberjack. However, if longline vessels convert to vertical line gear, they could in fact be adding fishing pressure on greater amberjack. The number of longline vessels expected to convert to vertical lines is estimated to range from 60 to 80 percent of existing longline vessels, or between 63 to 84 vessels. This presents some potential for an increase in the harvest of greater amberjack, but the extent of such increase cannot be quantified.

Other management measures in Secretarial Amendment 1 such as setting a quota for tilefishes and slightly reducing deep-water grouper (but with each quota set to the average of recent annual harvests), and a recreational reduction in the red grouper bag limit are less likely to affect fishermen's behavior. The quota measures for tilefishes and deep-water grouper should not affect greater amberjack harvest because greater amberjack are not a part of the deep-water fishery. With respect to lowering the bag limit of red grouper, recreational fishermen should be able to fill their aggregate grouper bag limit (currently 5 per person) with other grouper species, particularly because gag are the primary grouper species caught by this fishery.

The cumulative impacts on regulations adopted for greater amberjack have been beneficial to the stock such that this amendment does not propose, at least in the short term, any changes to existing regulations. These regulations, however, have constrained the activities of both commercial and recreational participants in the greater amberjack fishery. Several commercial fishermen, for instance, have indicated that the 3-month commercial closure resulted in domestic producers losing some market with subsequent reduction in ex-vessel prices for greater amberjack. An economic analysis conducted to analyze the impacts of the 3-month commercial closure (Amendment 15) concluded that this measure would have a significant economic impact on small business entities. Activities in the recreational fishery have also been restricted, particularly by the reduction in the bag limit from 3 to 1 fish per person per day (Amendment 12). Since there are no proposed changes in regulations under this amendment, there is expected to be no additional negative pressures on the commercial and recreational activities in the greater amberjack fishery.

Over time, the fishery may experience an increase in harvest. This could be due to an increase in abundance from a recovering stock, and if on top of that effort also increases, then harvest could further increase. An increase in fishing effort is probably a likely event. On the recreational front, an increase in fishing effort appears to be a good possibility. As the population increases, particularly in coastal areas, and as the economy rebounds from its current depressed condition, more people should be fishing. On the commercial side, an increase in fishing effort may be forthcoming from longline vessels that may convert to vertical line gear if the proposed 50-fathom line ban on longlines becomes effective. Forgone landings of greater amberjack from longline vessels are likely to be outweighed by increases in landings from vertical line vessels, since longline vessels currently land less than one percent of that of vertical line vessels. A possibly worst case scenario in the commercial sector occurs if the market for greater amberjack does not expand, since any additional increase in landings will only further depress prices from their current low levels. In the event that harvests significantly overshot the HG, more restrictive measures, possibly including a hard TAC, would have to be adopted, with accompanying adverse socioeconomic impacts such as depressed ex-vessel prices, longer closure, and further loss in the market for domestic greater amberjack. Among the alternatives, the HG that would most likely be exceeded is that for Alternative 4(a) and the least to be exceeded is that for Alternative 1(a) and Alternative 2(c). The Preferred Alternative falls somewhere in the middle of these two extremes. However, as is the case with most fishing regulations, short-term adverse impacts would be experienced but as the stock is fully rebuilt, long-term benefits would ensue.

12.0 FINDING OF NO SIGNIFICANT ENVIRONMENTAL IMPACT (FONSI)

The Gulf of Mexico Fishery Management Council (Council) is submitting the attached Secretarial Amendment 2 (Amendment) to the Fishery Management Plan for the Reef Fish Fishery of the Gulf of Mexico, U.S. Waters (FMP) for Secretarial review under procedures of the Magnuson-Stevens Fishery Conservation and Management Act. The Secretarial Amendment was developed as an integrated document that includes an Environmental Assessment (EA), Regulatory Impact Review (RIR), and a determination of the need for an Initial Regulatory Flexibility Analysis (IRFA). Copies of the Amendment are available from the Council at the following address:

Gulf of Mexico Fishery Management Council
The Commons at Rivergate
3018 U.S. Highway 301 North
Suite 1000
Tampa, Florida 33619

Through this Secretarial amendment, the Council proposes to: 1) specify MSY, OY, MFMT, and MSST levels to bring greater amberjack into compliance with current fishery management standards and 2) establish a rebuilding plan for greater amberjack in the Gulf of Mexico. The Preferred Alternatives contained within this Secretarial amendment for SFA status criteria are as follows:

> Maximum Sustainable Yield (MSY) for greater amberjack is the yield associated with $F_{30\%\ SPR}$ (proxy for F_{MSY}) when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{30\%\ SPR}$ to be 9.5 million pounds (mp).
>
> Optimum Yield (OY) for greater amberjack is the yield associated with an $F_{40\%\ SPR}$ when the stock is at equilibrium. The most recent stock assessment estimated the yield at $F_{40\%\ SPR}$ to be 8.5 mp.
>
> Set MFMT = $F_{30\%\ SPR}$($F_{30\%\ SPR}$ is currently estimated at 0.25); The greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{30\%\ SPR}$ is greater than 50 percent.
>
> Set the minimum stock size threshold (MSST) to (1-M)*B_{MSY} or 75 percent of B_{MSY}. Using the proxy of F_{MSY} being $F_{30\%\ SPR}$, B_{MSY} is estimated to be 28.4 mp. Greater amberjack stocks in the Gulf of Mexico will be considered overfished if the probability that $B_{current}$ is less than MSST is greater than 50 percent.

For the rebuilding plan, the Preferred Alternative is as follows:

> Limit the harvest of greater amberjack for 3-year intervals with the expected harvest set at the yield associated with $F_{40\%}$ for the first year of each interval (Rebuild the stock in 7 years). Expected harvest would be 2.9 mp for 2003-2005, 5.2 mp for 2006-2008, 7.0 mp for 2009-2011, and 7.9 mp for 2012.

Summary of Effects - Rationale

MSY Alternatives: In the generic SFA amendment, the 30 percent static SPR level was chosen for MSY based on general recommendations by Mace (1994). From these recommendations, the Council's Finfish Stock Assessment Panel (FSAP) recommended that species such as greater amberjack be managed with an MSY and B_{MSY} SPR proxy level of 30 percent. The Preferred Alternative, describes the yield that would be associated with the F value needed to attain a population at 30 percent SPR in equilibrium conditions and so is consistent with recommendations made to the Council about this species for setting MSY in the Generic SFA Amendment. It is also consistent with the current MFMT threshold that has been approved by NMFS of $F_{30\%\ SPR}$ In the most recent stock assessment, the yield estimated from fishing at $F_{30\%\ SPR}$ was 9.3 mp. Selecting a MSY value based on a higher F (Alternative 2) could lead to overfishing. Alternatively, selecting a MSY based on a lower F (Alternatives 3 and 4) could lead to more restrictive management measures than are necessary, thereby diminishing economic gains for the fisheries.

OY Alternatives: The range of alternatives for OY is 9.5 mp (=MSY; Alternative 3) to 8.2 mp (the yield associated with fishing at 0.65*F_{MSY}; Alternative 4). The yield for the Preferred

Alternative is 8.5 mp as is the yield associated with fishing at $F_{40\%SPR}$. NMFS guidance suggests that OY be set at the yield associated with fishing at $0.75*F_{MSY}$ (8.79 mp). The Preferred Alternative is actually more precautionary than NMFS guidance assuming that the MSY proxy is the yield associated with fishing at $F_{30\%SPR}$ because $F_{40\%SPR}$ is approximately 0.72 $F_{30\%SPR}$. A result of selecting the Preferred Alternative is that the stock biomass would be about $1.33*B_{MSY}$ while the yield would be about 89 percent of MSY. With the exception of the no action alternative that would retain the current definition of OY, the degree of protection afforded to the stock but loss in expected harvest (i.e., the amount of increase in stock biomass above B_{MSY} and resultant decrease yield) is a function of F. As F approaches F_{MSY}, the yield increases, but the stock biomass decreases.

<u>MFMT Alternatives</u>: The value of MFMT has already been defined in the Generic SFA amendment at $F_{30\% SPR}$ based on recommendations by the Council's RFSAP and FSAP after an analysis of this species' life history traits. Alternative 2 sets MFMT at $F_{25\%SPR}$ and Alternative 3 sets MFMT at $F_{35\%SPR}$. The use of a higher SPR level to set MFMT would overestimate MFMT and result in more restrictive management measures. The use of lower SPR levels would underestimate MFMT and would not maintain the conditions of the stock at the optimum level. The Preferred Alternative incorporates a suboption that sets the probability that $F_{current}$ is greater than MFMT at 50 percent. Lower levels were considered (30 and 40 percent); however, if the stock is managed at OY, then the probability that $F_{current}$ would exceed MFMT is 20-30 percent or lower based on NMFS guidance.

<u>MSST Alternatives</u>: The Preferred Alternative for MSST is the most precautionary alternative where MSST = $(1-M)*B_{MSY}$ or $0.75*B_{MSY}$. This alternative follows NMFS guidance that says that MSST should be equal to whichever is greater - one half of B_{MSY} or $(1-M)*B_{MSY}$. Of the alternatives, the MSST provided by Alternative 1 is greater than that provided in Alternatives 2 and 3 (0.5*MSST and 0.65*MSST, respectively). The Preferred Alternative incorporates a suboption that sets the probability the stock is not overfished (i.e., the probability that $B_{current}$ is less than MFMT) at 50 percent. Lower levels were considered (30 and 40 percent); however, if the stock is managed at OY, then the probability that $B_{current}$ would be less than MSST is much lower because the stock size should be greater than B_{MSY}. No action for this action would not provide for an MSST.

<u>Rebuilding Plan Alternatives</u>: The Preferred Alternative (Alternative 2, option b) is based on a constant F rebuilding strategy where the $F_{40\%SPR}$ yield streams are used to set expected harvest levels for three-year intervals. It is one of the more precautionary rebuilding plans considered in this amendment because it uses a $F_{40\%SPR}$ rather than $F_{30\%SPR}$ yield stream and sets the expected harvest is set based on the yield provided by the first year of each three-year interval. Alternatives based on the $F_{40\%SPR}$ constant F yield streams (Alternatives 1b, 2b, 2d, 3b, 5) that rebuild to the proposed OY rebuilding target are more precautionary than alternatives based on the $F_{30\%SPR}$ (Alternatives 1a, 2a, 2c, and 4b) that would rebuild to the proposed MSY rebuilding target because the resultant stock biomass would be higher.
Alternative 4 represents a constant catch rebuilding scheme where catch is held at a constant level over the length of the rebuilding period. The theory behind that stategy is that enough fish escape the fishery and add to the stock size until it reaches B_{MSY}. This method is advantageous in that the initial harvest level needed for the rebuilding plan is higher than that set in other strategies; however, as the stock increases in size, catch-per-unit-effort (CPUE) may increase to a level where the expected harvest could be filled within a very short time period and the fishery would need to be closed. Additionally, as the stock size increases, the participants in the fishery may want an increase in harvest because fish are percieved to be abundant and they may wish regulations to be relaxed. The other rebuilding method is constant F (Alternative 1) where F is held constant at a level that would allow a stock to

rebuild within the required time period. Under this scenario, the expected harvest level would be based on a constant proportion of the stock that could be removed. Unlike the constant catch scenario, as the stock size increases, so could the harvest (i.e., as the stock size approaches B_{MSY}, the harvest would be approaching MSY and OY). The main disadvantage to this scenario is that early in the rebuilding plan, the harvest may need to be at very low levels and possibly at a point where the economic viability of a fishery is severely affected. Alternatives 2, 3, and 5 are based on a combination of the constant catch and constant F rebuilding methods. In these alternatives, catch is initially held constant until a point where any drop in harvest to get to a constant F scenario is minimized. The advantage of this method is that it minimizes the initial low harvest level for the fishery early in the rebuilding program (as could occur in the constant F scenario) and allows the harvest to increase during the rebuilding period as the stock size increases.

For any of the rebuilding plan alternatives, periodic updates on greater amberjack landings would need to be requested by the Council and compiled by NMFS. The purpose of these updates would be to insure that the annual harvest by the recreational and commercial fisheries was not exceeding the expected annual harvest needed for the rebuilding plan. An additional requirement for all the rebuilding plan alternatives would be periodic stock assessments. Greater amberjack are a long-lived species and so changes in the population occur relatively slowly. Therefore, while annual updates in harvest are required to make sure the harvest required for the rebuilding plan are not exceeded, annual assessments of species like the greater amberjack are not needed and could occur at 3- to 5-year intervals (GMFMC, 1999). These assessments would be requested as needed when the Council and NMFS's Southeast Regional Office (SERO) develop the yearly Operations Plan, and would be subject to the availability of funds to conduct the assessment. Because the Preferred Alternative anticipates the expected harvest from the plan at 3-year intervals, the logical time frame for these stock assessments to occur would be at 3-year intervals just prior to when the harvest level is expected to be increased to insure that projections about the stock condition are still valid. If the assessment reveals that yield projections needed to rebuild the stock have changed (they either have increased or decreased), then management measures including, but not limited to size limits, bag limits, and seasonal closures, could be employed to adjust harvest accordingly. These would be enacted by the Council through a plan amendment, regulatory amendment, emergency action, or interim rule as described in detail in Section 8.2.2. What type of rule making action the Council chooses would be dictated by the severity of overages in harvest should an overage occur.

Conclusion

40§1508.27 identifies that both context and intensity need to be taken into account when evaluating the significance of impacts resulting from a major federal action. As discussed in Section 8.0, 9.0, 10.0, and 11.0, amberjack are a small component of the reef fish fishery and so the alternatives proposed in this amendment should have little effect on the fishery in the Gulf, much less so to the country as a whole. 40§1508.27(b) identifies 10 concepts that are needed to evaluate intensity. They are discussed below in conclusive form for status criteria and the rebuilding plan; however evaluations of significance using these concepts for each of the sets of alternatives (MSY, OY, MFMT, MSST, and the rebuilding plan) are discussed under each subsection of Section 8.0.

(1) Beneficial and Adverse Impacts: Precise impacts of requiring status criteria and the rebuilding plan cannot be determined without additional research. However, it should be noted that recent management measures as described in detail in Section 8.0 have ended overfishing and recent analyses of the stock (Turner and Scott, 2002; Turner, 2002) indicate that the stock

size is increasing. The actions proposed in this amendment do not propose any changes to the fishery currently operates and so should not have a significant impact. The intent of this amendment is to ensure that the stock continues to rebuild and that it fully recovers to a non-overfished level within the required time frame. Once the stock has been rebuilt, the status criteria should constrain the fishery so that the stock could be maintained at a precautionary level (greater than B_{MSY}). Under the Preferred Alternative for OY, the yield that the fishery may harvest the stock would be reduced by approximately 11 percent from the MSY level. However, the OY level is still higher than the average levels of harvest that have occurred in the past.

(2) Public Safety: Implementation of status criteria measures and the rebuilding plan would have no effect on public safety because the general public is not associated with fishing activities. Additionally, because greater amberjack are not the primary focus of the reef fish fishery, there would be no vessel safety issues other than general safety issues that arise from the participation in this fishery. However, as stated in Section 8.1, if a hard TAC were to be used to manage the fishery, a derby fishery (race to fish) could result where fishermen might place themselves at risk to maximize their share of the quota.

(3) Unique geographic areas: The alternatives considered in this amendment would not affect park lands, prime farmlands, wetlands, or wild and scenic rivers because those resources are onshore or nearshore, not in the EEZ. Reef fish fishing does occur in or adjacent to sensitive areas such as the Florida Middle Grounds HAPC, Dry Tortugas Ecological Reserve, the FKNMS, Madison-Swanson and Steamboat Lumps marine reserves, or the Flower Garden Banks National Marine Sanctuary. Most greater amberjack are caught with hook-and-line or spear fishing that minimally impacts hard bottom habitat. Bottom longline gear has been identified as potentially damaging hard bottom habitats; however, the extent of this damage has not been quantified. To do so would require extensive study that has not been conducted and would incur considerable expense. However, some protection is afforded by the prohibition of longline and buoy gear inside of lines approximating 50 fathoms west and 20 fathoms east of Cape San Blas, Florida. Secretarial Amendment 1 to the Reef fish FMP proposes to extend the longline gear prohibited area to 50 fathoms east of Cape San Blas. If historic or cultural resources or sites currently exist or are designated in the EEZ, it is possible that reef fish vessels could affect these sites (GMFMC, 2002). Hook-and-line gear could become entangled within those structures; however, this entanglement is likely to be minimal because fishermen would likely avoid losing fishing gear.

(4) Controversial effects on Human Environment: The alternatives considered in this document are not predicted to be controversial because past management actions have lowered landings to the point where overfishing is not occurring (i.e., there are no reductions in catches needed to implement the rebuilding plan). The public had the opportunity to comment on this amendment at public hearings and through letters. Public testimony and letters received by the Council spoke in favor of establishing status criteria and adopting the rebuilding plan.

(5) Uncertain, Unknown, or Unique Risks: Defining biological reference points and stock status determination criteria, and adopting a rebuilding plan for greater amberjack would not pose any uncertain, unknown, or unique risks to the reef fish industry or to others, other than potential economic and social impacts as discussed in previous sections. The true extent of the ecological impacts of these alternatives are unknown. As amberjack stocks increase, there could be effects to prey species or species that greater amberjack compete with for prey. However, these risks to individual species are likely to be minimal due to the fact that the greater amberjack stock biomass would be less than its unfished level.

(6) *Precedence*: The proposed actions do not establish new precedence. Biological reference points, stock status criteria measures, and rebuilding plan, have been implemented in other Gulf of Mexico fisheries.

(7) *Cumulative impacts*: The implementation of status criteria measures and the rebuilding plan in effect could cause direct, cumulative impacts to the biological or physical environment. As the greater amberjack stock size increases through the rebuilding plan, the effects of this population increase could affect prey species that are shared with other reef fish stocks that are also being rebuilt. Proposed rebuilding plans for red grouper and red snapper should result in higher numbers of both species and increase predation on shared prey items. The nature of such impacts, positive or negative, cannot be determined without further research. The costs for such research would be exorbitant and take many years to complete. Although these impacts may not be precisely known, they are likely to be minimal given that for all these species, their respective stock biomass would still be below their unfished state. In addition, management actions resulting in changes of fishing patterns in the red grouper and gag fisheries could alter fishing patterns on greater amberjack and visa versa.

(8) Adverse effects on resources: The effects of the proposed and rejected alternatives for implementation of status criteria measures and the rebuilding plan would not apply to any sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural or historical resources. Should such structures or resources be located in the EEZ, it is possible that reef fish vessels could damage these sites. Hook-and-line gear could become entangled within those structures; however, this entanglement is probably minimal because fishermen would try to avoid losing fishing gear. Resources within lines approximating 50 fathoms west and 20 fathoms east of Cape San Blas, Florida would be afforded protection from longline and buoy gear due to a prohibition of the gear within this area. Secretarial Amendment 1 to the Reef fish FMP proposes to extend the longline gear prohibited area to 50 fathoms east of Cape San Blas (GMFMC, 2002).

(9) Endangered Resources: An informal Section 7 consultation has been conducted by NMFS Office of Protected Resources regarding the proposed and rejected alternatives as to their impact on threatened or endangered species. The implementation of status criteria measures and the rebuilding plan is unlikely to have any additional impact on endangered species because the fishery would not change current fishing practices.

(10) Other environmental laws: The effects of the implementation of status criteria measures and the rebuilding plan would not have an impact on state or local regulations outside the EEZ, and would not create a conflict with any other federal law or regulation applicable to the EEZ. Alternatives for SFA criteria and the rebuilding plan, to the extent that they provide additional protection for marine resources, would only compliment state and federal laws that likewise provide protection.

Based on the analyses and discussions in this document, including its EA, and in the other referenced documents and sections herein, I have determined that the proposed action would not significantly affect the physical or human environment, including EFH, and that preparation of a supplemental environmental impact statement is not required by Section 102(2)(c) of NEPA or its implementing regulations.

Approved:______________________________________ ________
Assistant Administrator for Fisheries Date

13.0 OTHER APPLICABLE LAW

13.1 Habitat Concerns

Reef fish habitats and related concerns were described in the FMP and updated in Amendments 1 and 5, and in the Generic Essential Fish Habitat Amendment. The actions in this Secretarial amendment do not affect the habitat.

13.2 Vessel Safety Considerations

A determination of vessel safety with regard to compliance with 50 CFR 605.15(b)(3) will be requested from the U.S. Coast Guard. Actions in this Secretarial amendment are not expected to affect vessel safety.

13.3 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 greater amberjack 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.

While it is the goal of the Council to have complementary management measures with those of the states, federal and state administrative procedures vary, and regulatory changes are unlikely to be fully instituted at the same time.

This Secretarial Amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi and Texas to the maximum extent practicable. 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.

13.4 Effect on Essential Fish Habitat (EFH)

The Generic Amendment for Addressing Essential Fish Habitat Requirements for Fishery Management Plans of the Gulf of Mexico states the following with respect to greater amberjack EFH.

The greater amberjack occurs throughout the Gulf coast to depths of 400 m. Habitat associations are summarized in Appendix 1. Information is sparse on habitat associations for all life stages of amberjack. Adults are pelagic and epibenthic, occurring over reefs and wrecks and around buoys. Very little information exists on spawning adults, but in the northern Gulf spawning occurs from May to July and may be as early as March based on histology. Juveniles also are pelagic and often attracted to floating plants and debris in the nursery areas that also are offshore (NOAA, 1985).

The actions in this Secretarial amendment are not expected to have any adverse impacts on greater amberjack or other species' EFH. No changes in fishing practices are contained in this amendment.

13.5 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act is to control paperwork requirements imposed on the public by the Federal Government. The authority to manage information collection and record keeping requirements is vested with the Director of the Office of Management and Budget. This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

The Council does not propose, through this Secretarial Amendment, to establish any reporting requirements or burdens. However, it is not known at this time whether a recreational greater amberjack quota monitoring program, if developed by NMFS, would require additional reporting requirements from the recreational sector.

13.6 Federalism

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

14.0 SCIENTIFIC RESEARCH AND DATA NEEDS

Biological Needs

The RFSAP and the Council reviewed the amberjack stock assessments in 2000. The RFSAP identified the following data and research needs (GMFMC, 2000a):

- The RFSAP concurred with the Greater Amberjack Assessment (Turner et al., 2000) in recommending that the variability in growth of greater amberjack with age needs to be better characterized by a more statistically-based approach for aging catch, rather than using age-slicing. Currently, age-length keys do not exist for Gulf of Mexico greater amberjack and the Panel recommends that priority be given to obtaining adequate regional (stratified) age-length keys for this species.

- The RFSAP recommended that the VPA use a statistical framework that allows for error in some of the input data that are currently assumed to be known without error, e.g., total catch (catch at age).

- Knowledge of reproductive parameters is necessary for greater amberjack. For example, fecundity estimates are currently unknown and additional information on the maturation schedule is also required.

- The RFSAP recommends that a fishery-independent index of abundance and a recruitment index be given consideration.

- The problem of identifying lesser amberjack, Almaco jack, and banded rudderfish from greater amberjack needs to be resolved so that landings recorded on a species basis are accurate and verifiable.

Socioeconomic Needs

The Socioeconomic Panel (SEP) recommends that the Council request NMFS to pursue this integrated scientific analysis approach by further refinement of the Anderson bioeconomic simulation modeling program (GMFMC, 2000b). Research should continue to be funded to improve the analysis and identify research needed to completely parameterize the model. Quantitative results that determine the direction and magnitude of change for different management scenarios could then be developed. The SEP views this project as extremely important because the model could be adapted to address fishery management problems in other fisheries. The red snapper model is a significant step forward in the analysis presented to the SEP and will provide a great improvement in the economic recommendations to the Gulf Council.

As the Gulfwide economic simulation model is further refined, the SEP recommends that additional research be conducted to address the distribution of economic impacts within the Gulf of Mexico region. Specifically, communities along the Gulf need to be identified, and their level of economic dependency on Gulf fisheries should be determined. Information such as the number of commercial vessels, support industries, number of recreational saltwater anglers, etc. per community is needed. Some of this research has been conducted in the state of Florida by MARFIN funded research conducted by the University of Florida. This needs to be extended to the remaining Gulf states. This line of research would improve the ability to assess social impacts of Council policy decisions.

15.0 LIST OF PREPARERS

Gulf of Mexico Fishery Management Council
- Peter Hood, Fishery Biologist
- Antonio Lamberte, Economist

16.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE AMENDMENT/ENVIRONMENTAL ASSESSMENT ARE SENT

Coastal Zone Management Offices
Alabama, Mississippi, Louisiana, Florida, Texas

Other Agencies, Organizations, and Persons
Alabama Cooperative Extension Service
Alabama Department of Conservation and Natural Resources, Marine Resources Division
Florida Department of Environmental Protection
Florida Fish and Wildlife Conservation Commission
Florida Sea Grant
Louisiana Cooperative Extension Service
Louisiana Department of Wildlife and Fisheries
Mississippi Cooperative Extension Service
Mississippi Department of Marine Resources
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Washington Office
National Marine Fisheries Service Law Enforcement
Texas Cooperative Extension Service
Texas Parks and Wildlife Department
United States Fish & Wildlife Service
United States Coast Guard

17.0 PUBLIC HEARING LOCATIONS AND DATES

August 6, 2002
Texas A&M University
200 Seawolf Parkway
Galveston, Texas 77553

August 7, 2002
City Hall Auditorium
300 Municipal Drive
Madeira Beach, Florida 33708

18.0 PUBLIC REVIEW

LIST OF AGENCIES CONSULTED:

National Marine Fisheries Service
-Southeast Regional Office
-Southeast Fisheries Science Center

NOAA General Counsel
-Office of the Southeast Regional Counsel

RESPONSIBLE AGENCY:

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19.0 REFERENCES

Andaloro, F. and C. Pipitone. 1997. Food and feeding habits of the amberjack, *Seriola dumerii* in the Central Mediterranean Sea during the spawning season. Cah. Biol. Mar. 38: 91-96.

Barnette, M. C. 2001. A review of the fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Tech. Memo. NMFS-SEFSC-449. National Marine Fisheries Service, St. Petersburg, Fl. 62 p.

Briggs, J. C. 1958. A list of Florida fishes and their distribution. Bull. Fla. State Mus. Biol. Sci. 2:223-318.

Burch, R. K. 1979. The greater amberjack, *Seriola dumerili*: its biology and fishery off southeastern Florida. M.S. thesis, Univ. Miami, Miami, FL, 112p.

Cato, J. C. and F. J. Prochaska. 1977. "A statistical and budgetary economic analysis of Florida-based Gulf of Mexico red snapper-grouper by size and location, 1974-1975" Marine Fisheries Review. 39(11):6-14

Cummings, N. 1996. Addendum to stock assessment of Gulf of Mexico greater amberjack through 1995. Available from National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149. 18 p.

Cummings, N. 2000. Gulf of Mexico greater amberjack abundance from recreational charter and private boat anglers from 1981-1998. NMFS Sustainable Fisheries Division Contribution SFD-99/00-98. 12 p.

Cummings, N., and D.B. McClellan. 2000. Trends in the Gulf of Mexico greater amberjack fishery through 1998: commercial landings, recreational catches, observed length frequencies, estimates of landed and discarded catch at age, and selectivity at age. NMFS Sustainable Fisheries Division Contribution SFD-99/00-99. 151 p.

Dokken, Q., H. B. Lovett, T. Ozuna, Jr, B. J. Ponwith, E. Ozuna and L. Centeno. 1998 "Texas Fisheries Economic Development Report" submitted to Economic Development Administration by the Center for Coastal studies, Texas A&M University, 6300 Ocean Drive, Corpus Christi, TX 78412. TAMU-CC-9807-CCS

Dyer, C. and D. Griffith. 1996. An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in the Northeast and the Mid-Atlantic Regions. A report submitted by Aquirre International to NOAA/NMFS contract number 50-GNF-5-00008.

Florida Fish and Wildlife Conservation Commission. 2001. Results from the 1997 Southeast Socioeconomics Marine Angler Survey. (web page)

Gold, J. R. and L. R. Richardson. 1998. Population structure in greater amberjack, *Seriola dumerili*, from the Gulf of Mexico and the western Atlantic Ocean. Fish. Bull. 96: 767-778.

GMFMC. 1989. Amendment 1 to the Reef Fish Fishery Management Plan. Gulf of Mexico Fishery Management Council, Tampa, Florida. 356 p

GMFMC. 1995. Amendment 12 to the Reef Fish Fishery Management Plan. Gulf of Mexico Fishery Management Council, Tampa, Florida. 37 p.

GMFMC. 1997. Amendment 15 to the Reef Fish Fishery Management Plan. Gulf of Mexico Fishery Management Council, Tampa, Florida. 99 p.

GMFMC. 1998. Final Report of the Ad Hoc Finfish Stock Assessment Panel. Gulf of Mexico Fishery Management Council, Tampa, Florida. 11 p.

GMFMC. 1999. Generic Sustainable Fisheries Act Amendment. Gulf of Mexico Fishery Management Council, Tampa, Florida. 157 p.

GMFMC. 2000a. December 2000 report of the Reef Fish Stock Assessment Panel. Gulf of Mexico Fishery Management Council, Tampa, Florida. 22 p.

GMFMC. 2000b. September 2000 report of the Socioeconomic Panel meeting on reef fish. Gulf of Mexico Fishery Management Council, Tampa, Florida. 3 p.

GMFMC. 2002. Secretarial Amendment 1 to the Reef Fish Fishery Management Plan to Set a 10-year Rebuilding Plan for Red Grouper, with Associated Impacts on Gag and Other Groupers and Draft Supplemental Environmental Impact Statement - July 2002 draft. Gulf of Mexico Fishery Management Council, Tampa, Florida. 226 p.

Griffith, David. 1996. Impacts of New Regulations on North Carolina Fishermen: A Classificatory Analysis. Final Report to the North Carolina Fisheries Moratorium Committee. University of South Alabama, Mobile Alabama. UNC-SG-96-07. North Carolina Sea Grant Program.

Holland, S.M., A.J. Fedler, and J.W. Milon. 1999 . The operations and economics of the charter and headboat fleets of the eastern Gulf of Mexico and South Atlantic coasts.

Holiman, S. G. 1999. "Economic summary of the Gulf of Mexico reef fish recreational fishery". October. SERO-ECON-00-02.

Holiman, S. G. 2000. "Summary report of the methods and descriptive statistics for the 1997-98 southeast region marine recreational economics survey. April. SERO-ECON-00-11.

Holiman, S. G. 2002. "Data tables on greater amberjack recreational landings and effort. August. SERO-NMFS. 9721 Executive Center Drive, N. St. Petersburg, FL 33702.

Humphreys, R. L. 1986. Carangidae - greater amberjack. In R. N. Uchida and J. H Uchiyama (eds.), Fishery atlas fo the northwestern Hawaiian Islands. P. 100-101. U.S. Dep. Commer., NOAA Tech Rep., NMFS 38.

Jacob, S., F.L. Farmer, M. Jepson, and C. Adams. 2001. Landing a definition of fishing dependent communities: Potential social science contributions to meeting National Standard 8. Fisheries. 26(10): 16-22.

Kusel, J. 1996 "Well-Being in Forest-Dependent Communities, Part I: A New Approach." Sierra Nevada Ecosystem Project: Final report to Congress, Vol. II Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources.

Lucas, L. E. 2001. " Madeira Beach, Florida and the Grouper Fishery in the Gulf of Mexico: Landings, value and impacts of a one and two-month closure." Unpublished. Eckerd College. 4200 54th Ave. S., St. Petersburg, FL 33711.

Mace, P. M. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. Can. J. Fish. Aquat. Sci. 51:110-122.

Manooch, C.S., III. 1984. Fishermans Guide. Fishes of the southeastern United States. North Carolina Museum of Natural History, Raleigh, NC. 362 pp.

Manooch, III, Charles S. and Jennifer C. Potts . 1997. Age, growth and mortality of greater amberjack from the southeastern United States. Fisheries Research 30: 229-240.

Matallanas, J., M. Casadevall, M. Carrasson, J. Boix, and V. Fernandez. 1995. The food of *Seriola dumerili* (Pisces: Carangidae) in the Catalan Sea (western Mediterranean). J. Mar. Biol. Assoc. U.K. 75: 257-260.

McCay, B. J. 2000. "Defining community: A Fisheries Perspective" Presentation at the annual meeting of the American Anthropological Association. San Francisco. Nov. 15-19.

McClellan, D.B., and N.J. Cummings. 1996. Stock assessment of Gulf of Mexico greater amberjack through 1995. NMFS/SEFSC Miami Laboratory Contribution No. MIA-96/97-03. Available from National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149. 69 p.

National Marine Fisheries Service. 2002. Commercial Landings website. http://www.st.nmfs.gov/commercial/index.html. NMFS, NOAA

National Oceanic and Atmospheric Administration (NOAA). 1985. Gulf of Mexico coastal and ocean zones strategic assessment: data atlas. U.S. Dept. Commerce. NOAA, NOS. December 1985.

Prager, M. H. 2000. Exploratory Assessment of Dolphinfish, *Coryphaena hippurus*, based on U.S. Landings from the Atlantic Ocean and Gulf of Mexico DRAFT NMFS, Southeast Fisheries Science Center, 101 Pivers Island Road, Beaufort, NC 18 p.

Restrepo, V.R., G.G. Thompson, P.M. Mace, W.L. Gabriel, L.L. Low, A.D. MacCall, R.D. Methot, J.E. Powers, B.L. Taylor, P.R. Wade, and .F. Witzig. 1998. Technical guidance on the use of precautionary approaches to implementing national standard 1 of the Magnuson-Stevens fishery conservation and management act. NOAA Technical Memorandum NMFS-F/SPO-31. 54 p.

Richardson, H. W. 1979. Regional economics. University of Illinois Press, Urbana.

Sutton, S.G., R.B. Ditton, J.R. Stoll, and J.W. Milon. 1999. A cross-sectional study and longitudinal perspective on the social and economic characteristics of the charter and party boat fishing industry of Alabama, Mississippi, Louisiana, and Texas. Texas A&M Univ., College Station, TX. Memo. Rpt. 198 p.

Thompson, B. A.., M. Beasley, C. A. Wilson. 1999. Age distribution and growth of greater amberjack, *Seriola dumerili*, from the north central Gulf of Mexico. Fish. Bull. 97:362-371.

Turner, S.C. 2000a. Catch rates of greater amberjack caught in the handline fishery in the Gulf of Mexico in 1990-1998. NMFS Sustainable Fisheries Division Contribution SFD-99/00-92.

Turner, S.C. 2000b. Catch rates of greater amberjack caught in the headboat fisheries in the Gulf of Mexico in 1986-1998. NMFS Sustainable Fisheries Division Contribution SFD-99/00-107.

Turner, S. C. 2002. Further management reference points and projections for Gulf of Mexico greater amberjack, *Seriola dumerili*. NMFS/SEFSC, Miami Laboratory. Document SFD - 01/02 - 168. 11 p.

Turner, S.C., .J. Cummings, and C.E. Porch. 2000. Stock assessment of Gulf of Mexico greater amberjack using data through 1998. NMFS/SEFSC, Miami Laboratory. Document SFD 99/00-100. 27 p.

Turner, S. C., and G. P. Scott. 2002. Projections of Gulf of Mexico greater amberjack, *Seriola dumerili*, from 2003 through 2012. NMFS/SEFSC, Miami Laboratory. Document SFD 01/02-150. 13 p.

Waters, James R. 1996. "An Economic Survey of Commercial Reef Fish Vessels in the U.S. Gulf of Mexico." U. S. Department of Commerce, NOAA, NMFS, 101 Piver's Island Road, Beaufort, NC 28516. 63 p+ tables, figures and appendices.

Waters, J. R., R. J. Rhodes, and R. Wiggers. 2001. Description of economic data collected with a random sample of commercial reef fish boats in the Florida Keys. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 154, 45 p.

Waters, James R.. 2002. Data tables on greater amberjack commercial landings and vessels. NMFS-SEFSC at Beaufort. 101 Pivers Island Road, Beaufort, NC 28516.

Wilson, D., B. J. McKay, D. Estler, M. Perez-Lugo, J. LaMarque, S. Seminski, and A. Tomczuk. 1998. A Social and Cultural Impact Assessment of the Highly Migratory Species Fisheries Management Plan and the Amendment to the Atlantic Billfish Fisheries Management Plan. The Ecopolicy Center for Agriculture, Environmental, and Resource Issues, Rutgers University, New Brunswick, N.J.

Appendix 1

Summary Table of Greater Amberjack, (Seriola dumerili) life history for the Gulf of Mexico. Associations and interactions with environmental and habitat variables are listed with citations.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(ºC)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Eggs				Open Gulf Salinity: 30-35ppt						Hatching in 2 days		
Citation										16		
Larvae	Year-round for all Seriola spp. (not ID to species).	Assumed in offshore open waters	Most likely warm, summer temperatures	Open Gulf salinity 30-35ppt								
Citation	1,16	17	22	22								
Post Larvae	Summer	Pelagic, Offshore		Open Gulf salinity 30-35ppt								
Citation	22	15		22								
Juveniles	Summer-Fall	Often associated with "rip" lines and floating structures. Pelagic, offshore nearshore records		Open Gulf salinity (30+)		Pelagic, but no measurements	Invertebrates		Will seek out rip lines only floating plants. FL specimens found w/Sargassum.			
Citation	22	16,22		22			22		14,18,20,22		2,8	

No data available for environmental factors (Temp, Sal, Oxygen) predators, growth, mortality and production

Greater Amberjack, (<u>Seriola</u> <u>dumerili</u>) cont.

							Trophic relationships		Habitat Associations and Interactions			
Life Stage	Season	Location	Temp(^{o}C)	Salinity(ppt)	Oxygen	Depth(m)	Food	Predators	Habitat Selection	Growth	Mortality	Production
Adults	Year round, not as common in colder seasons, suggestion of migration to warmer parts of GOM	Widespread over much of GOM	Becomes more scarce in N. GOM under 18-20^{o}C in fall	Open Gulf Salinity (30+)		Widespread surface to several hundred m (few obs. suggest may go much deeper)	Top level predator - variety of fishes, crustaceans and cephalopods		Off Louisiana strongly associated with rig structures		Males shorter lifespan (to 7 yrs) than females (to 15yrs) GOM. Males shorter lifespan (to 8 than females (to 10) in S. GOM.	
Citation	5,22	4	22	22		19	4,22		22		5,22	
Spawning Adults	Little data. N. GOM spawning from May to July, may be as early as April based on histology	Offshore waters		Probably open Gulf Salinity 30-35ppt		Same as adults			Probably same as adults			
Citation	22	17,22							22			

Little or no data on spawning adults

Citations for the genus, Seriola.

1. Aprieto, V.L. Early development of five carangid fishes of the Gulf of Mexico and the south Atlantic coast of the United States. Fish. Bull. 72:415-443.

2. Beasley, M. 1993. Age and growth of greater amberjack, *Seriola dumerilli* (Risso), from the northern Gulf of Mexico. M.S. thesis. Louisiana State University, Baton Rouge, L.A.

3. Berry, F.H. and R.K. Burch. 1979. Aspects of the amberjack fisheries. Proc. 31st Ann. Gulf Caribbean Fish. Inst. 31:179-194.

4. Berry, F.H. and W.F. Smith-Vaniz. 1977. FAO species identification sheets: Carangidae. In: FAO species identification sheets for fishery purposes; western central Atlantic, fishing area 31. W. Fischer (ed.). FAO of the United Nations, Rome.

5. Burch, R.K. 1979. The Greater Amberjack, *Seriola dumerilli*: Its biology and fishery off southeastern Florida. MS Thesis, Univ. Miami. Miami, FL. 113 pp.

6. Ginsburg, I. 1952. Fishes of the family Carangidae of the northern Gulf of Mexico and three related species. Publ. Inst. Mar. Sci., Univ. Texas 2 (2):43-117.

7. Johnson, G.D. 1978. Development of fishes of the Mid-Atlantic Bight, An Atlas of egg, larval and juvenile stages. Carangidae through Ephippidae. Vol. IV. U.S. Fish and Wildlife Serv. Biol. Serv. Prog. FWS/OBS-78/12.

8. Laroche, W.A., W.F. Smith-Vaniz, and S.L. Richardson. 1984. Carangidae: development, pp. 510-522. In: Ontogeny and systematics of fishes. H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, and S.L. Richardson (eds.). Spec. Publ. No. 1, Amer. Soc. Ichthy. Herp. Allen Press, Lawrence, K.S.

9. Mather, F.J. 1952. Three species of fishes, genus *Seriola*, in the waters of Cape Cod and vicinity. Copeia 1952:209-210.

10. Mather, F.J. 1958. A preliminary review of the amberjacks, genus *Seriola*, of the western Atlantic. Proc. Third Inter. Game Fish Conf. 3:1-13.

11. Smith-Vaniz, W.F. 1984. Carangidae:Relationships, pp. 522-530. In: Ontogeny and systematics of fishes. H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall, and S.L. Richardson (eds.). Spec. Publ. No. 1, Amer. Soc. Ichthy. Herp. Allen Press, Lawrence, KS.

12. Smith-Vaniz, W.F. 1986. carangidae, pp. 815-831. In: P. Whitehead, M. Bauchot, J. Hureau, J. Nielson, E. Tortonese (eds.). Fishes of the North-eastern Atlantic and the Mediterranean, Vol. II. UNESCO. Paris.

13. Smith-Vaniz, W.F. and F.H. Berry. 1981. FAO species identification sheets: Carangidae. In: FAO species identification sheets for fishery purposes; eastern central Atlantic, fishing areas 34 & 37. W. Fischer, G. Bianchi, and W.B. Scott (eds.) Dept. of Fisheries and Oceans Canada, Ottawa.

14. Dooley, J.K. 1972. Fishes associated with the pelagic *Sargassum* community. Contrib. Mar. Sci. 16:1-32.

15. Hildebrand, S.F., and L.E. Cable. 1930. Development and life history of fourteen teleostean fishes at Beaufort, N.C. U.S. Bur. Fish. Bull. 46:383-488.

16. Sanzo, L. 1933. Uova, larvae e stadi giovanili di *Seriola* *dumerilli* Risso [in italian]. Mem. R. Com. Talassogr. Ital. 205. 12 pp.

17. Fahay, M.P. 1975. An annotated list of larval and juvenile fishes captured with surface-towed meter net in the South Atlantic Bight during four *RV Dolphin* cruises between May 1967 and February 1968. NOAA Tech. Rept. NMFS SSRF-685. 39 pp.

18. Schekter, R.C. 1972. Food habits of some larval and juvenile fishes from the Florida Current, near Miami, Florida. U.S. Environ. Prot. Agency Tech. Rept. (unpubl.) 85 pp.

19. McClane, A.J., ed. 1965. McClane's Standard Fishing Encyclopedia. Holt, Rinehart and Winston, Inc., New York. 1057 pp.

20. Randall, J.E. 1968. Caribbean reef fishes. T.F.H. Publications, Neptune City, N.J. 318 pp.

21. Nichols, J.T., and C.M. Breder, Jr. 1927. The marine fishes of New York and southern New England. Zoologica (N.Y.) 9(1):1-192.

22. B.A. Thompson, personal communication.

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