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AMENDMENT 21 TO THE

REEF FISH FISHERY MANAGEMENT PLAN

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

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Environmental Assessment Table of Contents

The following table lists the sections that comprise the environmental assessment, and the sections in Amendment 21 that correspond to each environmental assessment section.

ABBREVIATIONS USED IN THIS DOCUMENT

CEQ	Council on Environmental Quality
CFR	United States Code of Federal Regulations
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
FMP	Fishery Management Plan
FSU	Florida State University
GMFMC	Gulf of Mexico Fishery Management Council
HAPC	Habitat Area of Particular Concern
HBOI	Harbor Branch Oceanographic Institute
HMS	Highly Migratory Species (tunas, swordfish, oceanic sharks, and billfishes)
IRFA	Initial Regulatory Flexibility Analyses
MARFIN	Marine Fisheries Initiative (a NMFS program for funding marine fishery research)
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OY	Optimum Yield
RFA	Regulatory Flexibility Analyses
RFSAP	Reef Fish Stock Assessment Panel
RIR	Regulatory Impact Review
ROV	Remotely Operated Vehicle
SEIS	Supplemental Environmental Impact Statement
SMZ	Special Management Zone
USGS	United States Geological Survey

EXECUTIVE SUMMARY

The purpose of this amendment is to continue to provide protection for spawning aggregations of gag in order to prevent overfishing and to improve spawning success, to continue to protect a portion of the offshore population of male gag, which has been substantially reduced in proportion to female gag since the 1970s, and to continue to evaluate the effect and usefulness of marine reserves as a fishery management tool. To accomplish these objectives, this amendment contains proposals to continue the marine reserves located at Madison-Swanson and Steamboat Lumps beyond their initial June 16, 2004 expiration date, with modifications to the fishing restrictions within the reserves. The reserves were initially implemented in June 2000 to provide protection to a portion of the gag spawning aggregations and offshore male population in response to the classification by NMFS that the gag stock was undergoing overfishing and scientific information that suggested that the proportion of male gag in the population had declined substantially since the 1970s. A four-year time frame was set for the reserves to be in effect so that their effect on the fishery resources could be evaluated before deciding whether to proceed further. In 2002, NMFS reclassified the gag stock as neither overfished nor undergoing overfishing. However, the stock was not at its optimum yield level. The reason for continuing the reserves is to continue the protections afforded to the gag stock and spawning habitat, and to allow time for additional research into the effects of the reserves.

Three issues are addressed in this amendment regarding continuation of the reserves.

1. Should the marine reserves at Madison-Swanson and Steamboat Lumps be continued, and if so, for how long?

   The Preferred Alternative is to continue the reserves for as additional six years, until June 2010. In combination with the initial four-year period (June 2000 - June 2004), this will give a total of ten years in which to evaluate the effects, and will continue to provide protection to a portion of the gag spawning aggregations and offshore male population while the stock is being rebuilt toward its optimum yield level.

2. Should the existing regulations concerning what types of fishing are allowed and what types are prohibited be continued, or should the regulations within the reserves be changed?

   The Preferred Alternative is to allow surface trolling within the marine reserves at Madison-Swanson and Steamboat Lumps for coastal migratory pelagic species, for the months of May through October and to make a written request to NMFS HMS to close all HMS fishing, except to allow surface trolling for HMS species concurrently with the coastal migratory pelagics species during open season. Prohibit fishing and possession for all reef fish species and require vessels transiting the areas in possession of reef fish to comply with the same requirements as implemented for the Tortugas South and North closed fishing areas. This is a change from the original fishing restrictions, which were to prohibit fishing for all species year round except HMS species. The Council had

requested that the NMFS HMS Division implement a compatible closure for species under their management. However, a legal challenge from the Coastal Conservation Association contested the need to prohibit surface trolling for pelagic species in order to protect reef fish. The Council's request was subsequently held in abeyance while NMFS conducted research into the effect of trolling on reef fish. The results of that research are contained in this document (Appendices D and E).

3. Should the reserves continue to be in effect year-round, or should they be seasonal?

The Preferred alternative is to continue to have the reserves be in effect year-round (except for the six-month surface trolling season on coastal pelagic and HMS species) in order to provide continuity for ongoing research into the effects of the reserves. A year-round reserve provides protection not only for gag spawning aggregations, but for other species that spawn in the reserves other times of the year, such as scamp. It also protects a portion of the male gag, which tend to remain offshore year-round. Females tend to disperse shoreward outside of spawning season. In addition to gag, scamp have been observed spawning in the marine reserve at Madison-Swanson. Up to 66 fish species have been observed by researchers in Madison-Swanson and up to 53 species in Steamboat Lumps, although spawning aggregations for most of these species (other than gag and scamp) have not been observed in the areas to date[1].

[1] See Section 10.0 (Description of the Affected Environment)for a summary of the habitat and species observations. Species frequently observed in Madison-Swanson include gag, scamp, red grouper, snowy grouper, speckled hind, red snapper, silk snapper, red porgy, knobbed porgy, gray triggerfish, and greater amberjack. Species frequently observed in Steamboat Lumps include honeycomb moray, bandtail puffer, bank sea bass, red porgy, vermilion snapper, scamp and red grouper.

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

In and by itself, the continuation of the marine reserves (Section 6.1) does not create any economic or social impacts on fishing participants. Fishing regulations within the reserves are the actions that would potentially introduce changes in the economic and social status of the fishery participants.

Fishing restrictions within the marine reserves (Section 6.2) would potentially affect the operations of about 356 vessels that caught reef fish and other species in Statistical Areas 6 or 8. Understandably, there are vessels that would be minimally affected and some that would experience larger reductions in harvests if prohibited from fishing in certain parts of the two statistical areas. Most of these vessels catch a greater portion of their landings from Statistical Area 6. There are reported to be 60 to 70 vessels that catch most of their fish from 30 to 50 fathoms of water in Statistical Area 6. The average crew size for these vessels is approximately 2 to 3 persons.

Of the 356 vessels harvesting reef fish and other species in Statistical Areas 6 and 8, only some are likely to be highly dependent on catches from the two marine reserves. Any reductions in vessel catch and income would tend to materially affect the fishing operations of these vessels and the livelihood of the crew. To compensate for any potential revenue reduction from fishing restrictions within the reserves, affected vessels would have to fish in other areas and compete with other commercial vessels and recreational vessels. This practice would likely not fully offset revenue losses and would likely increase fishing costs.

Dealers receiving fish from the affected vessels will also experience adverse impacts. About 83 dealers received reef fish that were harvested in Statistical Area 6 or 8. These dealers comprise the universe of dealers that would be directly affected by the fishing restrictions

within the reserves. As with the case for vessels, there are dealers that would be minimally affected and there are those that would face large reductions in fish received from various vessels fishing in the area that would be subject to fishing restrictions. Alternative supply sources may not be readily available, or if available, the fish supplied may cost more or be of lower quality.

One other group that would be affected by fishing restrictions on the two marine reserves is the recreational sector, including for-hire vessels. There is very little information on the activities of this sector within the reserves. It can only be inferred from the lawsuit brought by the CCA that there has been a good deal of recreational fishing activities within the two marine reserves. Current rules (Alternative 6.2.6 or Alternative 6.2.2) allow only the harvest of HMS species by both the commercial and recreational sector, and these species can be harvested by any allowable methods of fishing. To the extent that the recreational sector also used to harvest other species, such as reef fish and coastal migratory pelagics, the establishment of the reserves and accompanying restrictions must have negatively affected both the harvest of fish and overall fishing experience of anglers within the reserves. Such negative impacts would be partly alleviated under Alternative 6.2.7 (Proposed Alternative) which would allow surface trolling for coastal migratory pelagic species (and possibly HMS species) within the reserves for the months of May through October.

Any impacts of the various alternatives for fishing restrictions on vessels and dealers would ripple through the various communities where these vessels and dealers conduct their business operations or where workers on those vessels and dealers reside. Several areas in the west coast of Florida have been identified as important areas where vessels and dealers conduct their business operations. Impacts on these entities from fishing restrictions within the reserves would likely filter into their support industries and communities.

Seasonal fishing regulations within the reserves (Section 6.3) would likely cushion the impacts of a year-round effectivity of those regulations. Although the Proposed Alternative under Section 6.3 provides for a year-round effectivity of regulations, the Proposed Alternative 6.2.7 does contain seasonal effectivity of regulations with respect to surface trolling for coastal migratory pelagic species (and possibly HMS species). The same participants described under Section 6.2 are expected to be affected by seasonal fishing regulations. The nature of impacts on these participants is also expected to be similar to the one described for fishing restrictions within the reserves.

1.0 INTRODUCTION

In June 2000, NMFS implemented a series of management actions proposed under the August 1999 Regulatory Amendment to the Reef Fish Fishery Management Plan to Set 1999 Gag/Black Grouper Management Measures (Revised) (GMFMC 1999a). These actions included raising the minimum size limit for gag from 20 inches total length to 22 inches for recreational harvest and 24 inches for commercial harvest; closing the commercial fishery to harvest of red, gag and black grouper during February 15 to March 15; and creating two marine reserves, Steamboat Lumps and Madison-Swanson (Figure 1) that are closed to all fishing except for the highly migratory species (tunas, swordfish, oceanic sharks, and billfishes). These actions were taken in response to a 1997 gag stock assessment (Schirripa and Legault 1997) and recommendation from the Reef Fish Stock Assessment Panel (RFSAP) that gag, while not overfished, may be undergoing overfishing (GMFMC 1998a).

In an earlier report (GMFMC 1997), the RFSAP expressed concern over the practice of fishing on gag spawning aggregations. They felt that this type of activity can cause:

1. **Increased focus of the fishery on large breeders.** Koenig et al. (1996) has shown that the largest fish in the stock concentrate in the spawning groups. Fishing these groups depletes the large breeders rapidly as noted from a dramatic decrease in mean size in only 10-15 years of fishing the spawning aggregations.

2. **A decrease in the proportion of males.** Coleman et al. (1996) showed that a decrease from 17% males in the late 1970s to 1-4% in the early 1990s occurred in the gag stocks of the Atlantic and the Gulf of Mexico. A similar decrease in the proportion of males was shown in scamp aggregations, but not for red grouper, which do not aggregate to spawn.

3. **Disruption of the social structure of the spawning groups.** A fishing-induced disruption of spawning was suggested by Shapiro (1987) and Coleman et al. (1996). The evidence indicates that social interaction is at the base of the sex-change process; disruption of this process inhibits the sex change process.

4. **Complete loss of the spawning groups.** C.C. Koenig FSU, C.B. Grimes NMFS and R.G. Gilmore, HBOI (unpublished data), based on visual surveys from submersibles, observed the loss of a gag spawning group and the decimation of a scamp spawning groups on a shelf-edge site off Ft. Pierce, FL (Oculina Banks) after 15 years of fishing.

To address these problems, the RFSAP recommended that the Council close a significant area of known gag spawning habitat and establish no-take marine fishery reserves . They felt that creating only seasonal closed areas during the spawning season would not protect the males that would be subject to fishing outside of the spawning season, as males are

known to remain offshore during non-spawning times of the year (L.A. Collins, NMFS, unpublished data).

The closed area provision was not without controversy. Scientists debated whether sex change was induced by social or environmental factors and whether fishing disruptions of spawning activity contributed to changes in sex ratio (Kenchington 1999, Koenig et al. 1996). In addition, the original Council proposal would have set aside about 50% of the dominant gag spawning grounds (Figure 2). The original proposal was for a single continuous closed area covering the areas shown as Site 8a-e (40 fathom contour west of Middle Grounds) plus site 9 (Steamboat Lumps) (Figure 3). After simplifying the area to be a four-sided parallelogram for ease of enforcement (Figure 4), this proposal would have covered 423 nautical square miles. As a result of strong public protests and questions about the science describing the benefits of closed areas to gag populations (Kenchington 1999), the Council reconsidered its proposal and decided that a study on the effects of closed areas and their utility to protect gag populations would be prudent.

To study the potential effects of area closures on gag spawning aggregations, the Council selected two areas for year-round closure to all fishing where gag spawning is known to occur. Figure 3 and the area descriptions in Appendix A describe 14 areas under consideration for reef fish reserves, out of which eight sites (sites 3 to 10) were considered suitable gag spawning habitat. Because the Council was interested in evaluating the efficacy of area closures to protect gag spawning aggregations and male gag, sites 5 (Madison-Swanson) and 9 (Steamboat Lumps) were selected (Figure 1). They are approximately the same size (115 and 104 square nautical miles, respectively) and they represent high relief (site 5- Madison-Swanson) and low relief (site 9 - Steamboat Lumps) sites. This would allow evaluation of the effectiveness of areal closures as well as the relative importance of site type (high vs. low relief).

It was the Council's intent to prohibit the use of any fishing gear within the closed areas in order to maximize enforceability as well as minimize the negative impact from incidental catch and release of reef fish while targeting other species. For this reason, the Council asked that the NMFS Highly Migratory Species (HMS) Division implement compatible closed area regulations for the species under their management jurisdiction (tunas, swordfish, oceanic sharks, and billfishes). This led to a legal challenge from a recreational fishing organization. The recreational organization felt that the no-take areas unfairly restricted access to the resource by recreational fishermen, and that restrictions on fishing for migratory species higher up in the water column were unwarranted because they would have no impact on the bottom reef fish species. As part of a settlement to the legal challenge, NMFS agreed to hold the Council's request to implement an HMS closure in abeyance, while research is conducted into the impact of the no-take areas, the effect of pelagic trolling on and ability to reach reef fish species, and the impact on enforceability by allowing pelagic trolling in the not-take areas.

A four-year sunset clause was included in the proposed alternative to give the NMFS and Council time to evaluate the utility of closed areas. As a result, if the Council chooses to continue the marine reserves at Madison-Swanson and Steamboat Lumps beyond June 2004, it must do so through a Reef Fish plan amendment. Non-action will result in the two reserves expiring on June 16, 2004, and the areas re-opening to all fishing.

2.0 HISTORY OF MANAGEMENT

2.1 HISTORY OF AREA RESTRICTIONS IN REEF FISH MANAGEMENT

The Florida Middle Ground Habitat Area of Particular Concern (HAPC) and the West and East Flower Garden Banks HAPC were established in August, 1984, under the Gulf and South Atlantic Councils' Corals and Coral Reefs FMP. Within these areas, fishing with a bottom longline, bottom trawl, dredge, pot, or trap is prohibited year-round.

The Reef Fish Fishery Management Plan (FMP) was implemented in November 1984. The original FMP established the first area restrictions on fishing for reef fish, i.e., prohibitions on the use of fish traps, roller trawls, and powerhead-equipped spear guns within an inshore stressed area.

Amendment 1 to the Reef Fish FMP, implemented in 1990, expanded the stressed area boundary to cover the entire Gulf coast. This amendment also established a longline and buoy gear boundary inshore of which the directed harvest of reef fish with longlines and buoy gear was prohibited and the retention of reef fish captured incidentally in other longline operations (e.g. shark) was limited to the recreational bag limit.

Amendment 5, implemented in February 1994, created a special management zone (SMZ) off the coast of Alabama within Alabama's general permit area for creating artificial reefs. Within this SMZ, reef fish fishing was limited to gear with no more than three hooks per line. This amendment also closed Riley's Hump (a mutton snapper spawning aggregation area) to all fishing during May and June.

An August 1999 regulatory amendment, implemented June 19, 2000, established two marine reserves on areas suitable for gag and other reef fish spawning aggregations sites that are closed year-round to fishing for all species under the Council's jurisdiction. The two sites cover 219 square nautical miles near the 40-fathom contour, off west central Florida.

A request from the Council to the NMFS Highly Migratory Species Division (HMS) to adopt a compatible closure for species under HMS jurisdiction (tunas, sharks, sailfish and swordfish) was held in abeyance by NMFS as part of a settlement of a legal challenge from the Coastal Conservation Association. NMFS also agreed to conduct research within the closed areas during May 2001 to May 2003, to address the potential trolling impacts. Most of the biological research is being carried out under MARFIN.

Amendment 19 (also known as the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves), implemented July 2001, created two marine reserves: Tortugas South (60 square nautical miles) and Tortugas North (125 square nautical miles) near the Dry Tortugas, Florida. Tortugas South encompasses Riley's

Hump. Fishing is prohibited in both areas and non-consumptive diving is also prohibited in Tortugas South.

2.2 HISTORY OF GROUPER MANAGEMENT

The following discussion describes only the management actions that affect grouper harvest. For a complete history of management of the entire reef fish fishery, refer to the most recent Reef Fish FMP plan amendment.

2.2.1 Management Activities Other Than Regulatory Amendments

The Reef Fish Fishery Management Plan and environmental impact statement (EIS) were implemented in November 1984. The regulations, designed to rebuild declining reef fish stocks, included prohibitions on the use of fish traps, roller trawls, and powerhead-equipped spear guns within an inshore stressed area and directed NMFS to develop data reporting requirements in the reef fish fishery. The National Marine Fisheries Service (NMFS) has collected commercial landings data since the early 1950's, recreational harvest data since 1979, and in 1984 initiated a dockside interview program to collect more detailed data on commercial harvest.

In July 1985, the Florida Marine Fisheries Commission established a Florida state regulation to set a minimum size limit of 18 inches for red grouper, gag, yellowfin grouper, Nassau grouper, and jewfish (goliath grouper). In December 1986, the Florida Marine Fisheries Commission set a state recreational bag limit of five grouper per person per day, with an off-the-water possession limit of ten per person, for any combination of groupers excluding rock hind and red hind.

Amendment 1 ,including environmental assessment (EA), regulatory impact review (RIR), and regulatory flexibility analyses (RFA), to the Reef Fish Fishery Management Plan, implemented in 1990, was a major revision of the original FMP. It 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. The target date for achieving the 20 percent SSBR goal was set at January 1, 2000. Among the grouper management measures implemented were:

- Set a 20-inch total length minimum size limit on red Nassau, yellowfin, black, and gag groupers;
- Set a 50-inch total length minimum size limit on jewfish (goliath grouper);
- Set a 5-grouper recreational bag limit;

- Set an 11.0 million-pound commercial quota[2] for groupers, with the commercial quota divided into a 9.2 million pound shallow-water grouper quota and a 1.8 million-pound deepwater grouper quota. Shallow-water grouper were defined as black grouper, gag, red grouper, Nassau grouper, yellowfin grouper, yellowmouth grouper, rock hind, red hind, speckled hind, and scamp (until the shallow-water grouper quota is filled). Deep-water grouper were defined as misty grouper, snowy grouper, yellowedge grouper, warsaw grouper, and scamp once the shallow-water grouper quota is filled. Jewfish (goliath grouper) is not included in the quotas;
- Allow a 2-day possession limit for charter vessels and head boats on trips that extend beyond 24 hours, provided the vessel has two licensed operators aboard as required by the U.S. Coast Guard, and each passenger can provide a receipt to verify the length of the trip.
- All other fishermen fishing under a bag limit are limited to a single day possession limit;
- Establish a framework procedure for specification of TAC to allow for annual management changes;
- Established a longline and buoy gear boundary at approximately the 50 fathom depth contour west of Cape San Blas, Florida and the 20 fathom depth contour east of Cape San Blas, inshore of which the directed harvest of reef fish with longlines and buoy gear was prohibited and the retention of reef fish captured incidentally in other longline operations (e.g., sharks) was limited to the recreational bag limit. Subsequent changes to the longline/buoy boundary could be made through the framework procedure for specification of TAC;
- Limit trawl vessels (other than vessels operating in the unsorted groundfish fishery) to the recreational size and bag limits of reef fish;
- Establish fish trap permits, allowing up to a maximum of 100 fish traps per permit holder;
- Prohibit the use of entangling nets for directed harvest of reef fish. Retention of reef fish caught in entangling nets for other fisheries is limited to the recreational bag limit;
- Establish the fishing year to be January 1 through December 31;
- Extend the stressed area to the entire Gulf coast;
- Establish a commercial reef fish vessel permit.

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

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

On November 7, 1989, NMFS announced that anyone entering the commercial reef fish fishery in the Gulf of Mexico and South Atlantic after a **control date of November 1, 1989** may not be assured of future access to the reef fish fishery if a management regime is developed and implemented that limits the number of participants in the fishery. The purpose of this announcement was to establish a public awareness of potential eligibility criteria for future access to the reef fish resource, and does not prevent any other date for eligibility or other method for controlling fishing effort from being proposed and implemented.

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

Amendment 4, including EA, RIR and initial RFA (IRFA), implemented in May 1992, established a moratorium on the issuance of new reef fish permits for a maximum period of three years. The moratorium was created to moderate short term future increases in fishing effort and to attempt to stabilize fishing mortality while the Council considers a more comprehensive effort limitation program. It allows the transfer of permits between vessels owned by the permittee or between individuals when the permitted vessel is transferred. Amendment 4 also changed the time of the year that TAC is specified from April to August and included additional species in the reef fish management unit.

Amendment 5, including a supplemental EIS (SEIS), RIR and IRFA, implemented in February 1994, established restrictions on the use of fish traps in the Gulf of Mexico EEZ, implemented a three-year moratorium on the use of fish traps by creating a fish trap endorsement and issuing the endorsement only to fishermen who had submitted logbook records of reef fish landings from fish traps between January 1, 1991 and November 19, 1992, created a special management zone (SMZ) with gear restrictions off the Alabama coast, created a framework procedure for establishing future SMZ's, 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 6, including EA, RIR and RFA, implemented in June 1993, extended the provisions of an emergency rule for red snapper endorsements for the remainder of 1993 and 1994, and it allowed the red snapper trip limits for qualifying and

non-qualifying permitted vessels to be changed under the framework procedure for specification of TAC.

Amendment 7, including EA, RIR, and IRFA, implemented in February 1994, established reef fish dealer permitting and record keeping requirements, allowed transfer of fish trap permits and endorsements between immediate family members during the fish trap permit moratorium, and allowed transfer of other reef fish permits or endorsements in the event of the death or disability of the person who was the qualifier for the permit or endorsement. A proposed provision of this amendment that would have required permitted vessels to sell harvested reef fish only to permitted dealers was disapproved by the Secretary of Commerce and was not implemented.

Amendment 8, including EA, RIR and IRFA, proposed establishment of a red snapper Individual Transferable Quota (ITQ) system. It was approved by NMFS and final rules were published in the Federal Register on November 29, 1995. However, concerns about Congressional funding of the ITQ system made it inadvisable for the ITQ system to become operational, pending Congressional action. In October 1996, Congress, through reauthorization of the Magnuson-Stevens Act, repealed the red snapper ITQ system and prohibited Councils from submitting, or NMFS from approving and implementing, any new individual fishing quota program before October 1, 2000.

Amendment 9, including EA, RIR and IRFA, implemented in July 1994, provided for collection of red snapper landings and eligibility data from commercial fishermen for the years 1990 through 1992. The purpose of this data collection was to evaluate the initial impacts of the limited access measures being considered under Amendment 8 and to identify fishermen who may qualify for initial participation under a limited access system. This amendment also extended the reef fish permit moratorium and red snapper endorsement system through December 31, 1995, in order to continue the existing interim management regime until longer term measures can be implemented. The Council received the results of the data collection in November 1994, at which time consideration of Amendment 8 resumed.

Withdrawn **Amendment 10**, including EA, RIR and IRFA, would have extended the validity of additional fish trap endorsements for the duration of the fish trap moratorium that was implemented under Amendment 5. These additional endorsements were to have been issued under an emergency rule, requested in March 1994, to alleviate economic hardships after the Council heard from fishermen who entered the fish trap fishery after the November 19, 1992 cutoff date and stated that they were unaware of the impending moratorium. The Council rejected the proposed amendment in May 1994 after NMFS stated that it had notified fishermen of the pending moratorium and fish trap endorsement criteria during the time between Council final action and NMFS implementation if they asked about fish trap rules or if they requested application materials and NMFS was aware that it was for purposes of entering the fish trap fishery. The Council also considered arguments that the change in qualifying

criteria circumvented the intent of the fish trap moratorium to halt expansion of the fish trap fishery at the November 19, 1992 level. After the Council rejected Amendment 10, NMFS subsequently rejected the emergency request.

Amendment 11, including EA, RIR and IRFA, was partially approved by NMFS and implemented in January 1996. The six approved provisions are: (1) limit sale of Gulf reef fish by permitted vessels to permitted reef fish dealers; (2) require that permitted reef fish dealers purchase reef fish caught in Gulf federal waters only from permitted vessels; (3) allow transfer of reef fish permits and fish trap endorsements in the event of death or disability; (4) implement a new reef fish permit moratorium for no more than five years or until December 31, 2000, while the Council considers limited access for the reef fish fishery; (5) allow permit transfers to other persons with vessels by vessel owners (not operators) who qualified for their reef fish permit; and, (6) allow a one time transfer of existing fish trap endorsements to permitted reef fish vessels whose owners have landed reef fish from fish traps in federal waters, as reported on logbooks received by the Science and Research Director of NMFS from November 20, 1992 through February 6, 1994. NMFS disapproved a proposal to redefine Optimum Yield from 20 percent SPR (the same level as overfishing) to an SPR corresponding to a fishing mortality rate of F0.1 until an alternative operational definition that optimizes ecological, economic, and social benefits to the Nation could be developed. In April 1997, the Council resubmitted the Optimum Yield definition with a new proposal to redefine Optimum Yield as 30 percent SPR. The resubmission document was disapproved by NMFS.

Amendment 12, including EA, RIR and IRFA, implemented in January 1997, reduced the greater amberjack bag limit from three fish to one fish per person, and created an aggregate bag limit of 20 reef fish for all reef fish species not having a bag limit.

Amendment 13, including EA, RIR and IRFA, implemented in September 1996, further extended the red snapper endorsement system through the remainder of 1996 and, if necessary, through 1997, in order to give the Council time to develop a permanent limited access system that was in compliance with the new provisions of the Magnuson-Stevens Act.

Amendment 14, including EA, RIR and IRFA, implemented in March and April 1997, provided for a ten-year phase-out for the fish trap fishery; allowed transfer of fish trap endorsements for the first two years and thereafter only upon death or disability of the endorsement holder, to another vessel owned by the same entity, or to any of the 56 individuals who were fishing traps after November 19, 1992 and were excluded by the moratorium; and prohibited the use of fish traps west of Cape San Blas, Florida. The amendment also provided the Regional Administrator (RA) of NMFS with authority to reopen a fishery prematurely closed before the allocation was reached, and modified the provisions for transfer of commercial reef fish vessel permits. In addition, the amendment prohibited the harvest or possession of Nassau grouper in the Gulf EEZ,

consistent with similar prohibitions in Florida state waters, the south Atlantic EEZ, and the Caribbean EEZ.

Amendment 15, including EA, RIR and IRFA, implemented in January 1998, prohibited harvest of reef fish from traps other than permitted reef fish traps, stone crab traps, or spiny lobster traps.

Amendment 16A, including EA, RIR and IRFA, submitted to NMFS in June 1998, was partially approved and implemented on January 10, 2000. The approved measures provided: (1) that the possession of reef fish exhibiting the condition of trap rash on board any vessel with a reef fish permit that is fishing spiny lobster or stone crab traps is prima facie evidence of illegal trap use and is prohibited except for vessels possessing a valid fish trap endorsement; (2) that NMFS establish a system design, implementation schedule, and protocol to require implementation of a vessel monitoring system (VMS) for vessels engaged in the fish trap fishery, with the cost of the vessel equipment, installation, and maintenance to be paid or arranged by the owners as appropriate; and, (3) that fish trap vessels submit trip initiation and trip termination reports. Prior to implementing this additional reporting requirement, there will be a one-month fish trap inspection/compliance/education period, at a time determined by the NMFS Regional Administrator and published in the *Federal Register*. During this window of opportunity, fish trap fishermen will be required to have an appointment with NMFS enforcement for the purpose of having their trap gear, permits, and vessels available for inspection. The disapproved measure was a proposal to prohibit fish traps south of 25.05 degrees north latitude beginning February 7, 2001. The status quo 10-year phase-out of fish traps in areas in the Gulf EEZ is therefore maintained.

Amendment 16B, including EA, RIR and IRFA, was submitted to NMFS in January 1999, and was implemented by NMFS on November 24, 1999. This amendment set a recreational bag limit of one speckled hind and one warsaw grouper per vessel, with the prohibition on the sale of these species when caught under the bag limit.

Amendment 17, including EA, RIR and IRFA, was submitted to NMFS in September 1999, and was implemented by NMFS on August 10, 2000. This amendment extended the commercial reef fish permit moratorium for another five years, from its previous expiration date of December 31, 2000 to December 31, 2005, unless replaced sooner by a comprehensive controlled access system. The purpose of the moratorium is to provide a stable environment in the fishery necessary for evaluation and development of a more comprehensive controlled access system for the entire commercial reef fish fishery.

Amendment 18, including EA, RIR and IRFA, is currently under development and will address issues primarily involving grouper management.

Amendment 19, including a final SEIS, RIR and IRFA, also know as the **Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves**, was submitted to NMFS in March 2001, and was implemented on August 19, 2002. This amendment, affecting all FMPs for the Gulf fisheries (Amendment 19 to the Reef Fish FMP), establishes two marine reserve areas off the Tortugas area and prohibits fishing for any species and anchoring by fishing vessels inside the two marine reserves.

Amendment 20, including EA, RIR and IRFA, also known as the **Corrected Charter/Headboat Moratorium Amendment**, affects the Reef Fish FMP (Amendment 20), the Coastal Pelagic FMP (Amendment 14) and, if implemented, a Dolphin/Wahoo FMP, was submitted to NMFS in October 2001. This amendment establishes a 3-year moratorium on the issuance of new charter and headboat vessel permits in the recreational for hire fisheries in the Gulf EEZ. The amendment was approved by NMFS and the provisions to determine eligibility and distribute moratorium permits was implemented on July 29, 2002, with the moratorium originally scheduled to become effective on December 26, 2002. However, on December 17, 2002, NMFS published an emergency action that deferred the date when "moratorium" charterboat permits are required from December 26, 2002 until June 16, 2003. This action was required because the final rule implementing the for-hire permit moratorium contained an error regarding eligibility that needed to be resolved before the moratorium could take effect. The purpose of this moratorium is to limit future expansion in the recreational for-hire fishery while the Council monitors the impact of the moratorium and considers the need for a more comprehensive effort management system in the for-hire recreational fishery. The Council set a qualifying cutoff date of March 29, 2001 in order to include all currently permitted vessels and vessels which have applied for a permit as of that date. The qualifying provisions also included persons who had a recreational for-hire vessel under construction prior to March 29, 2001 and who could show expenditures of at least five thousand dollars. In addition, persons who met the eligibility requirements to qualify as a historical captain (USCG licensed and operating as a captain of a for-hire vessel prior to March 29, 2001, will qualify for a permit within 90 days of the final rule, and at least 25 percent of earned income was from recreational for-hire fishing in one of the last four years ending March 29, 2001) were issued a letter of eligibility, which can be replaced by a permit/endorsement valid only on the vessel that is operated by the historical captain.

2.2.2 Secretarial Amendments

Section 304(c)(1) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) states that the Secretary may prepare a fishery management plan, with respect to any fishery, or any amendment to any such plan, in accordance with the national standards, the other provisions of this Act, and any other applicable law, if

(A) the appropriate Council fails to develop and submit to the Secretary, after a reasonable period of time, a fishery management plan for such fishery, or any

necessary amendment to such a plan, if such fishery requires conservation and management;

(B) the Secretary disapproves or partially disapproves any such plan or amendment, or disapproves a revised plan or amendment, and the Council involved fails to submit a revised or further revised plan or amendment; or

(C) the Secretary is given authority to prepare such plan or amendment under this section.

Section 304(e)(5) of the MSFCMA states that if, within the one-year period beginning on the date of identification or notification that a fishery is overfished, the Council does not submit to the Secretary a fishery management plan, plan amendment, or proposed regulations required by paragraph to end overfishing in the fishery and to rebuild affected stocks of fish, the Secretary shall prepare a fishery management plan or plan amendment and any accompanying regulations to stop overfishing and rebuild affected stocks of fish within 9 months.

Due to circumstances including delays in receiving information from NMFS needed to prepare rebuilding plans, and delays resulting from the terrorist events of September 11, 2001, the Council did not meet its deadline for submitting some rebuilding plans. In such cases, the rebuilding plan is prepared under a Secretarial amendment (a plan amendment that, officially, is prepared by the Secretary of Commerce). The amendment may still be prepared by the Council and may reflect the Council's policy, but it is submitted as a Secretarial amendment rather than as a Council plan amendment.

Secretarial Amendment 1, including an SEIS, RIR and IRFA, which was initially submitted to NMFS in September 2002, proposed the specification of maximum sustainable yield (MSY), optimum yield (OY), maximum fishing mortality threshold (MFMT), and minimum stock size threshold (MSST) levels that are in compliance with the Sustainable Fisheries Act, and it establishes a rebuilding plan for red grouper based on three-year intervals. It also proposed preventative quotas for deep-water groupers and tilefish to avoid effort shifting to those species. Under the proposed rebuilding strategy to set TAC every three years, a 1999 red grouper stock assessment indicated that for the first three-year interval a 36% - 53% reduction in fishing mortality relative to the 1990-2001 average would be required. A more recent red grouper assessment, completed in 2002, found that the stock condition had improved, and only approximately a 10% reduction relative to the more recent fishing mortality during 1999-2001 was required for the first three years of the rebuilding plan. To accomplish this, a revised Secretarial Amendment is being prepared that proposes a commercial trip limit that will achieve a 10% red grouper harvest reduction (currently estimated at 4,000-6,000 pounds), a reduction in the shallow-water grouper quota from 9.35 million pounds gutted weight (9.8 million pounds whole weight) to 8.80 million pounds gutted weight, and a repeal the Feb. 15 - Mar. 15 closed season on commercial harvest of red grouper, black grouper and gag in the Gulf EEZ (which appeared to be

resulting in mini-derby fisheries around the closed season rather than a fishing reduction). It also proposed setting a recreational bag limit of two red grouper out of the five aggregate grouper bag limit per person, with a double bag limit allowed for persons on qualified for-hire boats that are out over 24 hours. The amendment also proposes changing the quota for deep-water grouper from 1.6 million pounds whole weight (equal to 1.35 million pounds landed weight) to a landed weight quota of 1.02 million pounds (average annual harvest 1996-2000), and establishing a landed weight quota for tilefish (all tilefish species in aggregate) at 0.44 million pounds (average annual harvest 1996-2000). This amendment is currently being revised for review by NMFS.

Secretarial Amendment 2, including EA, RIR and RFA, was submitted to NMFS in November 2002, and was approved on June 17, 2003. It proposed the specification of MSY, OY, MFMT, and MSST levels for greater amberjack that are in compliance with the Sustainable Fisheries Act, and it establishes a rebuilding plan for greater amberjack based on three-year intervals. No specific management measures were proposed in this amendment, since the greater amberjack harvest is currently within the TAC specified for the first three-year interval.

2.2.3 Regulatory Amendments

A July 1991 regulatory amendment, including EA and RIR, implemented November 12, 1991, provided a one-time increase in the 1991 quota for shallow-water groupers from 9.2 million pounds to 9.9[3] million pounds. This action was taken to provide the commercial fishery an opportunity to harvest 0.7 million pounds that went unharvested in 1990 due to an early closure of the fishery in 1990. NMFS had projected the 9.2 million-pound quota to be reached on November 7, 1990, but subsequent data showed that the actual harvest was 8.5 million pounds.

A November 1991 regulatory amendment, including EA RIR and IRFA, implemented June 22, 1992, raised the 1992 commercial quota for shallow-water groupers to 9.8 million pounds (using the corrected gutted-to-whole weight conversion factor of 1.05, see footnote 1), after a red grouper stock assessment indicated that the red grouper SPR was substantially above the Council's minimum target of 20 percent, and the Council concluded that the increased quota would not materially impinge on the long-term viability of at least the red grouper stock.

A September 1993 regulatory amendment, including EA RIR and IRFA, was prepared that would have moved the longline and buoy gear restricted area boundary off central and south-central Florida inshore from the 20 fathom isobath to the 15 fathom isobath for a one-year period beginning January 1, 1994. However, longline industry representatives requested that the amendment not be submitted due to concerns that it

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

would lead to a quota closure. In addition, the NMFS Southeast Fisheries Science Center expressed concern that there were inadequate experimental controls to properly evaluate the impact of the action. Consequently, this amendment was not submitted.

An October 1993 regulatory amendment, including EA RIR and RFA, implemented January 1, 1994, set the opening date of the 1994 commercial red snapper fishery as February 10, 1994, and restricted commercial vessels to landing no more than one trip limit per day. The shallow-water grouper regulations were also evaluated but no change was made. The shallow-water grouper TAC, which previously had only been specified as a commercial quota, was specified as a total harvest of 15.1 million pounds (with 9.8 million pounds allocated to the commercial quota) and 20-inch TL size limit for gag, red, Nassau, yellowfin and black grouper.

A rejected December 1994 regulatory amendment, including EA RIR and IRFA, would have reduced the minimum size limit for red grouper from 20 inches to 18 inches in response to complaints from the commercial sector that regulations were too restrictive to allow them to harvest their quota of shallow water grouper. NMFS rejected the proposed action because of concern that it would result in the recreational sector exceeding its allocation. In March 1995 a revised regulatory amendment was submitted to NMFS that would reduce the red grouper size limit to 18 inches for only the commercial sector. That regulatory amendment was rejected by NMFS because newly discovered biases in the growth rate data collected in recent years resulted in uncertainty about the current status of the red grouper stock. Further analysis by NMFS biologists and the RFSAP reduced that uncertainty to the point where the status of red grouper stocks was determined to be most likely at or above 27 percent SPR, well above the overfishing threshold.

In September 1995 a second revised regulatory amendment, including EA RIR and IRFA, was submitted to NMFS to reduce the commercial red grouper size limit to 18 inches. This second revision was rejected by NMFS because they felt it would create user conflicts, produce long term economic losses to commercial fishermen, allow the harvest of juvenile fish, and potentially lead to the commercial quota being filled early and create a derby fishery.

An August 1999 regulatory amendment, including EA RIR and IRFA, implemented June 19, 2000, increased the commercial size limit for gag from 20 to 24 inches TL, increased the recreational size limit for gag from 20 to 22 inches TL, prohibited commercial sale of gag, black, and red grouper each year from February 15 to March 15 (during the peak of gag spawning season), and established two marine reserves on areas suitable for gag and other reef fish spawning aggregations sites that are closed year-round to fishing for all species under the Council's jurisdiction. The two sites cover 219 square nautical miles near the 40-fathom contour, off west central Florida. An additional proposal to continue increasing the recreational minimum size limit for gag and black grouper by one inch per year until it reached 24 inches TL was rejected

by NMFS because it was felt that it would have a disproportionate impact on the recreational fishery vs. the commercial fishery.

2.2.3 Control Date Notices

Control date notices are used to inform fishermen that a license limitation system or other method of limiting access to a particular fishery or fishing method is under consideration. If a program to limit access is established, anyone not participating in the fishery or using the fishing method by the published control date may be ineligible for initial access to participate in the fishery or to use that fishing method. However, a person who does not receive an initial eligibility may be able to enter the fishery or fishing method after the limited access system is established by transfer of the eligibility from a current participant, provided the limited access system allows such transfer. Publication of a control date does not obligate the Council to use that date as an initial eligibility criteria. A different date could be used, and additional qualification criteria could be established. The announcement of a control date is primarily intended to discourage entry into the fishery or use of the gear based on economic speculation during the Council's deliberation on the issues. The following summarizes control dates that have been established for the Reef Fish FMP. A reference to the full *Federal Register* notice is included with each summary.

November 1, 1989 - Anyone entering the commercial reef fish fishery in the Gulf of Mexico and South Atlantic after November 1, 1989 may not be assured of future access to the reef fish resource if a management regime is developed and implemented that limits the number of participants in the fishery. [54 FR 46755]

November 18, 1998 - The Gulf of Mexico Fishery Management Council (Council) is considering whether there is a need to impose additional management measures limiting entry into the recreational-for-hire (i.e., charter vessel and headboat) fisheries for reef fish and coastal migratory pelagic fish in the EEZ of the Gulf of Mexico and, if there is a need, what management measures should be imposed. Possible measures include the establishment of a limited entry program to control participation or effort in the recreational-for-hire for reef fish and coastal migratory pelagics. [63 FR 64031] (In the Charter/Headboat Moratorium Amendment, approved by the Council for submission to NMFS in March 2001, a qualifying date of March 29, 2001 was adopted.)

July 12, 2000 - The Gulf of Mexico Fishery Management Council (Council) is considering whether there is a need to limit participation by gear type in the commercial reef fish fisheries in the exclusive economic zone (EEZ) of the Gulf of Mexico and, if there is a need, what management measures should be imposed to accomplish this. Possible measures include modifications to the existing limited entry program to control fishery participation, or effort, based on gear type, such as a requirement for a gear endorsement on the commercial reef fish vessel permit for the

appropriate gear. Gear types which may be included are longlines, buoy gear, handlines, rod-and-reel, bandit gear, spearfishing gear, and powerheads used with spears. [65 FR 42978]

3.0 PURPOSE AND NEED FOR ACTION

3.1 Purpose and Need

Marine reserves were established in June 2000, at Steamboat Lumps and Madison-Swanson, through an August 1999 regulatory amendment (GMFMC 1999a). They were part of a package of regulations that were proposed in response to a NMFS determination that, based on a 1997 stock assessment, the gag stock was undergoing overfishing and approaching an overfished condition (NMFS 1998). In addition to the NMFS status determination, there were also scientific concerns that indicated the proportion of male gag in the population had decreased from 17% of the commercial harvest in the late 1970s (Hood and Schlieder 1992) to 2-10% of the harvest in the mid 1990s (Coleman et al. 1996).

The regulation package implemented in 2000 included creating the marine reserves at Steamboat Lumps and Madison-Swanson for a period of four years, with a prohibition on harvest of all species except for those managed by the NMFS Highly Migratory Species Division (billfish, swordfish, oceanic sharks, and tunas other than black tuna). The purpose of limiting the duration of the reserves to four years was to evaluate the reserve effects on gag and other species[4] that occupy the habitat. The regulations also included a seasonal closure on commercial harvest of gag, black grouper and red grouper during part of the peak gag spawning season, February 15th to March 15th, a minimum size limit increase for gag from 20 to 24 inches total length for the commercial fishery, and a minimum size limit increase for gag from 20 to 22 inches total length for the recreational fishery[5].

At the time that the marine reserves were created, the Council asked the NMFS Highly Migratory Species Division to adopt compatible regulations to prohibit fishing for species under their jurisdiction within the reserves. However, a legal challenge was filed by the Coastal Conservation Association (CCA) regarding the need to prohibit fishing for species higher up in the water column which are commonly fished by trolling. Subsequently , the NMFS Highly Migratory Species Division and CCA

[4] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

[5] The regulatory amendment also proposed that the recreational minimum size limit be subsequently raised in annual one-inch increments until it reached 24 inches total length. However, that proposal was disapproved by NMFS due to concern that a 24-inch minimum size limit on the recreational fishery would have a disproportionate impact compared to a 24-inch size limit on the commercial fishery, which fishes in deeper water on average and tends to catch larger gag.

reached an agreement whereby the Council's request would be held in abeyance while NMFS conducted research to answer the following questions:

1. Can recreational fishers trolling for coastal migratory pelagic species access the deep reef fishes at the shelf-edge (200-400 ft.) that occur at Madison-Swanson and Steamboat Lumps?
2. If downriggers can access reef species, what is the depth or effective distance-off-bottom for catching snapper/grouper?
3. Are there seasonal differences in susceptibility of deep species to trolling?
4. Can enforcement officials surveying the areas detect depth of trolling by recreational vessels from surface observations?

A NMFS in-house research project, in association with Florida State University, was proposed to answer these questions, with a project duration of May 2001 - May 2003. Preliminary results of this research project were presented to the Gulf Council at its May 12-15, 2003 meeting (Appendix D), and a final report is expected to be presented to the Council in July 2003, prior to taking final action on this amendment.

Secretarial Reef Fish Amendment 1 proposes a ten-year rebuilding plan for the red grouper stock[6], and is currently under review by NMFS. The proposed regulations in the Secretarial Amendment include repeal of the seasonal closure on commercial harvest of gag, black grouper and red grouper during February 15th to March 15th. This repeal was proposed because the one-month closed season did not appear to be effective in reducing red grouper fishing mortality. It resulted in increased fishing effort in the weeks before and after the closure, and contributed to economic disruptions in the grouper fishery. However, repeal of the closed season, if approved by NMFS, will leave the reserves as the only management measures remaining in place that provide protection for at least some of the gag spawning aggregations, and protection for a portion of the male gag population, that tends to remain offshore year-round.

On May 22, 2002, NMFS informed the Council that the gag stock was in an improved condition based on a 2001 gag stock assessment, and that the stock would be reclassified from undergoing overfishing to neither undergoing overfishing nor overfished. This designation will appeared in the 2002 Report to Congress on the Status of Fisheries (NMFS 2003).

[6] The red grouper stock was declared overfished by NMFS in October 2001 (letter dated October 13, 2001 from NMFS Acting Regional Administrator Joseph Powers to Gulf Council Chairperson Kay Williams) based on the results of the 1999 red grouper stock assessment (Schirripa et al. 1999) and supplemental NMFS analyses (NMFS 2001). In 2002, the Council's Reef Fish Stock Assessment Panel (RFSAP) reviewed a new red grouper stock assessment (NMFS 2002) and found that the stock biomass was now above the minimum stock size threshold (MSST). However, as of the writing of this amendment, NMFS has not provided any formal notification to the Council of a change in the stock's status. Regardless of whether the stock remains designated as overfished or not, the requirement to rebuild the stock to its MSY biomass level in ten years or less remains in force.

The marine reserves expire four years after their implementation, on June 16, 2004, unless continued beyond that time by a plan amendment. The purpose of this amendment is to continue those reserves, and to determine whether changes in the fishing restrictions within the reserves are warranted. The need for this amendment is that, if the reserves are allowed to expire, the protections afforded by the reserves to a portion of the gag spawning aggregations, to male gag, and to other species[7] within the marine reserves at Steamboat Lumps and Madison-Swanson, will cease.

3.2 What is the Overall Effect of the Reserves on the Stocks and Local Ecosystem?

In 1999, the Gulf Council conducted a series of facilitated workshops on marine reserves. In conjunction with those workshops, the Council produced two documents, *Marine reserves technical document, a scoping document for the Gulf of Mexico* (GMFMC 1999c) and *Marine reserves for fishery management: questions and answers, a scoping document for the Gulf of Mexico* (GMFMC 1999d) (these documents can be downloaded from the Council's web site http://www.gulfcouncil.org). A summary of the potential benefits and costs of marine reserves was summarized in these documents as follows:

BENEFITS	COSTS
● Enhance commercial and recreational fishing – Build and maintain healthy fisheries – Provide insurance against uncertainty – Minimize regulations on fishing grounds – Improve traditional management ● Simplify enforcement – Violations easily detected – Easier for the public to understand ● Improve fairness and equity ● Preserve biodiversity through habitat protection ● Reduce direct and indirect fishing mortality ● Maintain wilderness areas for viewing natural ecosystems ● Enhance opportunities for the dive industry and tourism ● Provide educational opportunities ● Provide scientific research opportunities	● Foregone fishing opportunities ● Potential for higher costs ● Fishing-related benefits difficult to predict – Lag time before benefits achieved – Increased pressure on fishing grounds – Not appropriate for all fisheries – Difficult to site – Difficult to design – Cannot provide foolproof protection – Benefits may not accumulate ● Will not eliminate other fishery regulations ● Uncertainty of outcome ● Increased enforcement complexities – Direct enforcement necessary – Incentive for poaching created – Complexities may be created

source: GMFMC 1999c

There have been numerous scientific papers written on the topic of marine reserves, both pro and con. Many of these reports are referenced in the scoping documents discussed above, and additional papers continue to be published. While many of

[7] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

these papers discuss the general ecosystem aspects of marine reserves, a few focus on the use of marine reserves as a fishery management tool. For example, Bohnsack (2000) compared the short-term impacts of no-take marine reserves and minimum size limits. He concluded that, while minimum size limits are a precise fishery management tool designed to protect juveniles of specific species from directed fishing throughout the fishery, no-take marine reserves can potentially protect all species and size/age classes, eliminate by-catch, protect habitat from fishing damage within the reserves, and can help maintain and restore desirable genetic qualities among fished stocks. Shipp (2002), however, argued that reserves are generally not as effective as traditional management measures, and are not appropriate for the vast majority of marine species because most marine species are far too mobile to remain within a reserve and/or are not overfished[8]. This section attempts to move away from theoretical discussions of marine reserves in general, and describes specific benefits and costs of the marine reserves at Madison-Swanson and Steamboat Lumps that have been observed to date, either through research or through testimony provided to the Council by fishermen.

Prior to implementation of the marine reserves at Madison-Swanson and Steamboat Lumps, a considerable amount of debate occurred before the Council regarding the usefulness of closed areas as a tool for addressing overfishing of gag and reduction in the proportion of males in the gag population. The primary points raised in that discussion were presented by Koenig (1999) and Kenchington (1999).

Koenig suggested that sex change in gag is socially induced and is dependent on the proportion of males during spawning aggregations. Based on a commercial fisherman's records, he inferred that male and transitional gag are captured at higher rates after the spawning season. Koenig also noted that catch per effort increases, especially during the peak spawning months of February and March, indicating that fishermen target spawning aggregations. Koenig noted that recent mitochondrial DNA studies of gag (Chapman et al., 1999) infer that inbreeding is occurring, which may be due to a reduction in males. He felt that such inbreeding can lead to a loss of genetic diversity and therefore the loss of potential for survival. Koenig felt that, while a spawning season closure would reduce fishing mortality on the spawning stock at a time when they are most aggregated and vulnerable, it would do nothing to protect males and preserve the sex ratio of the gag spawning aggregations because males are reduced in abundance by fishing at non-spawning times. However, he felt that the use of a shelf-edge closed area would help to protect gag.

Kenchington (1999) agreed that the effectiveness of closed areas as a means of protecting reef fish is now fairly well established. However, he disagreed with

[8] The report by Shipp was subsequently refuted by Carr et al. (2002), who argued that Shipp's report underestimated the scope of the fisheries problem, takes an incomplete view of how marine reserves may function within a fisheries context, and employs faulty logic regarding the presumed costs to fisheries should marine reserves fail to provide fishery benefits.

Koenig's suggestion that sex-change in gag is socially induced. Kenchington felt that the primary control in gag sex change is size, or perhaps age. He suggested that, if social interactions during spawning were the controlling factor, a lack of males would result in a higher rate of sex change from females, making it almost impossible for the observes change in sex ratio to occur. Kenchington questioned Koenig's inference that fishermen target gag spawning aggregations, believing that such aggregations are too short-lived for fishermen to take advantage of. He also questioned Koenig's assertion that male and transitional gag are captured at higher rates after the spawning season, noting that this conclusion was based on records kept by a single fisherman. Kenchington disagreed that the reduction of male gag might result in a loss of genetic diversity. He felt that the number of males remains many times greater than the numbers that would result in any narrowing of genetic diversity. Kenchington felt that a spawning season closure would reduce fishing mortality on all gag. He suggested that, if closed areas did result in any increase in gag reproduction and recruitment, since the resulting females tend to scatter inshore, it would benefit nearshore recreational fishermen more than offshore commercial fishermen, implying an allocative change.

Due to the debate over the effectiveness of closed areas as a management tool for gag, the reserves at Madison-Swanson and Steamboat Lumps were implemented for a finite period (4 years) while research into their impacts could be conducted. Ongoing research in Madison-Swanson and Steamboat Lumps are described in the Amendment 21 scoping document (Appendix B) and in the research summaries presented to the Council at its May 2003 meeting (Appendix D). Not all of the items listed above are applicable to the marine reserves at Madison-Swanson and Steamboat Lumps (for example, the reserves are in water too deep to provide benefits to the dive industry and tourism). However, the general effects and problems of the reserves observed to date are described below. A more detailed discussion of the impacts of the reserve on the environment is contained in the Environmental Consequences section.

Protection of spawning aggregations - Spawning aggregations of gag and scamp were confirmed at several sites within Madison-Swanson during February-March in 2001 and 2002 (Appendix D, second study). The marine reserve at Madison-Swanson is therefore successful at protecting at least a portion of the spawning aggregations, but the percentage of spawners receiving protection is unknown. The regulatory amendment that created the reserves (GMFMC 1999a) estimated that the closed areas would impact catches of gag, black grouper, red grouper, and other reef fish by 2.28 percent, 1.5 percent, 0.61 percent, and 0.05 percent, respectively. Assuming that spawning aggregation sites are distributed proportionately to the occurrence of the stock in general, these estimates can serve as at least a ballpark estimate of the percent of gag spawning aggregations protected by the reserves. Fishing vessels displaced from the reserves may increase fishing effort on gag outside of the reserves, however, it is likely that the major aggregation sites are well known to experienced

fishermen, and new major aggregation sites are unlikely to be found. Therefore, the percentage of sites protected is unlikely to change. Since gag exhibit complex social interactions during spawning (pers. comm. Chris Koenig), the absence of disruptions caused by fishing activity may aid in overall spawning success provided that the overall fishing mortality rate on the stock does not increase. Gag and scamp spawning aggregations have not been observed in Steamboat Lumps, but an increase in both species was noted in the reserve from 2001 to 2002 (Appendix D).

Edge benefit - During public testimony at the May 2003 Council meeting, the Council heard testimony that fishing in the waters surrounding the reserves was great. Fish emigrating from marine reserves to help restock adjacent fishing grounds was suggested as a potential benefit prior to establishment of the reserves (GMFMC 1999c), and the public testimony confirms that this has occurred.

Increased abundance within reserves - NMFS research (Appendix D) indicates that in general, both abundance and number of species have increased from 2001 to 2002. In Madison-Swanson, 55 fish taxa were observed in 2001 and 66 taxa in 2002. Frequency of occurrence and abundance was generally higher in 2002 than in 2001. Red snapper abundance, however, declined. In Steamboat Lumps, 53 taxa were observed in 2001 and 50 taxa in 2002. Abundances were generally greater in 2002 than in 2001. However, similar changes were noted in a control area that is open to fishing (Twin Ridges) so it is inconclusive whether the observed changes within the reserves are due to the reserves or to an general improvement in fish populations. The researchers also cautioned against concluding that trends existed based on just two years of observations. Additional research and monitoring will be needed to determine if there is an increase in abundance and diversity that can be attributed to the reserves.

Researchers noted several enforcement-related concerns which made it difficult to establish a baseline for evaluating the effect of the reserves:

- Fishing activity was a significant problem in both eastern Gulf MPAs in 2001-2002;
- Enforcement is difficult due to remote location and reprioritization of USCG resources, although reconnaissance flights have recently increased;
- Information on compliance levels, added to the current data on fish abundance and distribution, would improve the confidence in the evaluation of this test of the “Marine Reserve” concept as a management tool to rebuild fish stocks.

The primary drawbacks of the marine reserves at Madison-Swanson and Steamboat Lumps appear to be problems with enforcement and compliance, and restriction of

public access. Scientists working within the reserves have stated that they frequently see fishing vessels in the reserves. In recent months, however, the U.S. Coast Guard has been incorporating areal monitoring of the reserves from Falcon jets as part of its homeland security air patrols over the Gulf of Mexico[9]. The proposed total no-take fishing restriction within the reserves in order to fully protect gag within the reserve from all possible fishing impacts and to improve enforceability prompted a legal challenge from Coastal Conservation Association (CCA), which felt that prohibiting trolling for surface species was unnecessary and needlessly interfered with the public's access to the resource. As part of a settlement to that legal challenge, NMFS agreed to hold the Council's request to the NMFS Highly Migratory Species Division to prohibit fishing in the reserves for species under their jurisdiction in abeyance while research into the effects of trolling on reef fish and on enforceability is conducted. The findings of that research are included in the appendices to this document.

Another potential problem, which could create a source of confusion for fishermen, is that the location of the site described as Steamboat Lumps in this document (and in Appendix A) differs from the location of Steamboat Lumps described by Moe (1963). Moe's Steamboat Lumps is centered at 27°55' N latitude, 84°30' W longitude. This puts it southeast of the area described in this document as Steamboat Lumps, by about ten nautical miles to the nearest edge or 17 nautical miles center-to-center. To reduce confusion, it may be desirable to refer to the site in this document by a different name (e.g., North Steamboat Lumps).

4.0 SUMMARY OF THE SCOPING PROCESS

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) require that there shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR 1501.7). Because of the need to reach final action before the June 16, 2004 sunset date for the current marine reserve regulations, the Council decided that the range of issues and alternatives to be considered should be limited to those specifically related to continuation of the marine reserves at Madison-Swanson and Steamboat Lumps. In conjunction with this scoping process, the Council produced a scoping document (Appendix B) and held public meetings to solicit input as to the need for action and the scope of alternatives to be considered. These meetings were held at the following locations and dates:

[9] In addition, the Coast Guard recently made a high profile interception of a longline vessel fishing illegally in the marine reserve at Madison-Swanson, resulting in a Notice of Violation and Assessment with an $80,000 fine and 180-day permit suspension. Such a substantial penalty may serve as a deterrent to future non-compliance.

Panama City, Florida - June 19, 2002
Tampa, Florida - June 20, 2002

The scoping meetings consisted of a presentation by a Council staff member of the issues being considered in the scoping process. That was followed by a presentation by Dr. Chris Koenig, Florida State University, of ongoing research in Madison-Swanson and Steamboat Lumps and a description of the areas, including underwater video. Attendees to the meetings were then invited to provide oral or written comments. Summaries of the public and comments received are contained in Appendix C.

The results of the scoping meetings were presented to the Council at its July 2002 meeting in Sarasota, Florida, and the Council voted to proceed with the development of an options paper for extending the marine reserves at Madison-Swanson and Steamboat Lumps.

At the November 2002 Council meeting in Key Largo, Florida, the Council reviewed an options paper for Amendment 21 to continue the marine reserves at Madison-Swanson and Steamboat Lumps. During this review, the Council voted to remove a section containing alternatives to create buffer zones around the reserves due to enforceability and practicality issues. Because buffer zones do not exist in other area restrictions in the Gulf, these issues were moved to a section in the amendment titled, **Alternatives Considered But Rejected**. Other individual alternatives were also moved to the Alternatives Considered But Rejected section, either because they covered situations that no longer existed, were considered unenforceable, or were redundant with alternatives being considered in Amendment 18 (grouper management) that is currently in development. These included keeping the marine reserves at Madison-Swanson and Steamboat Lumps in effect until the gag stocks reached the biomass level capable of supporting maximum sustainable yield (the stock is already above that level), allowing surface trolling on a seasonal basis (enforcement issues), increasing the size of the reserves (in Amendment 18), and requiring VMS systems on vessels (in Amendment 18).

At the March 2003 Council meeting in Mobile Alabama, the Council reviewed a draft of Amendment 21 and selected Preferred Alternatives to continue the reserves for an additional six years and to keep the reserves in effect year-round rather than seasonal. The Council decided not to select a Preferred Alternative on the issue of whether to change the fishing restrictions within the reserves until after they heard presentations at the May 2003 Council meeting on the results of research into the impact of trolling on reef fish and enforceability of restricting gear by depth fished.

A public hearing on Amendment 21 was held April 9, 2003, in Tampa, Florida. Additional public testimony was taken on May 14, 2003, at the May Council meeting in Panama City, Florida.

A conference call by the Reef Fish Advisory Panel and the Special Reef Fish Scientific and Statistical Committee (SSC) was held April 28, 2003, to review Amendment 21. The Standing SSC reviewed the amendment as part of its meeting in Tampa on May 5-7, 2003.

Results of the research that has been conducted into the effects of the reserves was presented by the researchers at the May 12-15, 2003 Council meeting in Panama City, Florida. These presentations are summarized in Appendix D. However, the research was incomplete in that it did not yet include an evaluation of the effects of seasonal differences on trolling in the reserves. In addition, representatives of CCA maintained that the trolling study was flawed because it was conducted at trolling speeds slower than the speeds typically used by vessels that are surface trolling. Consequently, although the Council took public testimony on Amendment 21 at the May meeting and reviewed written and e-mailed comments received, final action was deferred until the July 14-17, 2003 meeting in Naples, Florida.

The Standing and Special Reef Fish SSC held a conference call on July 10, 2003 to review the results of the research conducted in the reserves and to re-evaluate their recommendations for Amendment 21 in light of that research.

At the July 14-17, 2003 Council meeting in Naples, the recommendations from the Standing and Special Reef Fish SSC conference call were presented, as well as a completion report on the NMFS research into the effects of trolling in the reserves (Appendix E). Additional public testimony was taken at that meeting, and additional written and e-mailed comments received were reviewed. The Council made its final decisions on Amendment 21 at that meeting. Those decisions are incorporated into the proposed alternatives in this document.

5.0 LIST OF PROPOSED ACTIONS AND BRIEF EXPLANATION

6.1 Continuation of Marine Reserves

Alternative 6.1.2: Establish a new sunset provision (evaluation period) for the marine reserves at Madison-Swanson and Steamboat Lumps, during which additional research on the effectiveness of the area closures will be carried out. The additional period will be for six years (sunset is June 16, 2010 or six years after the date that regulations implemented under this amendment become effective, whichever is greater).

Preliminary reports from researchers who are evaluating the marine reserves at Madison-Swanson and Steamboat Lumps indicate that both size and abundance of fish within the reserves have increased since the reserves were established. A six-year continuation, in combination with

the initial four-year period (June 2000 - June 2004), will give a total of ten years in which to continue to evaluate the effects, and will continue to provide protection to a portion of the spawning aggregations of gag, scamp and other species[10] that utilize the habitat, and will continue to provide protection for a portion of the offshore male gag population while the stock is being rebuilt toward its optimum yield level.

6.2 Fishing Restrictions Within the Reserves

Allow surface trolling within the marine reserves at Madison-Swanson and Steamboat Lumps for coastal migratory pelagic species, for the months of May through October and to make a written request to NMFS HMS to close all HMS fishing, except to allow surface trolling for HMS species concurrently with the coastal migratory pelagics species during open season. Prohibit fishing and possession for all reef fish species and require vessels transiting the areas in possession of reef fish to comply with the same requirements as implemented for the Tortugas South and North closed fishing areas.

The decision to allow limited surface trolling for six months of the year was supported by recreational fishing groups, which had opposed a complete closure of the marine reserves to all fishing. The months when fishing will be completely closed (November through April) encompass most of the spawning seasons for gag and scamp, except for May. This will allowed improved enforceability at a time when gag and scamp are forming spawning aggregations and are more susceptible to fishing and more likely to attract fishermen. A prohibition on possession of reef fish by vessels within the reserve except for vessels transiting the reserves was intended to improve enforceability of the reserves with respect to protection of reef fish and spawning aggregations. Allowing vessels with reef fish aboard to transit the reserves minimizes disruptions to the activities of vessels that do not fish in the reserves, and it will avoid potential safety-at-sea issues that could arise from requiring such vessels to spend extra time circumventing the reserves. However, allowing reef fish aboard vessels, even under very narrowly defined circumstances, may reduce enforceability of the no reef fish fishing provision, since there is no way to ell where the fish on board the vessel were caught.

[10] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

6.3 Seasonal Regulations

Alternative 6.3.3: Status quo, prohibit fishing within the marine reserves at Madison-Swanson and Steamboat Lumps year-round (except as allowed by the Proposed Alternative for Section 6.2).

The Proposed alternative is to continue to have the reserves be in effect year-round in order to provide continuity for ongoing research into the effects of the reserves. A year-round reserve provides protection not only for gag spawning aggregations, but for scamp (which have also been observed spawning in the marine reserve at Madison-Swanson, and for other species[11] that may spawn in the reserves other times of the year, and it protects a portion of the male gag, which tend to remain offshore year-round while the females tend to disperse shoreward outside of spawning season.

[11] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

6.0 MANAGEMENT ALTERNATIVES

6.1 Continuation of Marine Reserves

Alternative 6.1.1: Establish a new sunset provision (evaluation period) for the marine reserves at Madison-Swanson and Steamboat Lumps, during which additional research on the effectiveness of the area closures will be carried out. The additional period will be for four years (sunset is June 16, 2008 or four years after the date that regulations implemented under this amendment become effective, whichever is greater).

Proposed **Alternative 6.1.2: Establish a new sunset provision (evaluation period) for the marine reserves at Madison-Swanson and Steamboat Lumps, during which additional research on the effectiveness of the area closures will be carried out. The additional period will be for six years (sunset is June 16, 2010 or six years after the date that regulations implemented under this amendment become effective, whichever is greater).**

Alternative 6.1.3: Establish a new sunset provision (evaluation period) for the marine reserves at Madison-Swanson and Steamboat Lumps, during which additional research on the effectiveness of the area closures will be carried out. The additional period will be for ten years (sunset is June 16, 2014 or ten years after the date that regulations implemented under this amendment become effective, whichever is greater).

Alternative 6.1.4: Establish a new sunset provision (evaluation period) for the marine reserves at Madison-Swanson and Steamboat Lumps until such time as the gag fishery has been sustainable at OY for two or more years.

Alternative 6.1.5: Establish a new sunset provision (evaluation period) for the marine reserves at Madison-Swanson and Steamboat Lumps until such time as the proportion of male gag within the reserves has returned to its historic level of 17% of the spawning population.

Alternative 6.1.6: Continue the marine reserves at Madison-Swanson and Steamboat Lumps indefinitely, unless repealed by a future plan or regulatory amendment.

Alternative 6.1.7: Status quo. The marine reserves at Madison-Swanson and Steamboat Lumps will expire after June 16, 2004.

Comparison of alternatives

	Alternative 6.1.1	Alternative 6.1.2 (Proposed)	Alternative 6.1.3	Alternative 6.1.4	Alternative 6.1.5	Alternative 6.1.6	Alternative 6.1.7
Duration	4 years	6 years	10 years	indefinite	indefinite	continuous	0 years
Primary objective	additional research	additional research	additional research	biological reference point	biological reference point	long-term resource protection	user access

Discussion: Benefits of the marine reserves at Madison-Swanson and Steamboat Lumps include protection of spawning aggregations of gag and other species[12] from intervention by fishing gear as well as protection of a portion of the male gag population year-round. Protection of both spawning aggregations and a portion of the male population is an integral part of rebuilding gag populations to Optimum Yield levels. Scientific studies suggest that population level size and sex ratio changes in gag are the direct result of fishing activities on the spawning aggregations (Koenig et al. 1996). In addition, spawning aggregations are considered by some researchers to be deficient in males because social sex change processes that compensate for the loss of males and equilibrate the spawning sex ratio are, in a sense, short-circuited through the removal of those males at non-spawning times of the year at shelf-edge depths (Koenig et al. 1999). In at least one case, gag spawning aggregations have been observed to have disappeared from the Experimental Oculina Research Reserve after about two decades of intense fishing. A similar loss is implied on the northern shelf-edge reefs (south, southeast of Panama City) off the west coast of Florida where no aggregations of gag have been observed, even though suitable spawning habitat exists for gag throughout that area (Koenig et al. 1999). However, the claims that sex ratio changes in gag are due to social factors that have been disrupted by fishing, and that a lack of gag aggregations indicates that the aggregations have been fished out (as opposed to never having existed to begin with), have been disputed by other scientists (Kenchington 1999). An additional evaluation period for the reserves would allow more research to be conducted into their effectiveness as a fishery and ecosystem management tool.

Alternative 6.1.1 continues the marine reserves at Madison-Swanson and Steamboat Lumps for an additional four years. This is the same as the initial evaluation period, June 2000 - June 2004, and will allow some additional research to be conducted. However, because of the lead time necessary to implement an FMP amendment, the Council needs to take final action on this amendment in May 2003, leaving only three years to conduct research. While a formidable amount of research has been conducted in the reserves, this is a very short time period in which to evaluate their

[12] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

effect on a species that can live for more than 20 years (Turner et al. 2001). The Council rejected this alternative because an additional four years is still a relatively short time in which to evaluate the effects of the reserves.

Alternative 6.1.2 (Proposed Alternative) continues the marine reserves at Madison-Swanson and Steamboat Lumps for an additional six years, so that at the end of the time period, the total time the reserves will have been in existence from inception will be ten years. This alternative was recommended by ReefKeeper International. It allows additional time for male gag numbers and the gag stocks to respond to the protection from the closed areas, and would allow the continuation of long-term scientific studies on the effects of the reserves. As with the four-year continuation, the protections afforded by the reserves would ultimately end unless continued further by another amendment prior to the reserves' expiration. Gag reach 50% male maturity at age 11 (GMFMC 1999a), so this ten-year time period will not provide sufficient time to fully evaluate the effects on the male gag population. However, the Council felt that this alternative provided the best balance between allowing additional research and resource protection and obtaining timely feedback on the effects of the reserves.

Alternative 6.1.3 continues the marine reserves at Madison-Swanson and Steamboat Lumps for an additional ten years. This would allow additional time for a more comprehensive investigation into the reserves and their impact on gag and other species[13], an on the ecosystem. As with the four-year continuation, the protections afforded by the reserves would ultimately end unless continued further by another amendment prior to the reserves' expiration. Gag are protogynous hermaphrodites, initially maturing as females and then converting to males at an older age. The 50% female maturity occurs at 3.6 years, the 50% male maturity at 11.0 years, and the maximum observes age of gag is 21 years (GMFMC 1999a). This would allow time to more fully evaluate the effect of the reserves on the male gag population, but the Council rejected this alternative because they felt that the time period was too long to keep the reserves in place without evaluating their impact to determine if they should again be continued.

Alternative 6.1.4 would discontinue the reserves once gag had reached a stock status at which they are capable of sustaining OY for two or more years. This alternative was suggested by ReefKeeper International. The time frame involved is indeterminate. Gag were recently reclassified by NMFS as neither overfished nor undergoing overfishing. However, the stock is still in need of additional rebuilding to achieve the OY levels. If the marine reserves are shown to be a contributing factor to the gag stock status, eliminating the reserves once the gag stock has reached the OY level could reverse any gains made due to the reserves and have detrimental impacts

[13] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

on the stock unless the action is countered by increasing the restrictions in other management measures. This alternative does not take into account concerns over the gag male-to-female ratio, genetic diversity, or the contribution of the reserves to research opportunities, to an ecosystem management approach, or to other species[14] which utilize the reserves. The Council rejected this alternative because of these concerns.

Alternative 6.1.5 would discontinue the reserves once the proportion of male gags had reached 17% of the spawning stock within the reserve. This alternative was suggested by ReefKeeper International, but may not be feasible. The time frame involved is indeterminate. Furthermore, due to year-to year variability and seasonal variability of the sex ratio within a small area, it is unknown whether any percent of male biomass within a reserve is even a suitable objective. A study conducted in the late 1970s found that male gag comprised 17% of the commercial harvest, but by the mid-1990s they comprised 2%-10% of the harvest (GMFMC 1999a). However, the behavior of male and female gag differ during spawning aggregations, which may give them different vulnerabilities to fishing gear. This means that the percent of male biomass in the harvest may overestimate the percent of male biomass in the actual population. Direct observations of sex ratios within the reserves consequently may not correspond to harvested ratios. The proportion of male biomass within the reserve will vary seasonally, depending upon whether the fish are in spawning aggregations or dispersed. On a larger geographic scale, the RFSAP's evaluation of the most recent gag stock assessment concluded that fishing at F_{MAX} with the current F profile would provide a stock-wide male spawning stock biomass of about 12.8% of the unfished stock (GMFMC 2001). Even if this biological objective is considered appropriate, discontinuing the reserves when the objective has been reached does not make sense. If the marine reserves are determined to be a contributing factor to increasing the percent of male biomass, eliminating the reserves once the male gag biomass objective will reverse any gains made from the reserves. Other problems with this alternative are that it does not take into account concerns over the gag stock biomass levels with respect to sustaining optimum yield, or the contribution of the reserves to research opportunities, to an ecosystem management approach, or to other species[15] which utilize the reserves. The Council rejected this alternative because of these concerns.

Alternative 6.1.6 continues the marine reserves at Madison-Swanson and Steamboat Lumps indefinitely. This makes the reserves a permanent management tool, unless modified or removed by a later plan amendment. This alternative is a precautionary

[14] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

[15] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

approach to fishery and ecosystem management, as it requires future action to eliminate the reserves rather than action to continue their existence. The Council rejected this alternative because they felt that, given the ongoing research into the effects of reserves, the reserves should be subject to periodic evaluation and reauthorization rather than allowed to continue indefinitely.

Alternative 6.1.7, status quo, would allow the marine reserves at Madison-Swanson and Steamboat Lumps to expire after June 16, 2004. Increased size and abundance of fish within the reserves have been observed since their implementation, but whether these increases have or will lead to net benefits to the fishery beyond the reserves and to the ecosystem remains a question. If benefits do not accrue, or cannot be demonstrated, the perception by many in the fishing community is that such reserves unnecessarily restrict access to the fishery resource. The Council rejected this alternative because they felt that the preliminary reports of larger and more abundant fish and the protection provided to the spawning habitat within the reserves justified their continuation while additional research is conducted.

Socioeconomic Impacts

The various alternatives in this section pertain to the extension of the marine reserve designation. In and of itself, the designation of an area as a marine reserve does not directly alter the economic status of the fishery. But the designation sets the tone and/or structure for establishing restrictive regulations governing fishing activities in the reserve, thereby affecting the likelihood of indirect impacts. In the present case, restrictive fishing regulations were imposed concurrent with the designation of marine reserve status in June 2000. It is logical to expect that some restrictive regulation would remain with a continued designation of the two areas as marine reserves. Thus, some economic effects may be expected from any alternative that would extend the duration of the marine reserves, but the extent of such effects would depend on the specific fishing regulations governing the two marine reserves.

As discussed in the regulatory amendment establishing the two reserves (GMFMC 1999), the two marine reserves and their accompanying fishing regulations were expected to generate future benefits through protection and enhancement of the stock, but at the same time impose short-run costs to the participants in the fishery through the restriction of traditional fishing behavior. Further, the reserve designation and accompanying harvest restrictions was expected to facilitate research opportunities to determine the net stock/ecological effects of reserves. Net benefits were expected to be positive. Assuming restrictive harvest measures continue throughout an extended reserve designation, the major issue surrounding the selection of the best alternative for extending the duration of the marine reserve designation is balancing the benefits and costs of the designation. The assumption of linkage of restrictive harvest measures with the reserve designation will be maintained throughout the following discussion of designation duration.

Although evaluation of the alternatives from the cost perspective may appear straight forward, involving an assessment of historical harvests from the areas in question, assuming these harvests either cannot be made up from other areas or at least not as efficiently, i.e. requiring greater costs, subtracting this amount from historic total harvests and assuming this loss (cost) continues on an annual basis. While this might be true initially, one potential expectation of a reserve is that it either enhances the overall stock such that harvests increase elsewhere throughout the range of the species or at least enhances quantities in the immediate areas outside the reserve. The net effect of either phenomena is the potential of recovered harvests such that the initial short run losses (costs of the action) are either mitigated or totally eliminated. While this phenomena seems plausible, demonstration of such for the current situation has not been demonstrated and cannot be assumed, though the assumption of stock enhancement is a major component of the future benefits expected to result from the reserve designation.

Absent this mitigation and, therefore, assuming a continuing stream of losses from reduced harvest opportunities, the proposed alternatives can be evaluated and ranked based on the proposed length of the designation. Put more directly, if a constant recurrent annual loss is expected to occur, the alternatives can simply be ranked according to their duration. From this perspective, the status quo alternative (Alternative 6.1.7) would impose the least costs since the reserves would sunset in 2004. Among the remaining alternatives containing specific time periods, the least costly alternatives are, in order of least to greatest, Alternative 6.1.1 (4 years), Alternative 6.1.2 (6 years), and Alternative 6.1.3 (10 years). Alternatives 6.1.4 and 6.1.5 cannot be ranked since the time periods required to achieve the biological targets are unknown. Alternative 6.1.6 potentially represents a permanent designation, thereby potentially imposing the greatest costs, though the duration could be for any period of time.

On the benefit side of the analysis, it should be recalled that benefits of the reserve designation and accompanying harvest restrictions are expected to accrue to protection and enhancement of the stock and the facilitation of research opportunities to determine the net stock/ecological effects of reserves. Evaluation of the benefits, assuming the harvest restrictions are static under each alternative during the length of the designation, requires knowledge of the length of time necessary to achieve the enhancement goals and necessary research, as well as determination of whether the benefits are permanent, allowing suspension of the harvest restrictions (in theory, the areas could be designated reserves without continuation of certain/all harvest restrictions) or temporary, therefore requiring continuous harvest restrictions in order to maintain the benefit stream.

Unfortunately, this information is not yet known due to the absence of appropriate data and research. Absent this information, benefits assessment is reduced to an evaluation of the degree to which the various alternatives might be expected to

reasonably allow sufficient time to accomplish the necessary goals, or be determined to be excessive. From this perspective, those alternatives that establish marine reserve designations of the shortest duration arguably bear the greatest risk of not allowing sufficient time. This would include the status quo alternative (sunset in 2004) and Alternative 6.1.1 (4 year duration). At the other extreme, assuming Alternative 6.1.6 equated to permanent designation with accompanying harvest restrictions, sufficient time would obviously be afforded to accomplish the necessary goals, however, unless it were determined that permanent restrictions were necessary to support the benefits stream or the benefit stream were determined to not justify the costs, a permanent designation would be excessive and unjustified. As previously discussed, the time frames for Alternatives 6.1.4 and 6.1.5 are unknown and could be any number of years, though they are likely to be greater than that under status quo and less than permanent designation. Further, the criteria for both alternatives present inherent problems. If the reserves contribute little to the maintenance of OY, the costs associated with Alternative 6.1.4 would exceed the benefits. On the other hand, if the reserves are critical to the maintenance of OY, elimination of reserve status after the goal is met would defeat the purpose of establishing the reserves in the first place. With regards to Alternative 6.1.5, achieving the 17% male population ratio for gag is only one of the objectives of the reserves. Focusing solely on this criterion presents the danger that other objectives may not be achieved, it is unknown whether the benefits outweigh the costs, and similar to the discussion of Alternative 6.1.4, if the attainment of the objective is mainly due to the reserves, eliminating them would again defeat the purpose of establishing the reserves. Alternatives 6.1.2 (6 years) and 6.1.3 (10 years) represent somewhat of medium designation, neither of excessively short or long duration. However, while the time lengths should afford the opportunity for a reasonable amount of necessary research to be accomplished, as with the other alternatives it is unknown whether the other management goals can be accomplished, or whether the costs will exceed the benefits and, should permanent restriction be necessary to maintain the benefits stream, termination of the designation would defeat the purpose of the reserves.

Nevertheless, the benefits cannot be assessed absent an experimental closure. Therefore, despite the uncertainty discussed above, extending the duration of the reserves for another 4 or 6 or 10 years appears to provide a better balance of costs and benefits than the other alternatives. Among these alternatives, it is likely that extending the duration of the reserves for another 10 years (Alternative 6.1.3) would allow a better determination of the effects of the reserves. It would, however, impose greater costs than the other alternatives if the harvest reductions or higher costs of harvest are not mitigated by improved stock conditions. On the other hand, a 4- or 6-year extension may not be sufficient to fully determine the effects of the reserves. If the benefits from the reserves are determined to be significant and the longer period is necessary to achieve the desired stock affects, then the 10-year alternative would provide the best economic outcome. If it is determined that the benefits do not justify the costs, the 4-year alternative would be the best choice among these three

alternatives as it would impose the lowest costs. The 6-year alternative lies roughly between the 4-year and 10-year alternatives. The benefits, should they exist, of the 6-year alternative may not significantly differ from those of the 4-year alternative. Overall, however, due to the absence of certainty of expected benefits, it cannot be determined which of the alternatives would maximize net benefits.

6.2 Fishing Restrictions Within the Reserves

Note: More than one alternative may be proposed from this section, provided that the proposed alternatives do not conflict with each other.

Alternative 6.2.1: Allow trolling within the marine reserves at Madison-Swanson and Steamboat Lumps for coastal migratory pelagic species (mackerel, wahoo, cobia and dolphin), for blackfin tuna, and do not renew the Council's request to NMFS that they implement a compatible closure for species under their jurisdiction - billfish, swordfish, oceanic sharks, and tunas other than blackfin (i.e., allow trolling for the HMS species). Prohibit fishing for all other species.

Alternative 6.2.2: Prohibit all fishing within the marine reserves at Madison-Swanson and Steamboat Lumps, and renew the Council's request to NMFS HMS that they implement a compatible closure for species under their jurisdiction (billfish, swordfish, oceanic sharks, and tunas other than blackfin).

Alternative 6.2.3: Prohibit trolling within the marine reserves at Madison-Swanson and Steamboat Lumps, and prohibit fishing using other fishing methods for any species except HMS species (billfish, swordfish, oceanic sharks, and tunas other than blackfin).

Alternative 6.2.4: Allow only surface trolling in the marine reserves at Madison-Swanson and Steamboat Lumps. Surface trolling is defined as fishing with lines trailing behind a vessel which is in constant motion with a visible wake at speeds in excess of four knots. Such trolling may not involve the use of downriggers, wire lines, planers, or similar devices.

Alternative 6.2.5: Prohibit possession of any reef fish within the marine reserves at Madison-Swanson and Steamboat Lumps.

Alternative 6.2.6: Status quo, Prohibit fishing within the marine reserves at Madison-Swanson and Steamboat Lumps for any species except HMS species (billfish, swordfish, oceanic sharks, and tunas other than blackfin).

Proposed **Alternative 6.2.7: Allow surface trolling within the marine reserves at Madison-Swanson and Steamboat Lumps for coastal migratory pelagic species, for the**

months of May through October and to make a written request to NMFS HMS to close all HMS fishing, except to allow surface trolling for HMS species concurrently with the coastal migratory pelagics species during open season. Prohibit fishing and possession for all reef fish species and require vessels transiting the areas in possession of reef fish to comply with the same requirements as implemented for the Tortugas South and North closed fishing areas.

Comparison of alternatives

	Alt. 6.2.1	Alt. 6.2.2	Alt. 6.2.3	Alt. 6.2.4	Alt. 6.2.5	Alt. 6.2.6	Alt. 6.2.7 (Proposed)
Fishing for: reef fish species	prohibited	prohibited	prohibited	allowed*	prohibited	prohibited	prohibited
Fishing for: coastal pelagic species	allowed	prohibited	prohibited	allowed*	allowed**	prohibited	allowed May - Oct
Fishing for: HMS species	allowed	depends on NMFS HMS Division	restricted	allowed*	allowed**	allowed	allowed May - Oct or year-round, depending on HMS Div.
Fishing for: other species	prohibited	prohibited	prohibited	allowed*	allowed**	prohibited	prohibited
Fishing method: surface trolling	allowed for allowable species	depends on NMFS HMS Division	prohibited	allowed	allowed**	allowed for HMS species	allowed May - Oct or year-round, depending on HMS Div.
Fishing method: deep trolling	allowed for allowable species	depends on NMFS HMS Division	prohibited	prohibited	allowed**	allowed for HMS species	prohibited or allowed only for HMS species, depending on HMS Div.
Fishing method: other methods	allowed for allowable species	depends on NMFS HMS Division	allowed for HMS species	prohibited	allowed**	allowed for HMS species	prohibited or allowed only for HMS species, depending on HMS Div.
Traverse reserves with fish aboard	allowed	allowed	allowed	allowed	prohibited for reef fish only	allowed	allowed

* This alternative may be combined with other alternatives to restrict fishing for certain species.
** This alternative may be combined with other alternatives to restrict fishing for other species or fishing methods.

Discussion: The Proposed Alternative (Alternative 6.2.7) is a modification of Alternative 6.2.2. However, rather than prohibiting all fishing year-round within the

reserves, surface trolling for coastal pelagic and highly migratory species is allowed only during the months of May through October (assuming that the NMFS HMS Division concurs with the Council's request for compatible regulations). All fishing will be prohibited during most of the gag spawning season (December through May with a peak in February and March). This alternative was supported by recreational fishing organizations that had opposed a ban on all fishing within the marine reserves, but was opposed by environmental organizations that felt that a total closure was needed for enforceability and to minimize impacts from fishing on the overall ecosystem within the reserves. Vessels are unlikely to catch gag while surface trolling, but the enforceability of allowing surface trolling while prohibiting other fishing methods may be difficult, based on the results of the NMFS enforcement study (Appendix D). The proposed alternative provides maximum enforceability during the gag spawning season, and improves enforceability of the year-round prohibition on fishing for reef fish by prohibiting possession of reef fish except on vessels that are transiting the reserves. For purposes of this alternative, transiting is defined as shown below, from the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves (Reef Fish Amendment 19):

Vessels in continuous transit across the reserve with no fishing gear deployed are not considered to be fishing, even though there might be fishing gear and fish aboard the vessel. Continuous transit across the reserve is defined as non-stop progression through the closed area enroute to the next destination. Gear "stowed appropriately" for the following vessels are defined as:

> **Longliners - Long lines may be left on the drum with all gangion lines and hooks disconnected and stowed below deck. Hooks shall not be baited. All buoys shall be disconnected from the gear however, buoys can remain on deck.**
>
> **Trawlers - All nets will remain on deck, with doors secured and disconnected from the trawl gear.**
>
> **Gillnets - Gillnets shall be left on the drum. However additional nets not attached to the drum, will be stowed below deck.**
>
> **Rod and Reel - Rods shall be out of the holders and stowed on or below deck. Terminal gear will be disconnected and stowed separately from the rod and reel. Terminal gear is defined as hook, leader, sinker, flasher or bait. Sinkers will be disconnected from down riggers and stowed separately.**

The marine reserves at Madison-Swanson and Steamboat Lumps were created with a sunset provision in order to evaluate their effect as a fishery management tool. The primary objective of these marine reserves was to protect a portion of the gag

spawning aggregations and a portion of the male gag population, which tends to remain offshore year-round. Secondary objectives were to protect other species[16] that utilize the reserve habitat, protect the habitat itself, and evaluate the utility of marine reserves as a management tool. Since the creation of the marine reserves, research in them has been conducted by NMFS and by Florida State University. Results of that research to date are presented in Appendix D, and are summarized in Section 3.2 (What is the Overall Effect of the Reserves on the Stocks and Local Ecosystem?). In short, the research findings to date along with testimony provided to the Council at its May 2003 meeting have found that the reserves are successful in:

- Protection of gag and scamp spawning aggregations
- Creating an edge benefit of enhanced fishing around the reserves
- Increasing abundance of fish within reserves, except for red snapper

However, problems have also been identified with the current restrictions within the reserves:

- Fishing activity was a significant problem in both reserves in 2001-2002;
- Enforcement is difficult due to remote location and reprioritization of USCG resources, although reconnaissance flights have recently increased;
- Information on compliance levels, added to the current data on fish abundance and distribution, is needed to improve the confidence in the evaluation of this test of the "Marine Reserve" concept as a management tool to rebuild fish stocks.

The original fishing restrictions in the marine reserves at Madison-Swanson and Steamboat Lumps prohibited fishing by any means and for all species except those managed by NMFS HMS, and a request was made by the Council to NMFS HMS to adopt compatible restrictions for the species that they manage. However, members of the fishing community questioned the need to include surface trolling in the restrictions, given that the primary reason for the reserves was to benefit gag and other bottom dwelling species. They felt that trolling for pelagic species does not contribute to fishing mortality on bottom fish nor does it disrupt spawning aggregations. Arguments in favor of including a prohibition on trolling were that trolling can reach depths where gag and other reef fish occur and can therefore impact those species, and allowing surface trolling but not deep trolling would be unenforceable. In addition, researchers felt that minimizing all fishing activity to the extent possible within the reserves optimizes their use as control areas for comparing and evaluating the impact of fishing in open areas.

[16] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in the Madison-Swanson and Steamboat Lumps reserves.

As part of a settlement to a legal challenge brought by Coastal Conservation Association, NMFS agreed to hold the Council's request to HMS in abeyance while they conducted research, in conjunction with Florida State University, into the effects of trolling on reef fish and the enforceability of allowing surface trolling while prohibiting other types of fishing. Preliminary results were presented to the Council at the May 12-15, 2003 Council meeting (Appendix D), and a final report was presented at the July 14-17, 2003 meeting (Appendix E). The findings from the preliminary reports were:

- Reef fish are relatively easy to catch with recreational fishing gear while trolling in the marine reserve at Madison-Swanson.
- A wide variety of reef fish are susceptible to trolling gear including gag, scamp, speckled hind, Warsaw grouper, red snapper and greater amberjack.
- Enforcement personnel have great difficulty determining depth of trolled lines from adjacent vessels.
- Under ideal conditions, observers need to be within 30m of target vessel to determine if fishing lines are in the water.

The final report added a comparison of trolling st low speed (1.5 - 4 knots) vs. high speed (12 - 15 knots), fishing during the gag spawning season vs. fishing outside of the spawning season, and observations on the distance of gag from the bottom based on underwater videos. The final report added the following:

- Reef fish are most susceptible to live baits fished below 4 kts on monofilament lines without downriggers outside the spawning season (CPUE = 0.090), and least susceptible to artificial baits fished on the surface at 15 kts (CPUE = 0.000).
- High speed fishing (12 - 15 knots) results in the line and lure being on or near the surface.
- Gag grouper in the study area are found up to 28.22 m (92.58 ft) off the bottom

The following discussion assumes that fishing restrictions within the reserves will be imposed year-round, other than the surface trolling provisions in the Proposed Alternative (Alternative 6.2.7). Section 6.3 contains alternatives to implement the reserves on a seasonal rather than year-round basis. If seasonal restrictions are implemented, the impacts of the restrictions will be reduced, except that enforcement will be improved since year-round enforcement will not be necessary.

Alternative 6.2.1 modifies the current fishing restrictions to specifically allow fishing for HMS species and coastal pelagic species. (Technically, it is the NMFS HMS Division that allows fishing for the HMS species. Under this alternative, the Council does not renew its request to NMFS HMS Division to prohibit that fishing). It is less restrictive than status quo in that it allows trolling for coastal pelagic species, which

is prohibited under the current regulations. This alternative would be appropriate if it is determined that surface trolling does not impact reef fish or the habitat within the reserves, if enforceability issues can be addressed, and if allowing surface trolling does not significantly impact the utility of the reserves as research control areas. However, this alternative does not differentiate between surface and deep-water trolling. Traversing the reserves with fish on board is allowed provided the vessel does not stop to fish.

Alternative 6.2.2 prohibits all fishing activity within the reserves assuming that NMFS HMS concurs with the Council's request. If NMFS HMS does not concur, then this alternative is effectively the same as status quo. This alternative would be appropriate if it is determined that surface trolling does impact reef fish or the habitat within the reserves, if enforceability issues cannot be addressed, and if allowing surface trolling does significantly impact the utility of the reserves as research control areas. Traversing the reserves with fish on board is allowed provided the vessel does not stop to fish.

Alternative 6.2.3 prohibits a specific type of fishing, i.e., trolling, regardless of the target species, and otherwise continues the existing prohibition on fishing within the reserves for all species except for HMS species. By prohibiting a specific fishing method rather than target species, enforceability will be improved. Fishing for HMS species using other fishing methods will still be allowed. The FMP for Atlantic Tunas, Swordfish and Sharks (NMFS 1999) lists the following gear types in the commercial HMS fishery (many of these gears have area and/or species restrictions): pelagic longlines, bottom longlines, Atlantic pelagic driftnets, Atlantic coastal driftnets, southeast shark drift gillnets, sink gillnets, purse seines, handlines, and harpoons. Some of these allowed gear types could impact reef fish species and bottom habitat, i.e., bottom longlines. Thus, this alternative will not provide the protection for reef fish and bottom habitat that could be provided by a total prohibition on bottom fishing. Recreational fishing methods are rod and reel, typically used either by trolling or by chumming and drifting. Precedent for gear area restrictions regardless of species targeted exists in the current fish trap regulations, which prohibit the use of fish traps in the stressed area, and west of Cape San Blas, and in the HAPC regulations for the Florida Middle Grounds and Texas Flower Banks, which prohibit certain types of bottom fishing gear in those areas. Traversing the reserves with fish on board is allowed provided the vessel does not stop to fish.

Alternative 6.2.4 allows surface trolling and provides a specific definition for surface trolling. All other fishing methods are prohibited. Fishing is allowed for all species, but species restrictions could be added by combining this alternative with Alternative 6.2.1 or 6.2.4. This alternative would be appropriate if it is determined that surface trolling does not impact reef fish or the habitat within the reserves, and if allowing surface trolling does not significantly impact the utility of the reserves as research control areas. Enforceability issues are addressed by differentiating between surface

and deep-water trolling, Surface trolling is defined in a manner that precludes the likelihood of the gear fishing deep in the water column. However, some of the definition parameters may be difficult to enforce from an enforcement vessel or airplane, particularly the determination of whether a vessel is traveling in excess of four knots. Traversing the reserves with fish on board is allowed provided the vessel does not stop to fish that are prohibited from harvest within the reserves.

Alternative 6.2.5 prohibits the possession of reef fish while vessels are in the reserves. Since reef fish cannot be possessed, fishing for those species is effectively prohibited, other than catch-and-release. Fishing for other species using any lawful means is allowed. Under this regulation, vessels are not allowed to traverse the reserves with reef fish aboard, but will have to circumnavigate the reserves. Since the mere possession of rather than fishing for, reef fish within the reserves is prohibited, at-sea enforcement will be simplified. However, unless the reef fish are in plain view on the deck of the vessel, enforcement of this regulation cannot be accomplished from airplanes or remote sensing.

Alternative 6.2.6, status quo, retains the existing prohibition on fishing for all species except HMS species. This alternative has some inconsistency in the regulations, in that trolling for pelagic species under HMS jurisdiction is allowed but trolling for pelagic species under the Council's jurisdiction is prohibited. This alternative would me most appropriate if it is determined that additional research is needed in order to decide whether surface trolling should be allowed or prohibited.

Alternative 6.2.7 (Proposed Alternative) prohibits fishing in the reserves year round for all species except coastal migratory pelagics[17] and HMS species. For those species, fishing will be allowed in the reserves only by surface trolling during the months of May through October. (This assumes that the NMFS HMS Division implements a compatible regulation for the HMS species. If not, surface trolling for coastal pelagics will be allowed during May through October, but HMS fishing will continue to be allowed year-round.) In public testimony, fishermen indicated that May through October is the time when most HMS trolling occurs. Consequently, the prohibition on fishing during the remainder of the year (if approved by the HMS Division) should have little impact on HMS fishing, but allowing fishing for migratory coastal pelagic species during May through October may result in an overall increase in fishing activity during that period.

Sharks are included in the HMS species, and could be caught in the marine reserves during the coastal pelagics and HMS open season under Alternative 6.2.7. Sharks are targeted with bottom longlines, which can also catch reef fish. The specification that

[17] Species in the Coastal Migratory Pelagics FMP include king and Spanish mackerels, cero, dolphin, cobia, and little tunny. The Council is considering adding wahoo and blackfin tuna to the FMP through Coastal Migratory Pelagics Amendment 15, currently under development.

only surface trolling will be allowed will prevent longlines and their resulting impacts on reef fish and bottom habitat in the marine reserves (provided NMFS HMS Division implements a compatible gear restriction).

The NMFS research on trolling in the marine reserves at Madison-Swanson and Steamboat Lumps found that, while it is possible for trolling gear to catch reef fish at speeds below 4 knots, at speeds of 12 to 15 knots the gear stays on or near the surface,. No reef fish were caught at the high speeds during the study. However, much of the surface trolling occurs at intermediate speeds between 4 and 12 knots. The NMFS research did not evaluate trolling at those speeds, but public testimony indicated that the gear will stay near the surface. Thus, under Alternative 6.2.7, lawful surface trolling that is targeting coastal migratory pelagics and HMS species is unlikely to impact gag or other reef fish.

Enforcement under Alternative 6.2.7 during the open surface trolling season will be complicated by the need for U.S. Coast Guard officers to differentiate between vessels that are lawfully surface trolling and vessels that are fishing illegally. As discussed above, enforcement officers during the NMFS research had difficulty determining the depth of trolled fishing lines, or even if the lines were in the water. Alternative 6.2.7 includes a prohibition on possession of reef fish while in the reserves, except by vessels transiting the reserves, and includes a definition of transiting. This will improve enforceability on the prohibition of fishing for reef fish by limiting the circumstances under which reef fish can be possessed while in the reserves. However, it will require at-sea enforcement from surface vessels rather than remote enforcement methods such as VMS or airplane observations. In addition, the effectiveness of the prohibition on fishing for reef fish will be reduced (compared to a total no reef fish provision), since there is no way to tell where the fish on board a vessel that is underway were caught. During the November through April months, enforcement will be improved since all fishing will be prohibited regardless of method used or species targeted.

Socioeconomic Impacts

As discussed in detail in Section 8.4 of the Regulatory Impact Review (RIR), the Steamboat Lumps site (located in Statistical Area 6) is estimated to reduce harvest by 97,000 pounds of shallow-water grouper (SWG), 19,000 pounds of other reef fish (ORF), and 3,000 pounds of coastal migratory pelagic species(CMP). The corresponding revenue reductions are $194,000 for SWG, $23,000 for ORF, and $3,000 pounds of CMP. The Madison-Swanson site is estimated to reduce commercial harvest by 41,000 pounds of SWG, 25,000 pounds of ORF, and 14,000 pounds of CMP. The corresponding revenue reductions are $87,000 for SWG, $37,000 for ORF, and $21,000 for CMP. In essence, these may be considered the baseline annual effects of the reserves on commercial harvests and revenues. As

such, harvests and revenues from elsewhere in the fishery would have to be increased by these amounts, or benefits of some other type would have to materialize to justify the establishment of the harvest restrictions in the reserves.

Alternatives 6.2.2 and 6.2.3 would have approximately the same impact, depending upon concurrence of NMFS HMS, and would continue to impose the same effects that occur under the current harvest restrictions.

Both Alternatives 6.2.1 and 6.2.4 would allow trolling within the reserves, but Alternative 6.2.1 is more specific in the species that can be harvested by trolling, namely coastal migratory pelagic and HMS species. Alternative 6.2.4, on the other hand, does not specify the type of fish that can be harvested by trolling so that this alternative would allow the harvest of more species, including reef fish, than Alternative 6.2.1. Thus, Alternative 6.2.1 would result in larger reduction in harvest than Alternative 6.2.4. The harvest reduction under Alternative 6.2.5 may approximate that of Alternative 6.2.1 more than that of Alternative 6.2.4. However, Alternative 6.2.5 would impose higher costs on vessels that may not be fishing in the reserves, since these vessels would not be allowed to traverse the reserves on their way to and from reef fish fishing grounds. In addition, those vessels fishing within the reserves for species other than reef fish would incur additional labor costs as harvested reef fish would have to be culled from other catches and thrown back into the water, or these vessels would have to select areas within the reserves where there is less likelihood of catching reef fish.

Alternatives 6.2.2 and 6.2.6 would have virtually the same effects, although Alternative 6.2.6 would entail slightly less administrative cost. However, if under Alternative 6.2.2 NMFS approves the Council request to implement compatible closures in the reserves, this alternative would result in a larger harvest reduction than Alternative 6.2.6 and also Alternative 6.2.3. Alternative 6.2.3 has potentially higher negative impacts than Alternatives 6.2.2 and 6.2.6 (assuming NMFS does not implement a compatible closure for HMS species under Alternative 6.2.3) because it would disallow the use of other fishing methods to harvest HMS species. Some fishermen may be more skillful using fishing methods other than trolling so that forcing them to switch gear in harvesting HMS species would require higher costs not only in terms of gear but also in terms of fishing time. If NMFS does not implement a compatible closure for HMS species, the alternatives under Group 2 may be ranked, from lowest to highest negative impacts, as follows: Alternative 6.2.6, Alternative 6.2.2, and Alternative 6.2.3. If the reserves are closed to fishing for HMS species, Alternative 6.2.2 would entail the highest negative impacts among the alternatives.

There are about 356 vessels that caught reef fish and other species in Statistical Areas 6 or 8. These vessels comprise the universe that would be directly affected by fishing restrictions within the reserves. Understandably, due to the heterogeneity of the vessels, some vessels would be minimally affected while other vessels would

experience larger reductions in harvests if prohibited from fishing in certain parts of the two statistical areas. Most of the vessels that have historically operated in these statistical areas catch a greater portion of their landings from Statistical Area 6. There are approximately 60 to 70 vessels that catch most of their fish from 30 to 50 fathoms of water in Statistical Area 6. The average crew size for these vessels is approximately 2 to 3 persons.

Of the 356 vessels harvesting reef fish and other species in Statistical Areas 6 and 8, only some are likely to be highly dependent on catches from the two marine reserves. Any reductions in vessel catch and income would tend to materially affect the fishing operations of these vessels and the livelihood of the crew. To compensate for any potential revenue reduction from fishing restrictions as a result of an area closure, affected vessels would have to fish in other areas and compete with other commercial and recreational vessels. This practice would likely not fully offset revenue losses and would likely increase fishing costs, since it is assumed that the original fishing pattern was determined to be the most economically profitable practice for these vessels, otherwise they would not have adopted this pattern.

In addition to the vessels that would be directly affected by fishing restrictions within the reserves, dealers receiving fish from the affected vessels would also experience adverse impacts. About 83 dealers received reef fish that were harvested in Statistical Area 6 or 8. These dealers comprise the universe of dealers that would be directly affected by fishing restrictions within the reserves. As with the case for vessels, there are dealers that likely would be minimally affected and those that would face large reductions in fish received from certain vessels that historically fish in the restricted areas. Alternative supply sources may not be readily available to these dealers or, if available, the fish supplied may cost more or be of lower quality.

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

One other group that would be affected by fishing restrictions on the two marine reserves is the recreational sector, including for-hire vessels. There is very little information on the activities of this sector within the reserves. It can be inferred from the lawsuit brought by the CCA, however, that there has historically been a good deal of recreational fishing activities within the two marine reserves. Current rules (as represented by Alternatives 6.2.6 or 6.2.2) allow only the harvest of HMS species by both the commercial and recreational sector, and these species can be harvested by

any allowable methods of fishing. To the extent that the recreational sector also historically harvested other species, such as reef fish and coastal migratory pelagics, the establishment of the reserves and accompanying restrictions likely negatively affected both the harvest of fish and overall fishing experience of these anglers. Losses in consumer surplus would likely result from any of the alternatives for fishing restrictions within the reserves. In addition, if the restrictions result in some anglers reducing the frequency of for-hire bookings or cancel trips entirely, the for-hire fishery would also experience reductions in revenues and potentially profits. If trolling is, however, an important fishing method for recreational fishing within the reserves, then allowing this fishing method, as in Alternatives 6.2.1 and 6.2.4 would result in lower negative impacts to the recreational fishery than the other alternatives.

Any impacts on vessels and dealers of the various alternatives for fishing restrictions would ripple through the various communities where these vessels and dealers conduct their business operations or where workers on those vessels and dealers reside. Longline vessels reported selling their grouper catches to dealers located in various locations in Florida, notable of which are Key West (11 vessels), Fort Myers Beach (10 vessels), Cortez (11 vessels), Madeira Beach (54 vessels), St. Petersburg (34 vessels), Treasure Island (16 vessels), Apalachicola (11 vessels), Port St. Joe (11 vessels), and Panama City (15 vessels). Vertical line vessels sell their catch to dealers located in such places as Islamorada (23 vessels), Key Largo (17 vessels), Key West (115 vessels), Marathon (37 vessels), Summerland Key (49 vessels), Tavernier (12 vessels), Fort Myers (15 vessels), Fort Myers Beach (13 vessels), Cortez (11 vessels), Tampa (38 vessels), Madeira Beach (21 vessels), Redington Shores (13 vessels), St. Petersburg (26 vessels), Tarpon Springs (38 vessels), Treasure Island (14 vessels), Hudson (14 vessels), Crystal River (20 vessels), Gainesville (17 vessels), Steinhatchee (20 vessels), Tallahassee (22 vessels), Panacea (24 vessels), St. Marks (19 vessels), Apalachicola (48 vessels), Eastpoint (30 vessels), Port St. Joe (27 vessels), Panama City (48 vessels), and Destin (31 vessels). Notable locations of dealers to whom fish trap vessels sell their catch are Naples (10 vessels), Crystal River (10 vessels), and Steinhatchee (9 vessels). These communities would also experience the impacts of fishing restrictions within the marine reserves. Similar information cannot be generated for the recreational fishery. It can be stated, however, that west coast Florida areas identified as activity centers for the for-hire fishery may also experience the impacts of the fishing restrictions within the reserves. Holland et al. (1999) identified the following as major activity centers for charterboats in Florida: Naples and Fort Myers/Fort Myers Beach on the Peninsula Gulf and Destin, Panama City/Panama City Beach and Pensacola on the Panhandle Gulf. The major activity centers for headboats are: Clearwater and Fort Myers/Fort Myers Beach on the Peninsula Gulf and Destin and Panama City/Panama City Beach on the Panhandle Gulf.

Fishing restrictions, such as those considered for the two marine reserves that impose limitations on a sub-sector of the fishery participants for the purpose of providing

long-term benefits to the overall stock and all fishing participants, introduce, in addition to the direct impacts discussed above, the issues of equity and allocation. Where restrictions are localized, as in the proposed action, it is typical that certain sectors of the fishery are more dependent upon the stock in those areas, such as the commercial and recreational fishery participants described above, and would be more constrained by the proposed restrictions. Benefits, however, would accrue immediately to those who receive non-use benefits and who bear none of the costs of the restriction, while benefits that accrue to enhanced stock abundance, resulting in potentially relaxed harvest restrictions or higher or more economically produced harvests elsewhere are received by the general fishery. Thus, a situation is created whereby any net benefits that may result from fishing restrictions within the reserves would be distributed in a disproportional manner because a certain segment of the fishery bears the greater costs of the restrictions.

Another issue that accompanies fishing restrictions within the two marine reserves relates to the costs of monitoring and enforcing the restrictions. Certainly, the more areas closed the higher the costs would be, particularly if the closed areas are individually small in geographical scope. Both intentional and unintention violations would be high in such a situation. Also, it is easier and less costly to observe fishing restriction violations in a marine reserve where all fishing is prohibited compared to a reserve where only certain fishing methods or species prohibitions apply. Additionally, enforcement decisions in a fishing prohibited reserve requires simply observation of the boundaries of the reserve and determination that these boundaries have been violated by fishing effort as opposed to also having to determine whether a specific fishing practice (gear and/or species) has been also violated. A vessel monitoring system (VMS) may be developed to enhance enforcement, but understandably, there are costs that would be expended by both the government and industry with this type of a system (see Amendment 16A to the Reef Fish FMP for a discussion of the costs involved in developing and maintaining a VMS). For the present time, enforcement of the proposed area closures would be included as part of the routine enforcement activities around this area.

6.3 Seasonal Regulations

Alternative 6.3.1: Apply fishing restrictions within the marine reserves at Madison-Swanson and Steamboat Lumps during the peak gag spawning season, February through March.

Alternative 6.3.2: Apply fishing restrictions within the marine reserves at Madison-Swanson and Steamboat Lumps during the entire gag spawning season, December through May

Proposed **Alternative 6.3.3: Status quo, prohibit fishing within the marine reserves at Madison-Swanson and Steamboat Lumps year-round.**

Comparison of Alternatives

	Alternative 6.3.1	Alternative 6.3.2	Alternative 6.3.3 (Proposed)
Seasonality of regulations	Feb. - Mar. (2 months)	Dec. - May (6 months)	year-round
Groupers protected during peak spawning season	gag yellowmouth grouper - (partial)	gag red grouper yellowmouth grouper	all species
Protection of male gag within reserves	partial	partial	full

Discussion: The marine reserves at Madison-Swanson and Steamboat Lumps were created as part of a regulatory amendment to provide protection primarily for gag, but because of the multi-species nature of an management area, impacts will be felt by other species[18] as well.

Research was conducted at Madison-Swanson by Andrew David and Christopher Gledhill of NMFS during February and April, 2001, using panoramic video camera arrays, digital cameras, chevron traps, and an underwater remotely operated vehicle (ROV), identified the following species within the area: gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red grouper (*Epinephelus morio*), snowy grouper (*Epinephelus niveatus*), speckled hind (*Epinephelus drummondhayi*), red snapper (*Lutjanus campechanus*), silk snapper (*Lutjanus vivanus*), red porgy (*Pagrus pagrus*), knobbed porgy (*Calamus nodosus*), gray triggerfish (*Balistes capriscus*), and greater amberjack *(Seriola dumerili*). At Steamboat Lumps, they found that sandy substrates in the central portion of the reserve harbored honeycomb moray (*Gymnothorax saxicola*), and bandtail puffer *(Sphoeroides spengleri*), while sites sampled in the northeast region of the reserve, with habitat consisting of sandy substrates, fish burrows or rocky outcrops were dominated by honeycomb moray, bank sea bass (*Centropristis ocyurus*), red porgy, vermilion snapper (*Rhomboplites aurorubens*), scamp and red grouper (*Epinephelus morio*). The following is a summary of the spawning seasons for shallow-water grouper:

[18] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

Shallow-water grouper spawning seasons (also see Figure 5):

Species	Peak season	Total Season
Red grouper	April-May	December-July
Gag	February-March	December-May
Black grouper	unknown*	October, December-March
Yellowmouth grouper	March-May	January-December
Yellowfin grouper	unknown*	March, May-August
Scamp	unknown*	March-May
Red hind	unknown*	April, June-August
Rock hind	unknown*	January-June

*Little information is available on spawning seasons with an asterisk. The seasons given are best estimates from limited data, peak season is unknown.

Section 6.2 (Fishing Restrictions Within the Reserves) provides a range of alternatives for fishing regulations and prohibitions within the marine reserves at Madison-Swanson and Steamboat Lumps. The discussion in that section assumes that fishing restrictions within the reserves will be imposed year-round. Section 6.3 contains alternatives to implement the reserves on a seasonal rather than year-round basis. If seasonal restrictions are implemented (Alternatives 6.3.1 and 6.3.2), the impacts of the restrictions described in Section 6.2 will be reduced, except that enforcement will be improved since year-round enforcement will not be necessary. The shorter the seasonal implementation (Alternative 6.3.1), the less impact the reserves will have on the resource. In addition, any benefits in terms of increased size and abundance of fish within the reserves are likely to be reduced or eliminated by increased fishing pressure during the open season, particularly if fishermen are attracted to the reserves in expectation of enhanced fishing due to the closure.

Alternative 6.3.1 makes the fishing restrictions within the marine reserves at Madison-Swanson and Steamboat Lumps seasonal in nature, with the closure in effect for two months during the peak gag spawning season, February through March. This minimizes the impact to fishermen who use the areas. However, it does not encompass the entire gag spawning season and will therefore not protect some of the spawning aggregations within the reserves. It does not address the potential benefits to gag from year-round protecting of a portion of the male gag population year-round in order to help restore the male-to-female ratio. It also does not address potential benefits to other species that utilize the reserves for spawning at other times of the year. The Council rejected this alternative because it limits the effects of the reserves and maintaining the reserves year-round will provide continuity for ongoing research.

Alternative 6.3.2 makes the fishing restrictions within the marine reserves at Madison-Swanson and Steamboat Lumps seasonal in nature, with the closure in effect for six months during the entire gag spawning season, December through May.

This provides essentially the same protection to gag spawning aggregations within the reserve as a year-round closure. However, as with Alternative 6.4.1, it does not address the potential benefits to gag from year-round protecting of a portion of the male gag population year-round in order to help restore the male-to-female ratio, not does it address potential benefits to other species that utilize the reserves for spawning at other times of the year. The Council rejected this alternative because it limits the effects of the reserves and maintaining the reserves year-round will provide continuity for ongoing research.

Alternative 6.3.3 (Preferred Alternative), the status quo alternative, maintains the existing year-round closure within the marine reserves at Madison-Swanson and Steamboat Lumps. This provides protections to all species that spawn in the areas regardless of the time of year, and provides protection to fish that remain in the areas year-round. It also provides for an area that is relatively undisturbed by fishing activities that can be used in ongoing research for comparison to exploited areas. For these reasons the Council selected this as the Preferred Alternative.

Socioeconomic Impacts

The alternatives to continuing the current year-round closure would reduce the negative effects of the fishing restrictions within the reserves. It is unknown, however, whether the shorter periods of harvest restrictions would support the achievement of the Council's objectives. Whether or not shorter periods would still achieve the intended protection to spawning aggregations and adult males depends on whether there are significant variations in the spawning months from year to year. The shorter the period of restriction, the greater the likelihood that the necessary protection will not be achieved. Thus, Alternative 6.3.1 (2 months) would be expected to afford less certainty that the required protection is achieved than either Alternative 6.3.2 (6 months) or Alternative 6.3.3 (annual restriction). An annual restriction would eliminate this problem. If the shorter periods are capable of achieving the necessary protection, then they would be preferred over the proposed alternative from an economic standpoint since they would produce identical benefits l at a lower cost.

As discussed in more detail in the RIR (Section 8.4), Alternative 6.3.1 would reduce harvest by 11,000 pounds of SWG, 2,000 pounds of ORF, and 400 pounds of CMP in Statistical Area 6; by 7,000 pounds of SWG, 4,000 pounds of ORF, and 2,000 pounds of CMP in Statistical Area 8. Total harvest reductions under Alternative 6.3.1 would amount to about 26,000 pounds, with an ex-value of $47,000. Alternative 6.3.2 would reduce harvest by 41,000 pounds of SWG, 8,000 pounds of ORF, and 1,000 pounds of CMP in Statistical Area 6; by 22,000 pounds of SWG, 12,000 pounds of ORF, and 7,000 pounds of CMP in Statistical Area 8. Total harvest reductions under Alternative 6.3.2 would be about 93,000 pounds for an ex-vessel value of $169,000.

It should be noted that the fishing restrictions that would be in effect under Alternatives 6.3.1 and 6.3.2 may be expected to be accompanied by an increase in effort before and after the effective period of the restrictions. The two marine reserves, in particular, would likely experience intensive fishing pressure when the restrictions are lifted and, depending on the enhanced productiveness of the areas, resulting in an increase in harvests before and after the restrictions compared to historic harvests. However, considering, the relative size of catch within the reserves as a percent of total grouper and reef fish harvest, any potential decrease in price as a result of these increased landings is not likely to be substantial. Such increases may, however, jeopardize any stock benefits of the restrictions.

In the absence of better data, it is assumed that the same number of commercial vessels and dealers described in the previous section would be affected by the seasonal alternatives. It should be obvious that reducing the period of restriction will reduce the negative impacts on these entities since the affected harvest quantities is reduced. The recreational fishery would also logically experience lower negative impacts when restrictions are limited to only a portion of the year. The amount of these impacts cannot, however, be quantified.

The alternatives on seasonal applicability of fishing restrictions within the reserves entail different enforcement implications. A year-round application, as under Alternative 6.3.3, provides more flexibility to enforcement personnel in terms of scheduling activities to enforce the regulations, particularly in the face of limited enforcement resources for fishery-related matters. Enforcement activities for the marine reserves may be conducted in conjunction with other enforcement activities. A shorter period of application would demand the allocation of resources to enforce regulations within the reserves and allow less enforcement resource flexibility. Overall, though, a shorter the period requiring enforcement activities may entail lower total enforcement costs.

7.0 ALTERNATIVES CONSIDERED BUT REJECTED

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) require that agencies rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated (40 CFR 1502.14). This section discusses alternatives that were presented during the scoping process or during development of this amendment, but which are not under consideration in the amendment.

Alternatives Considered But Rejected Under Continuation of Marine Reserves (Section 6.1)

Continue the marine reserves at Madison-Swanson and Steamboat Lumps until the gag stock biomass reached B_{MSY} for two or more years.

Discussion: This alternative was suggested in comments provided during the scoping meetings. However, this has already occurred. The RFSAP's evaluation of the most recent gag stock assessment concluded that, as of 1999, the gag spawning stock biomass is at about 120% of the biomass at F_{MAX} (a proxy for F_{MSY}) (GMFMC 2001). Therefore, as of 2004, when the action will be implemented, the biomass objective in this alternative will have been met for five years, and the reserves will be immediately discontinued. Because the triggering mechanism of this alternative has already occurred and it would therefore have no impact relative to the status quo alternative, it is not included in the range of alternatives for consideration

Alternatives Considered But Rejected Under Fishing Restrictions Within the Reserves (Section 6.2)

Allow surface trolling for coastal pelagic species (mackerel, wahoo, cobia and dolphin) from July to December (outside of the gag spawning season).

Discussion: This alternative was suggested in comments provided during the scoping meetings. The alternative would result in year-round surface trolling for HMS species and a seasonal surface trolling for coastal pelagic species. The organization that suggested this alternative, ReefKeeper International, acknowledged that the alternative would present more challenges to enforcing gear restrictions. Because of the complexity of this alternative, the additional enforcement problem it would create, and the limited changes it would provide to either the resource or resource users compared to the alternatives presented, it is not a reasonable or necessary additional alternative, and is not included in the range of alternatives for consideration. The Proposed Alternative (Alternative 6.2.7) is similar to this rejected alternative, but it implements identical open seasons for coastal pelagic and HMS species (Provided the NMFS HMS Division implements compatible regulations), and it prohibits possession of reef fish except by vessels transiting the marine reserves to improve enforceability.

Alternatives Considered But Rejected for creating buffer zones around the reserves

Buffer Zone Alternative 1: Implement a buffer zone of one mile (or other distance) around the marine reserves at Madison-Swanson and Steamboat Lumps. Within the buffer zones:

- *The use of roller trawls, fish traps, and powerheads for the harvest of reef fish is prohibited;*
- *Bag and possession limits are set at one half the regular limits for all species for which harvest is prohibited within the reserves (For species with odd number bag limits, the buffer zone limit will be one half rounded up to the nearest hole number.)*[19]
- *Fishing within the buffer zone is limited to fishing gear with no more than three hooks per line.*

Buffer Zone Alternative 2: Implement a buffer zone of one mile (or other distance) around the marine reserves at Madison-Swanson and Steamboat Lumps. Any vessel fishing within the buffer zone, commercial, charter, or private, must be equipped with a functioning VMS.

Discussion: The creation of buffer zones was suggested by ReefKeeper International during the scoping meetings for this amendment. An edge effect can occur immediately adjacent to a reserve with larger and more fish being caught as a result of some of the fish straying beyond the reserve boundary. Because of this, the waters surrounding a reserve may be more desirable fishing areas and could cause increased fishing pressure. Buffer zones were suggested as a way to control fishing pressure and create special enhanced fishing areas immediately adjacent to the reserves by imposing fishing regulations that are more restrictive than in fully open access waters but not a total prohibition on fishing as occurs in the reserves themselves. Such areas could also be used to improve enforcement of the reserves by requiring additional electronic vessel monitoring requirements in order to better track vessels in the vicinity of the reserves and more likely to violate the area restrictions than more distant vessels. A one-mile buffer, as an example, was used in the alternatives, which would increase the total area impacted by approximately 40%. However, during the November 2002 Council meeting at which the initial options paper for this amendment was reviewed, U.S. Coast Guard Council representatives and other Council members commented that a one-mile buffer around each reserve was too small to effectively enforce, and that vessels without VMS that were intent on violating the reserve restrictions would sail through the buffer zone and into the reserve itself. Council members noted that other area restrictions created by the Council, such as the Alabama Special Management Zone (SMZ) had no buffer zones. Consequently, the Council voted to remove alternatives for creating buffer zones from consideration in the amendment.

[19] Charter vessels and headboats that are out more than 24 hours and qualify for a two-day bag limit would be allowed a one-day limit while in the buffer zone. For enforcement purposes, if stopped at sea for inspection while in the buffer zone, such vessels would be required to document that they were at sea for more than 24 hours at the time of inspection.

Other Alternatives Eliminated from Consideration

Additional Marine Reserve Areas

Increase the size of the marine reserves at Madison-Swanson and Steamboat Lumps.

Discussion: This alternative was suggested in comments provided during the scoping meetings as a way to compensate for a possible reduction in the effectiveness of the reserves due to fishing vessels accidently drifting across the reserve borders. Draft Amendment 18 (currently under development) already contains alternatives for additional closed areas, including areas that are contiguous to Madison-Swanson and Steamboat Lumps, effectively expanding the size of those marine reserves. Therefore, consideration of these alternatives in this amendment would be redundant. The question of whether to create additional marine reserves or to expand the existing reserves introduces issues of accessibility to the resource and the efficacy of adopting a broad ecosystem approach to fishery management that are beyond the scope of this amendment, and they have therefore not been included for consideration.

VMS Requirements

Require all commercial and charter boats for hire fishing for reef fish in the eastern Gulf to employ vessel monitoring devices (VMS).

Require all commercial boats fishing for reef fish in the eastern Gulf to employ vessel monitoring devices (VMS).

Require all boats fishing for reef fish in the eastern Gulf to employ vessel monitoring devices (VMS).

Discussion: The VMS alternatives above were suggested in comments provided during the scoping meetings as a way to improve enforceability of the reserves. VMS alternatives are included in draft Amendment 18 (currently under development), where they will be considered in depth. The far-reaching impacts of the above alternatives are not consistent with the Council's intent to limit the scope of this amendment to issues directly related to the continuation of the marine reserves at Madison-Swanson and Steamboat Lumps. The alternatives are redundant with Amendment 18, and therefore they have not been included for consideration in this amendment. Note that the section on buffer zones (Section 6.3) does contain a VMS alternative of more limited scope specifically addressing enforcement of the marine reserves at Madison-Swanson and Steamboat Lumps.

Evaluation

Develop scientific research plans and goals as part of the amendment plan, with research completion set two years in advance of the reserves' sunset date.

Discussion: This alternative was suggested in comments provided during the scoping meetings as a way to ensure that the appropriate data is available for evaluating the effectiveness of the reserves. The alternative as proposed is too vague to be useful as a management action. It may have been the intent of the organization making this proposal, ReefKeeper International, that specific research plans and goals be included in the amendment rather than to include the alternative as stated. However, the question of determining appropriate goals and ways of measuring success is part of the research needs. The marine reserves at Madison-Swanson and Steamboat Lumps were created in part for the purpose of evaluating the utility of closed areas in fishery management. Development of appropriate goals and ways of measuring success is perhaps better presented as a research priority. For this reason, this alternative is not included for consideration, but the Council may wish to express the need to develop such goals and measures as a research priority.

8.0 REGULATORY IMPACT REVIEW

8.1 Introduction

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

The RIR also serves as the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 and provides general information needed in determining whether the proposed regulations will have a "significant economic impact on a substantial number of small business entities" in compliance with the Regulatory Flexibility Act of 1980 (RFA).

This RIR analyzes the probable impacts on fishery participants of the proposed plan amendment to the Reef Fish Fishery Management Plan.

8.2 Problems and Objectives

The general problems and objectives are addressed by this proposed plan amendment in Section 2 and Section 3 of this document and are incorporated here by reference. The major issues identified for this plan amendment are: (1) continuation of the Steamboat Lumps and Madison-Swanson marine reserves; (2) fishing restrictions within the marine reserves; and, (3) seasonal regulations within the marine reserves.

8.3 Description of the Fishery

The Steamboat Lumps and Madison-Swanson marine reserves cover about 219 nautical miles and are located in Statistical Areas 6 and 8. The specific fishing activities in these two marine reserves are relatively unknown, but certain fishery characteristics can be inferred from fishing activities in Statistical Areas 6 and 8 and from fishing activities in Florida and other states in the Gulf.

One major purpose of establishing the two marine reserves was to protect the gag spawning aggregation. While the major species targeted for protection is gag, other species are also caught in the marine reserves. Among the various species caught, groupers are possibly the dominant species harvested in the two areas, particularly by the commercial sector. A legal challenge brought by the Coastal Conservation Association regarding the prohibition of fishing by any means and for all species, except those managed by NMFS HMS clearly implies that recreational fishing, particularly for those species susceptible to surface trolling such as pelagic species, is also an important activity in the two areas. Thus, fishing activities in the two marine reserves may be considered as conducted by both the commercial and recreational sectors.

The commercial sector is the dominant sector in the red grouper fishery while the recreational sector is the dominant sector in the gag fishery. For the years, 1986-2001, commercial landings are about 76% of total red grouper catch and 40% of total gag catch. Within the commercial sector, longline and fish trap vessels account for most of red grouper catches while vertical line vessels account for most of gag catches. Catches of shallow-water grouper by other gear types are relatively low.

8.3.1 Commercial Fishery

Participants in the reef fish fishery in the GOM and in particular the grouper fishery include commercial fishermen utilizing different types of gear: bottom longline, vertical line gear (handline and bandit gear), fish traps, cast nets and powerheads for

spearfishing. The grouper fishery occurs along the northeastern Gulf coast primarily along the west coast of Florida. The vast majority of the human activity related to the grouper fishery occurs in Florida. (U.S. Department of Commerce, 2001).

Per logbook information, commercial fishing vessels landed an annual average of 22 million pounds of all species, with an ex-vessel value of $39 million, for the years 1993-2002. For the same period, the commercial fishery landed an annual average of 7.6 million pounds of shallow-water grouper, of which 68% is red grouper, 16% is gag, 11 percent is black grouper, and the rest is other shallow-water grouper species. The corresponding annual ex-vessel revenues from shallow-water grouper catch averaged at $15.6 million, of which 63% is accounted for by red grouper, 19% by gag, 12% by black grouper, and the rest by other shallow-water grouper species.

Statistical Areas 6 and 8, where the two marine reserves are located, accounted for 12.9% of landings of all species as reported in logbooks and 13.5% of the corresponding ex-vessel revenues. These two areas also accounted for 24.9% of all shallow-water grouper landings and 25.2% of ex-vessel revenues from shallow-water grouper. Of the shallow-water grouper caught in these areas, 63% is red grouper, 20% is gag, 13% percent is black, and the rest is other shallow-water groupers.

For the period 1993-2002, an average of 1,338 vessels reported landings in their logbook submissions and took an average of 18,735 trips annually. These vessels landed an average of 22 million pounds of fish valued in the dock at $39 million. An average of 356 vessels taking 2,598 trips reported to have caught fish in Statistical Areas 6 or 8. These vessels landed an average of 2.8 million pounds of fish valued at $5.3 million.

Bottom longlining and buoy vessels annually caught an average of 3.7 million pounds of grouper (mostly red grouper) valued dockside at $7.1 million (Waters, 2001). There was an average of 165 bottom longlining vessels taking an average of 1,410 trips per year from 1993-2000. On average there were 894 vessels using vertical line gear from 1993-2000. The catch (mostly gag) averaged about 2.6 million pounds valued dockside at $5.4 million per year. These vessels took 7,600 trips per year on average. There were on average 60 vessels using powerheads yearly between 1993-99 that caught a total of 3,000 pounds of grouper for a value of $6,000. There were no grouper reported caught with powerheads in 2000. As of May 1998, there were 86 fish trap endorsements issued by NMFS Amendment 16A); currently there are 65 fish trap permits. Between 1997-00, vessels fishing with traps caught an average of 800 thousand pounds valued at over $1.4 million, while spear fishermen caught an average of 69 thousand pounds of grouper valued at over $153,000.

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

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 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 underrepresented in earlier surveys; 2) vessels from around the Gulf: Collier County, Florida to Cameron County, Texas; and 3) demographic information on the fishermen.

Waters' (1996) survey 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). Longliner 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 32-6000 gallons. Vessels in the survey that had a fuel capacity of less than 1250 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%) 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% of the respondents citing household incomes of $30,000 or less. Respondents averaged approximately 44% of household income from commercial fishing for reef fishes, 21% from other types of commercial fishing and 35% 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% of household income from commercial fishing while, except for bottom longlining vessels, respondents from low volume vessels earned 25-39% 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.

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. 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 represent about 60-70% of the reef fish bottom longlining fleet and about 6% 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% of all grouper landed in Madeira Beach are consumed within about 40 miles of Madeira Beach while 30% was sent to other parts of Florida, out of state and to Canada. Closure of the grouper fishery for one month (February 15-March 15) would reduce catches by about 10% to this market and would reduce annual revenues by about 10%. A two-month closure would result in a 17-22% reduction in annual landings and a 19-23% reduction in annual revenues. Estimates were based on using landings and revenues in 1999 and 2000 as proxies for 2001 landings and revenues annually. 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. Appendix G of the Gulf Council's Generic SFA Amendment contains community related fisheries data for Monroe County Florida.

8.3.1.1 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 out of the Gulf States region. More than half of all reef fish dealers are involved in buying and selling grouper. Between 1997-2000, there were on average 123 reef fish dealers actively buying and selling in the grouper market. Of these, 101 or 82% sold more than $30,000 per year worth of domestic grouper on a regular basis. These dealers may hold multiple types of permits and because we do not know 100% of the business revenues, it is not possible to determine what percentage of their business comes from grouper fishing activity.

Grouper sales take place at several locations along the Gulf coast but are concentrated in Florida. In 2000, more than 8 million pounds of grouper valued dockside at over $18 million were landed on the Florida west coast. The top ten counties ranked by dockside value of grouper sales in 2000 are all in Florida: Pinellas ($8.06 m), Bay ($2.24m), Franklin ($1.25m), Citrus ($1.09m), Lee ($1.05m), Collier ($0.93m), Manatee ($0.78m), Monroe ($0.66m), Levy (0.43m), Okaloosa ($0.32m). The top five counties account for over $12 million in landings while the top 10 counties account for over $16 million in landings of grouper (U.S. Department of Commerce, 2001).

8.3.2 Recreational Fishery

The recreational component of the grouper fishery in the GOM includes charter boats, headboats (or party boats), and private anglers fishing from shore or private or rental boats. In 1999, recreational grouper catches totaled about 5.3 million pounds. Of this, gag grouper comprised about 57% and red grouper about 36% (Holiman 2001). Most of these grouper are caught by anglers using private or rental boats; charter boats make up the next largest catch.

8.3.2.1 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% of the time and spotted sea trout about 33% of the time. Red snapper is the most common reef fish targeted by approximately 4.5% of intercepted anglers. Red grouper and gag are targeted by about 1% and 4% of anglers respectively (Holiman, 1999). There are over 500,000 anglers (resident and non-resident) with saltwater licenses in counties in Florida where grouper 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, 2001b). The highest numbers of total, resident and non-resident licenses are in Monroe (79,030), Lee (54,777) and Pinellas (49,080) counties. Numbers of licenses by resident and non-residence status are presented by county in Table 7.7.

Social and economic characteristics of private anglers are collected periodically by the Marine Recreational Economics Survey with an economic add-on survey. The economic data add-on conducted during 1997-98 have been summarized in Holiman (1999) and Holiman (2000). The typical angler in the Gulf region is 44 years old, male (80%), white (90%), employed full time (92%), 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%) one-day trips where expenditures on average were less than $50. Seventy-five percent reported that they held saltwater licenses, and 59% 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% were employed or self-employed and about 23% were unemployed, mostly due to retirement.

8.3.2.2 Charter Boats and Headboats

There are about 1,907 charter boats/headboat/party boat with both reef fish and charter permits for both reef fish and coastal pelagic fish distributed across the Gulf States. The majority of these permits, 1,194 are in Florida, followed by Texas with 300, Louisiana with 162, Alabama with 159 and Mississippi with 92 (NMFS, 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 industry participants and the GOM Fishery Management Council's Socioeconomic Panel is currently reviewing this study. The criticisms focused on the financial sections of the study.

Overall, about 37% of charter boats reported targeting grouper in the Florida Gulf in 1998. About 60% of headboats reported targeting snapper and grouper (gag and red)

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 head boats. In the western Gulf, grouper were not identified by either charter or party boat operators as a target species. 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 the number of charter boats in the Gulf increased about 16% to 615. Most of this growth occurred along the Florida peninsula coast; in contrast, the number of charter boats in the Panhandle region decreased by 8%. The number of headboats increased about 20%, mostly along the southwest Florida coast. Charter passenger trips remained stable at about 848,458 passengers on 180,523 trips in 1997 (please note that this total is low, since the MRFSS data do not include Texas), while headboat passenger trips increased to 1,137,362 passengers on 44,655 trips in 1997 (Holland et. al. 1999).

8.3.2.2.1 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 boats sampled in 1998 (not the entire fleet), 52.9% of the charter boats held Gulf reef fish charter permits, 56.8% held coastal migratory pelagic permits, 14.3% held South Atlantic snapper/grouper permits, 5.2% held swordfish permits, 7.8% held shark commercial permits, 26.6% held hind and Spanish mackerel commercial permits, 6.5% held South Atlantic snapper/grouper commercial permits, 13.7% held red snapper commercial permits, and 22.1% held commercial Gulf Reef fish permits. Seventy six and one half% of the Headboat operators held Gulf fish reef permits, zero held Gulf reef fish commercial permits, and 70.6% held coastal migratory pelagic fish 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%) had fiberglass hulls, were diesel fueled (76%) with single (41%) or dual engines (59%). Most offered one half-day trips and full-day trips but only 15% 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% were half-day, 50% were full day and 3% were overnight trips.98% of all headboat trips were made to federal waters (Holland et al., 1999).

The mean age of Florida headboat operators was 48 years with 84% between the ages of 31-60. 78% were married and 11% were divorced. Florida headboat operators had an average of 13 years of education, with 100% having at least 12 years of education and 22% with 16 years or more. About 86% of the operators were male. All operate on a full-time basis and about 92% reported that 100% 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% were members of a local headboat association (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% had fiberglass hulls and are diesel fueled (97%) with single (8%) or dual (92%) engines. Most (86%) offered half-day trips and full-day (64%) 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% were half-day and 20% were full day. About two-thirds of these trips were in federal waters offshore and 36% of the headboats took 100% of their trips in federal waters (Holland et. al., 1999).

The mean age of Florida charter boat operators was 46 years with 82% between the ages of 31-60. 63% were married and 15% were divorced. Florida charter boat operators had an average of 13 years of education, with 95% having at least 12 years of education and 34% with 16 years or more. About 98% of the operators were male. Most (90%) operate on a full-time basis and about 61% reported 100% of their household income was from the charter business. 80% 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. 24% of them belonged to their local chamber of commerce and 34% belonged to their local charter boat association (Holland et. al., 1999).

8.3.3 Fishing Dependent Communities

"Fishing community" is defined in the M-S Act 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" (Magnuson-Stevens Act section 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).

Appendix D of the Draft Environmental Impact Statement for the Generic Essential Fish Habitat Amendment presents a thorough description of fishing dependent communities in the Gulf coasts. There is no intent here to replicate this document, but some discussions are presented relative to fishing dependent communities in

Florida, since some of these communities are the ones that may be affected by actions in the current amendment. Most of the discussion here are taken from Secretarial Amendment 1 considering the high likelihood that the fishing communities affected by the red grouper rebuilding plan would be the same communities that would be affected by this amendment.

Jacob et al. (2001) developed a protocol for defining and identifying fishing dependent communities in accordance with National Standard 8 through a current 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 hinterlands (Richardson, 1979). It differs from using an administrative unit such as county boundaries, which may distort smaller communities or locality data as it is 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).

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 hinterlands 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.

The following criteria were used to include communities. There are some additional cities/locations where grouper sales are significant (e.g. over $100,000 per year) which could reasonably be included in this list after additional analysis. This list should be considered a preliminary effort at designating these communities. First, the area was included if it was associated with commercial vessel reef fish permit holders using these gears: longlining, spears, traps, or vertical lines. Second, the area was included if it was associated with greater than 10 charter, party or headboat reef fish permit holders. Third, the area was included if it was in the top 20 locations for grouper sales in the GOM (top 85%). Fourth, the area was included if it was identified as a fishing community or activity center by a previous study; Fifth, the area was included if there were more than 20,000 private anglers holding licenses in the county where the proposed area was located. Using these criteria, we identified 38 cities/ports around the GOM where any of these types of grouper activity occurred. Being included in this universe does not imply that a significant amount of grouper related fishing activity occurred in the area, simply that some activity potentially occurred and that activity might be impacted by the rebuilding plan or other regulations in Secretarial Amendment 1. Port and site visits can further verify and rank which of these areas will be impacted the most from the proposed regulations.

The permit owner addresses for the 156 bottom longline vessels are clustered in Florida: Cortez, Madeira Beach, Miami, St. Petersburg, and Tampa.

The permit owner addresses for 894 vertical line vessels are clustered in: Apalachicola, Carrabelle, Cedar Key, Clearwater, Crystal River, Destin, Ft. Myers, Indian Rocks, Madeira Beach, Marathon, New Orleans, Panacea, Panama City, Pensacola, Nokomis, St. Petersburg, Steinhatchee, Tampa, Tarpon Springs, and Yankeetown in Florida; Orange Beach, AL; Pascagoula, MS; and Houston, TX.

As of May 1998 there were 86 fish trap endorsements to the commercial reef fish permit and currently (as of November 2001) there are 65 endorsements. The permit owner addresses for vessels using fish traps are clustered in these areas: Destin, Homosassa, Naples, Steinhatchee, and Tarpon Springs, FL. Vessels using diving to catch reef fish do not show a clear cluster but are found in several areas of the Gulf. There are more than three reef fish permitted dealers with a facility in these locations: Cameron, LA; Galveston, TX; and Destin, Ft. Myers Beach, Key West, Madeira Beach, Marathon, Panama City, Pensacola, St. Petersburg, Tampa, and Tarpon Springs, FL.

The permit owner addresses for charter/headboat holders of reef fish permits were clustered in these areas: Apalachicola, Biloxi, Carrabelle, Chauvin, Clearwater, Destin, Freeport, Galveston, Houston, Marathon, Naples, Orange Beach, Panama City Beach, Pensacola, Port Aransas, Sarasota/Nokomis/Englewood. In June 2001 a charter vessel/headboat permit moratorium was submitted to NMFS for approval and

implementation. In June 2003, this permit moratorium has been approved for implementation. Note in NMFS data files, some owners listed ports where vessels were documented rather than actual homeports.

The top 20 cities in terms of grouper sales together accounted for over $18 million of grouper sales in 2000. This is over 85% of all grouper sales in the Gulf for 2000. The sales, coming from various numbers of vessels and dealers in each location, represent a minimum of $200,000 per year per area. The ranking of the cities presented here change relatively little over the period, 1997-2000. These cities are in order of sales ranking: Madeira Beach, Panama City, Apalachicola, St. Petersburg, Tarpon Springs, Crystal River, Ft. Myers Beach, Key West, Tampa, Naples, Clearwater, Steinhatchee, Miami, Cortez, Destin, Homosassa, Panacea, Everglades, Golden Meadow, Stock Island.

The U.S. Census periodic economic survey does not collect economic data (such as numbers of businesses, industry employment by NAISC industrial code) for entities with under 2500 population or for census-designated places. A census-designated place (CDP) is a place recognized by the census but unincorporated as a governmental area. For example, economic data from the US Census economic survey exist for Madeira Beach, FL with a population of about 4,400 while no such data exist for Steinhatchee, FL because it is unincorporated. Data do exist for Cortez, FL because it is a CDP. For places without Census data, other data sources for example by county or by zip code (when the whole area is included in one zip code such as Steinhatchee) may provide information. Otherwise, the data need to be collected through interview and site visits. Data for numbers employed in agriculture, forestry, and fisheries need to be interpreted carefully. Fishermen (captains and crew) would be counted in this number while persons working in wholesale (e.g. processing, fish houses) may be counted in the general category of wholesale rather than in fishery employment.

In general these areas have small populations, many with less than 7,000 persons (Apalachicola, Carrabelle, Cedar Key Cortez, Homosassa, Ft. Myers Beach, Everglades City, Madeira Beach, Stock Island). Several of these areas have an unusually high rate of less than high school graduation, some as high as 50%. With exceptions (Carrabelle, 13.6% and Cedar Key, 12.2%) many of the areas have relatively low percentages, 2-3% counted as employed in agriculture, forestry and fishing. These types of demographic statistics give an idea of the background and labor market conditions within which the various fishing activities operate. Small, isolated areas with low educational attainment among the labor force indicate relatively few alternatives for the labor force. In these cases, losing fishing activity would impact the area relatively more than an equally situated areas with a more educated workforce.

8.4 Impacts of Management Measures

8.4.1 Introduction

The discussions under the "Socioeconomic Impacts" subheading in Section 6 comprise part of the impact analysis for RIR purposes pertaining to this amendment and are incorporated here by reference.

The Steamboat Lumps marine reserve falls within the boundaries of Statistical Area 6, while the Madison-Swanson marine reserves is within the boundary of Statistical Area 8. These marine reserves were established in June 2000 and were designed to sunset four years later, or June 16, 2004. Since the establishment of these reserves, fishing of all types and for all species has been prohibited with the exception of fishing for HMS species. It was the Council's original intent to include HMS species in the fishing prohibition, and a request to implement this prohibition was submitted to the HMS Division of NMFS. However, as part of the settlement to the lawsuit brought by the Coastal Conservation Association with specific reference to the effect of surface trolling on reef fish, the Council's request was held in abeyance until a study on the effects of trolling on reef fish species and the enforceability of regulations governing depth of fishing was completed.

The establishment of the two marine reserves and the prohibition of fishing within the reserves regulations were part of a package of regulations designed to arrest the problem that gag was approaching an overfished condition. The marine reserves were also designed to protect a portion of gag spawning aggregations and offshore male population whose ratio to the entire gag population had been observed to decline since the 1970s. In 2002, NMFS reclassified gag as neither overfished nor undergoing overfishing, but the stock has not yet improved to its optimum level. Therefore, the Council has determined that continued protection of the gag stock and spawning habitat is necessary. Such continuation will also provide additional time to conduct research on the effects of marine reserves.

8.4.2 Continuation of Marine Reserves

There are seven alternatives considered for the continuation of the two marine reserves. The alternatives mainly differ on the sunset date of the marine reserve designation, with four alternatives identifying a specific sunset date and three alternatives establishing an indefinite sunset date. The four specific dates are no continuation beyond the original sunset under Alternative 6.1.7 (Status Quo), a four-year extension of the original sunset date under Alternative 6.1.1, a six-year extention of the original sunset date under Alternative 6.1.2 (Preferred Alternative), and a 10-year extension of the original sunset date under Alternative 6.1.3. The other alternatives would extend the original sunset date for an indefinite date (Alternative 6.1.6), to some future date when the gag fishery has been sustainable at OY for two

years (Alternative 6.1.4), and to some future date when the proportion of male gag within the reserves has returned to its historic level of 17%.

In and of itself, the designation of an area as a marine reserve does not bring about changes in the economic status of the fishery. But the designation sets the tone and for /or structure for establishing restrictive regulations governing fishing activities in the reserve, thereby affecting the likelihood of indirect effects. In the present case, restrictive fishing regulations have been imposed since June 2000 when the two marine reserves were established. It is logical to expect that some restrictive regulations would remain with the continued designation of the two areas as marine reserves. Thus, some economic effects may be expected from any alternative that would extend the duration of the marine reserves, but the extent of such effects would depend on the specific fishing regulations governing the two marine reserves. For this reason, a more qualitative discussion is appropriate when assessing the costs and benefits of the various alternatives to extend the duration of the marine reserves. However, subject to data availability, some quantification of economic impacts will be attempted with respect to the alternatives specifying regulations on fishing activities within the marine reserves (see Sections 8.4.4 and 8.4.5 below). Along this vein, the following discussions on the effects of marine reserves assumes that current harvest restrictions remain in effect with the continued designation of the two proposed marine reserve areas.

The two marine reserves were established to accomplish a multiple objectives. First, they were part of a set of regulations designed to arrest overfishing of gag. Second, they were intended to protect gag spawning aggregations. And third, they were expected to provide protection to male gag so that the ratio of male gag to the entire gag population, at least within the reserves, would be enhanced. A subsidiary reason for the establishment of the two marine reserves was to create an environment that would allow the study of the effects of marine reserves not only on the gag population but also on the broader ecological conditions in and around the reserves. This would allow a more focused research on the utility of marine reserves as a fishery management tool.

In view of a recent determination by NMFS that gag is neither overfished nor undergoing overfishing, the first objective of the reserves is rendered moot, unless it can be demonstrated that overfishing of gag would likely re-occur if the marine reserves were eliminated. Nevertheless, gag may still have to be rebuilt to $B_{msy,}$, necessitating further protection. Also, if the management strategy shifts away from the criteria of overfished and overfishing conditions and into the achievement of a sustainable OY, then marine reserves can possibly lend support to that strategy.

Regardless of whether or not gag is determined to be overfished and/or undergoing overfishing, the remaining objectives of the reserves remain valid. However, protecting gag spawning aggregation and enhancing the ratio of male gag population

would assume significance only if they are related to the status of the stock. In a sense then, these two objectives would have to have some impacts on stock status to be considered desirable management objectives. To the extent that achieving these two objectives would enhance spawning success and possibly prevent reduced recruitment, at least within the reserves, the reserves can partly reduce the likelihood that overfishing of gag would re-occur. From this perspective, the reserves would retain their desirability as management tools with respect to gag. Additionally, other species within the marine reserves would also be provided protection.

Various studies (see Appendix D for summaries) have been conducted on the two marine reserves. Results of one of these studies generally indicates that the Madison-Swanson Marine Reserve has been successful in protecting at least a portion of the spawning aggregations. No spawning aggregation has been observed in the Steamboat Lumps site. One of the studies also observed the presence of more gag males and females hydrated eggs in the Madison-Swanson site than in the reference site outside the reserve. Moreover, both abundance and number of species have been observed to have increased within the marine reserves, although a similar observation was reported for the control area (Twin ridges) so that it was deemed inconclusive as to whether the observed changes were due to the marine reserves or to a general improvement in fish population. The researchers cautioned against considering the changes as a trend since only two years of data were available and recommended that additional studies be undertaken. In addition, public testimony at the May 2003 Council meeting appeared to indicate that fishing in waters surrounding the reserves was great, suggesting the possibility that fish emigrated from the marine reserves to help restock adjacent fishing grounds.

The foregoing discussions raise the following issues. First, the two marine reserves offer some potential in helping to preserve the current status of the gag stock by protecting spawning aggregations. Second, preliminary evidence indicates a good likelihood that spawning aggregations can actually be protected. Third, there appeared to be more gag males in the reserves than outside them. Fourth, there is some possibility that the marine reserves can enhance fish abundance in and around the reserves. Fifth, the two marine reserves have only been in existence for a few years such that, as indicated by the studies on these reserves, the overall effects of the reserves particularly with respect to fish abundance cannot be ascertained with a high level of certainty. The first four issues lend support to a contention that the two marine reserves can achieve the objectives for which they were established while the fifth supports the continuation of the two marine reserves to provide more solid evidence of the effects of marine reserves.

As discussed in a previous regulatory amendment (GMFMC 1999), the two marine reserves were expected to impose costs on the participants in the fishery. These costs were described in the amendment. At that time, it was thought that mainly the commercial sector of the fishery would be affected by the marine reserves.

Subsequent to the publication of the amendment, however, a lawsuit filed by the Coastal Conservation Association brought to light the fact that recreational fishermen also fished in the reserves. Since the costs of the marine reserves estimated at the time of the original amendment did not include consideration of costs to the recreational sector, they may be considered underestimates of the true cost of the action.

At this juncture, it is instructive to outline the general costs associated with the establishment of the two marine reserves, with the understanding that these costs would be expected to continue to be incurred if the designation of the two subject areas as marine reserves were extended.

The primary effect of the two marine reserves would be the displacement of fishermen that historically utilized the fishery resource in those areas. It is assumed that fishermen who historically harvested fish in the two areas must have considered the areas as more productive than other areas. Otherwise, they would have fished in these other areas. The reserves, therefore, remove more productive areas from these fishermen's production horizon. As a result, two things are likely to happen to these participants. First, their harvest and revenues would decrease. The reduction in harvest would come from fishing in less productive areas. Second, if fishermen attempted to offset their harvest and revenue loss by fishing in other areas, they would incur higher cost per pound of fish caught or fewer fish per dollar of cost relative to their previous fishing activities in the reserves. The marine reserves (and accompanying restrictions) effectively could be described as providing a double squeeze on the profitability of these commercial vessels in that they likely incur both reduced harvests and increased costs. In addition to profit reductions of these vessels directly affected by the marine reserves, other vessels fishing elsewhere would also be affected to the extent that they would now face additional competition from the vessels displaced from the reserves. An additional consideration is the possible mitigation effect on prices that reduced harvest quantities may cause. However, since the two marine reserves accounted for only a small portion of total grouper and reef fish caught in Florida and elsewhere in the Gulf, a reduction in harvest would not likely be accompanied by a significant, if any, increase in price.

Recreational vessels, particularly the for-hire vessels, that fished in the reserves for reef fish would also be displaced by the establishment of the reserves. They would either have to shift their fishing effort on the reserves to HMS species, which are still allowed to be harvested within the reserves, or shift their fishing effort to other areas. It is likely that such effect on fishing effort would increase the cost of recreational fishing. In addition, competition would increase in those areas receiving displaced effort. Thus, not only would the cost of recreational fishing increase, there is also the likelihood that the overall quality of the fishing experience would decline.

Closed areas also increase enforcement costs. Although, no specific cost estimate was provided in the original amendment that established the two reserves, it was noted that for a given enforcement budget, some resources would have to be shifted away from other activities to the enforcement of the closed areas. The studies on the two marine reserves mentioned some enforcement problems regarding fishing within the reserves, and this may signify that more enforcement activities and thereby more expenditures may be required in order for the reserves to be effective.

There are two additional points worth mentioning about the benefits and costs of the two marine reserves. First, the benefits (if achieved) would accrue in the future while the costs are incurred from the moment the reserves were established. Second, the realization of benefits is less certain than the imposition of costs. The economic issue with respect to the continuation of the reserves, therefore, has to take into account not only the trade-off between short-run costs and long-term benefits but also the probability of realizing the expected benefits and incurring the costs.

Although evaluation of the alternatives from the cost perspective may appear straight forward, involving an assessment of historical harvests from the areas in question, assuming these harvests either cannot be made up from other areas or at least not as efficiently, i.e. requiring greater costs, subtracting this amount from historic total harvests and assuming this loss (cost) continues on an annual basis. While this might be true initially, one potential expectation of a reserve is that it either enhances the overall stock such that harvests increase elsewhere throughout the range of the species or at least enhances quantities in the immediate areas outside the reserve. The net effect of either phenomena is the potential of recovered harvests such that the initial short run losses (costs of the action) are either mitigated or totally eliminated. While this phenomena seems plausible, demonstration of such for the current situation has not been demonstrated and cannot be assumed, though the assumption of stock enhancement is a major component of the future benefits expected to result from the reserve designation.

Absent this mitigation and, therefore, assuming a continuing stream of losses from reduced harvest opportunities, the proposed alternatives can be evaluated and ranked based on the proposed length of the designation. Put more directly, if a constant recurrent annual loss is expected to occur, the alternatives can simply be ranked according to their duration. From this perspective, the status quo alternative (Alternative 6.1.7) would impose the least costs since the reserves would sunset in 2004. Among the remaining alternatives containing specific time periods, the least costly alternatives are, in order of least to greatest, Alternative 6.1.1 (4 years), Alternative 6.1.2 (6 years), and Alternative 6.1.3 (10 years). Alternatives 6.1.4 and 6.1.5 cannot be ranked since the time periods required to achieve the biological targets are unknown. Alternative 6.1.6 potentially represents a permanent designation, thereby potentially imposing the greatest costs, though the duration could be for any period of time.

On the benefit side of the analysis, it should be recalled that benefits of the reserve designation and accompanying harvest restrictions are expected to accrue to protection and enhancement of the stock and the facilitation of research opportunities to determine the net stock/ecological effects of reserves. Evaluation of the benefits, assuming the harvest restrictions are static under each alternative during the length of the designation, requires knowledge of the length of time necessary to achieve the enhancement goals and necessary research, as well as determination of whether the benefits are permanent, allowing suspension of the harvest restrictions (in theory, the areas could be designated reserves without continuation of certain/all harvest restrictions) or temporary, therefore requiring continuous harvest restrictions in order to maintain the benefit stream.

Unfortunately, this information is not yet known due to the absence of appropriate data and research. Absent this information, benefits assessment is reduced to an evaluation of the degree to which the various alternatives might be expected to reasonably allow sufficient time to accomplish the necessary goals, or be determined to be excessive. From this perspective, those alternatives that establish marine reserve designations of the shortest duration arguably bear the greatest risk of not allowing sufficient time. This would include the status quo alternative (sunset in 2004) and Alternative 6.1.1 (4 year duration). At the other extreme, assuming Alternative 6.1.6 equated to permanent designation with accompanying harvest restrictions, sufficient time would obviously be afforded to accomplish the necessary goals, however, unless it were determined that permanent restrictions were necessary to support the benefits stream or the benefit stream were determined to not justify the costs, a permanent designation would be excessive and unjustified. As previously discussed, the time frames for Alternatives 6.1.4 and 6.1.5 are unknown and could be any number of years, though they are likely to be greater than that under status quo and less than permanent designation. Further, the criteria for both alternatives present inherent problems. If the reserves contribute little to the maintenance of OY, the costs associated with Alternative 6.1.4 would exceed the benefits. On the other hand, if the reserves are critical to the maintenance of OY, elimination of reserve status after the goal is met would defeat the purpose of establishing the reserves in the first place. With regards to Alternative 6.1.5, achieving the 17% male population ratio for gag is only one of the objectives of the reserves. Focusing solely on this criterion presents the danger that other objectives may not be achieved, it is unknown whether the benefits outweigh the costs, and similar to the discussion of Alternative 6.1.4, if the attainment of the objective is mainly due to the reserves, eliminating them would again defeat the purpose of establishing the reserves. Alternatives 6.1.2 (6 years) and 6.1.3 (10 years) represent somewhat of medium designation, neither of excessively short or long duration. However, while the time lengths should afford the opportunity for a reasonable amount of necessary research to be accomplished, as with the other alternatives it is unknown whether the other management goals can be accomplished, or whether the costs will exceed the benefits and, should permanent

restriction be necessary to maintain the benefits stream, termination of the designation would defeat the purpose of the reserves.

Nevertheless, the benefits cannot be fully assessed absent an experimental closure. Therefore, despite the uncertainty discussed above, extending the duration of the reserves for another 4 or 6 or 10 years appears to provide a better balance of costs and benefits than the other alternatives. Among these alternatives, it is likely that extending the duration of the reserves for another 10 years (Alternative 6.1.3) would allow a better determination of the effects of the reserves. It would also, however, impose greater costs than the other alternatives if the harvest reductions or higher costs of harvest are not mitigated by improved stock conditions. On the other hand, a 4- or 6-year extension may not be sufficient to fully determine the effects of the reserves. If the benefits from the reserves are determined to be significant and the longer period is necessary to achieve the desired stock affects, then the 10-year alternative would provide the best economic outcome among these three alternatives. If it is determined that the benefits do not justify the costs, the 4-year alternative would be the best choice among these three alternatives as it would impose the lowest costs. The 6-year alternative lies roughly between the 4-year and 10-year alternatives. Since the 4-year and 6-year alternatives differ only by 2 years, the benefits, should they exist, of the 6-year alternative may not significantly differ from those of the 4-year alternative. Overall, however, due to the absence of certainty of expected benefits, it cannot be determined which of the alternatives would maximize net benefits.

8.4.3 Fishing Restrictions Within the Reserves

Inclusive of the status quo, there are seven alternatives considered in this section. Alternative 6.2.6 would continue current restrictions, and prohibit fishing for any species, except HMS species, within the reserves. Alternative 6.2.1 would allow trolling within the reserves for coastal migratory pelagic species and blackfin tuna, not renew the request to NMFS that they implement compatible closure for species under their jurisdiction, and prohibit fishing for all other species. Alternative 6.2.2 would prohibit all fishing within the reserves and request NMFS-HMS to implement a compatible closure for species under their jurisdiction. Alternative 6.2.3 would prohibit trolling within the reserves and prohibit fishing using other fishing methods for any species except HMS species. Alternative 6.2.4 would allow only surface trolling within the reserves. Alternative 6.2.5 would prohibit the possession of any reef fish within the reserves. The Proposed Alternative, Alternative 6.2.7, would allow surface trolling within the reserves for coastal migratory pelagic species from May through October, request NMFS-HMS to prohibit fishing for HMS species, except to allow surface trolling for HMS from May through October, and prohibit fishing and possession for all reef fish species within the reserves. This alternative differs from all of the other alternatives in that it specifies an open season for trolling within the reserves.

The general costs and benefits of the designation of the two reserves were discussed in the last section. In this section, the discussion focuses on the costs of the various alternatives on fishing restrictions within the reserves. The differential effects of the alternatives for the duration of the reserves (see Section 8.4.2) are also presented. Throughout the discussions in this section, it is assumed that the fishing restrictions apply year round, except for Alternative 6.2.7.

In the original regulatory amendment that established the two reserves, it was estimated that closure of the two areas would reduce overall landings of gag by 2.28%, red grouper by 0.61%, black grouper by 1.5%, and other shallow-water grouper by 0.05%. Two major assumptions used in the estimation were: (1) the closed areas would cover all areas in Statistical Areas 6 and 8 with water depths between 30 and 50 fathoms and, (2) all commercial landings of shallow-water grouper in Statistical Areas 6 and 8 would follow the distribution of landings by water depth reported in the Florida Trip Ticket System. Although arguably a practical necessity, the first assumption would result in an overestimate of impacts of the proposed action since it would encompass a larger geographic range than the proposed action. Further, the second assumption was questioned by industry participants on the basis that reported depths of catch in the FTTS did not reflect actual catches by water depths. Industry participants contended that most grouper catches were caught in water depths below 50 fathoms while the FTTS information used showed that most catches of grouper were from areas deeper than 50 fathoms. If industry comments were true, then the second assumption would lead to an underestimation of impacts of the closed areas on commercial landings.

One way of modifying the first assumption is to further assume that catches of shallow-water grouper between 30 and 50 fathoms are uniformly distributed within these water depths. In this way, grouper catches in the reserves can be calculated as the product of grouper caught between 30 and 50 fathoms and the proportion of area within the reserves to total area between 30 and 50 fathoms. The Steamboat Lumps site, which is located in Statistical Area 6, covers an area of 108.4 square nautical miles and is 13.2% of the area between 30 and 50 fathoms in Statistical Area 6. The Madison-Swanson site, which is located in Statistical Area 8, covers an area of 110.6 square nautical miles and is 25.7% of the area between 30 and 50 fathoms in Statistical Area 8. These percentages can be assumed to represent the proportion of grouper caught between 30 and 50 fathoms that can be assigned to the two reserves. It should be noted that this approach does not differentiate between the different species of shallow-water grouper.

Modifying the second assumption involves using different information regarding the distribution of grouper catches within Statistical Areas 6 and 8. One possible source of additional information is the distribution of red grouper catches by water depth reported in the Trip Interview Program (TIP). Although some concerns have been raised regarding the representativeness of sampled trips for this program, it does

provide information on catches by water depths that appear to address the criticism leveled at the FTTS data regarding the distribution of grouper catches by water depths. Per TIP information for 1998-1999, about 55.4% of red grouper are caught between 30 and 50 fathoms. Information for other species is not available. It is, therefore, assumed that this distribution of catches by water depths also applies to the other species in the shallow water grouper complex.

Incorporating these modifications, closure of the Steamboat Lumps site would reduce catches of shallow-water grouper in Statistical Area 6 by 7.3% (0.132 x 0.554). The corresponding reduction for Statistical Area 8 as a result of closing the Madison-Swanson site is 14.2% (0.275 x 0.554). When expanded to the entire Gulf shallowe water grouper catch (using the proportion of catches in Statistical Areas 6 and 8 to catches in the entire Gulf), the reduction in catches are 3.11% for gag, 2.0% for red grouper, 3.70% for black grouper, and 0.71% for other species. As noted above, earlier estimates of catch reduction are: 2.28% for gag, 0.61% for red grouper, 1.51% for black grouper, and 0.5% for other groupers. While the new numbers are larger than earlier estimates, they are still relatively small, particularly when compared to normal annual variability of grouper landings. At any rate, the modified numbers are used to estimate the impacts of the various alternatives that would restrict fishing in the two reserves.

Table 1 provides information on commercial landings and ex-vessel revenues from shallow-water grouper catches in Statistical Areas 6 and 8. Landings of shallow-water grouper in both statistical areas have steadily increased over the years. In general, the same steady increase holds for each of the major shallow-water grouper species. A situation like this, or for that matter any steady increase or decrease in the variables under study, makes it difficult to ascertain the impacts of restricting harvest in the reserves. To illustrate this difficulty, two averages are shown in the table, one covering the period 1993-1999 and the other for the period 2001-2002. The year 2000 is left out since the reserves were established in June 2000. It may also be noted that logbook information for 2002 is incomplete so that data for this year are underestimates for the full year. For both statistical areas, the average landings of all shallow-water grouper for the period prior to the establishment of the reserves are lower than those for the period after the reserves were established. A similar observation can be made of each of the major grouper species, except for black grouper in Statistical Area 6. This information suggests that the reserves have not had any effect on reducing the harvest performance of the commercial fishery. However, the information does not necessarily imply that the reserves did not have any impacts at all on harvest. The increase in catches after the establishment of the reserves could very well be due to other factors, such as an increase in the general fish population or an increase in fishing effort in the open areas. With respect to the latter, an increase in fishing effort can also include fishing effort expended within the reserves. The following discussions attempt to explore these two possibilities.

Table 2 presents information on harvest of all species other than shallow-water groupers in Statistical Areas 6 and 8, harvest of all species other than shallow-water groupers in areas other than Statistical Areas 6 and 8, and harvest of shallow-water groupers in areas other than Statistical Areas 6 and 8. Average harvests of red grouper in areas other than Statistical Areas 6 or 8 appear to decline slightly after the establishment of the reserves, although this could potentially be due to the 2002 data being incomplete. However, comparing harvests for 1999 to those for 2001, a decline in harvest appears to be the case. This situation is rather surprising since these other areas were open for fishing, except for the February 15-March 15 closure which also applied to Statistical Areas 6 and 8. In the case of gag, a perceptible increase in catches after the establishment of the reserves can be observed. Black grouper experienced only a slight increase in catch after the establishment of the reserves. For these two species, harvests in other areas appear to follow the same pattern as those for Statistical Areas 6 and 8. Average harvests of other species (other than shallow-water grouper) declined slightly in Statistical Area 6 but increased perceptively in Statistical Area 6 after the establishment of the reserves. Average harvests of other species in other areas showed a relatively substantial decline, although again this could be due to the less than complete data for 2002. Although there appears to be some evidence that the increase in harvest of gag in statistical areas where the reserves are located may be partly due to the increase in overall fish abundance, a similar statement cannot be made for red grouper and other species.

Table 3 presents information on the number of boats that reported catching reef fish in Statistical Areas 6 and 8 and the number of trips these boats took to fish for reef fish in the two statistical areas. Averages for the period before and after the establishment of the reserves in June 2000 are also presented, with data for 2000 excluded in calculating the averages. The average total number of boats declined sharply after the establishment of the reserves, but this is most likely due to the fact that in the early 1990s, there were many boats that secured reef fish commercial permits in anticipation of the then pending moratorium on permits. During the last few years, in fact, the total number of boats in the commercial reef fish fishery has stabilized at around 1,200. The low number for 2002 is most likely due to incomplete logbook records. The period after the establishment of the reserves experienced a slight decline in the number of boats that fished in Statistical Area 6 or 8, and this was most likely due to the decline in the number of boats that fished in Statistical Area 6, since a slight increase in the number of boats fishing in Statistical Area 8 occurred after the establishment of the reserves. While the total number of trips for all areas in the Gulf declined for the period after the establishment of the reserves, an increase appeared to have occurred for Statistical Area 6 or 8, and this could be due to an increase for Statistical Area 8. A slight decrease in the number of trips occurred in Statistical Area 6. The information presented in Table 3 does not appear to support a conclusion that fishing effort increased after the establishment of the reserves. However, it should be cautioned that the number of boats and trips may not be a

sufficient measure of fishing effort since these variables do not incorporate hours fished or hooks utilized.

The foregoing discussion appears to rule out an increase in fishing effort as the main factor contributing to increases in harvest of groupers after the establishment of the reserves. There remains the possibility that general fish abundance may be the more relevant contributing factor. Since the reserves have been in existence for only a few years, it cannot be reasonably inferred that the reserves were the cause of any potential increase in fish abundance.

It is recognized that techniques, such as regression analysis, exist that can be used to determine a shift in harvest path as a result of changes in regulations, whether the path continues its upward or downward movement. But there is little that can be done with a limited number of observations, as in the current situation. ++++Only 7 observations of before and 2 observations after the establishment of the reserves so that using more complex estimating techniques is likely bound to provide inconclusive results. All that can be concluded at this point is that the effects of the reserves on reducing harvest of groupers and increasing fish abundance cannot be determined with any degree of certainty.

The lack of empirical evidence to determine whether or not the expected effects of the reserves on harvest did materialize does not, however, necessarily invalidate the expectation that the two marine reserves would reduce the harvest of species, especially groupers, that historically were caught in these areas. In fact, logic leads us to assert such contention. Existing evidence may have been confounded by the presence of other factors contributing to the observed increase in harvests. In the ensuing discussions of the effects of the various alternatives governing fishing within the reserves, the underlying assumption is that reserves would in fact have effects on fishing participants. Estimation of the costs of the various alternatives utilizes data from before the establishment of the reserves, since the post-designation data contains the effects of the reserves and other unexplained factors. As noted above, all alternatives are assumed to remain in effect year round.

Table 4 presents harvests and revenues for shallow-water groupers (SWG), coastal migratory pelagics (CMP), and other reef fish (ORF). Since the modified approach to estimate the effects of the reserves on landings and revenues does not distinguish the various shallow-water grouper species and non-grouper species, no specific information by particular species within each group is presented. Also, no information on HMS species is presented since the reef fish and coastal migratory logbook program does not adequately capture the harvests of these species.

For the purpose of estimating the reductions in commercial harvest due to the reserves, the modified percentage reductions discussed above are used. These are 7.3% for Statistical Area 6 and 14.2% for Statistical Area 8. Also, it is assumed that

other reef fish and coastal migratory pelagics are distributed throughout the two statistical areas in the same manner as shallow-water grouper. Using average landings and revenues for the 1993-1999 period from Table 4, the current harvest restrictions for the Steamboat Lumps site (located in Statistical Area 6) are estimated to reduce harvest by 97,000 pounds of SWG, 19,000 pounds of ORF, and 3,000 pounds of CMP. The corresponding revenue reductions are $194,000 for SWG, $23,000 for ORF, and $3,000 pounds of CMP. These restrictions applied to the Madison-Swanson site are estimated to reduce commercial harvest by 41,000 pounds of SWG, 25,000 pounds of ORF, and 14,000 pounds of CMP. The corresponding revenue reductions are $87,000 for SWG, $37,000 for ORF, and $21,000 for CMP. In essence, these may be considered the baseline annual effects of the reserves on commercial harvests and revenues. As such, harvests and revenues from elsewhere in the fishery would have to be increased by these amounts, or benefits of some other type would have to materialize to justify the establishment of the harvest restrictions in the reserves.

Estimates of the annual commercial harvest and revenue reductions under the various harvest restriction alternatives are presented in Table 5. If based solely on information presented in Table 4, Alternatives 6.2.2 and 6.2.3 would have the same effects as the current harvest restrictions (Alternative 6.2.6). Reductions under Alternatives 6.2.1, 6.2.4 and 6.2.5 are equal to one another and differ from those under current harvest restrictions only with respect to the non-inclusion of the effects on CMP species. The effects of Alternative 6.2.7 are similar in nature but larger in magnitude than those of Alternative 6.2.1 mainly because trolling for coastal migratory species is allowed only for six months of the year.

To aid in the following discussion, based on the results presented in Table 5, the alternatives may be grouped into two groups. Group 1 consists of Alternatives 6.2.1, 6.2.4, 6.2.5, and 6.2.7 and Group 2, Alternatives 6.2.2, 6.2.3 and 6.2.6. The two groups differ mainly in the inclusion or exclusion of harvest reductions for CMP species, or the seasonality of the trolling ban as with Alternative 6.2.7. Within each group, however, the alternatives have additional potentially differing impacts that are not captured in Table 5. Consider Group 1 first. Both Alternatives 6.2.1 and 6.2.4 would allow trolling within the reserves, but Alternative 6.2.1 is more specific in the species that can be harvested by trolling, namely only coastal migratory pelagic and HMS species. Alternative 6.2.4, on the other hand, does not specify the type of fish that can be harvested by trolling so that this alternative would allow the harvest of more species, including reef fish, than Alternative 6.2.1. Thus, Alternative 6.2.1 would result in larger reduction in harvest than Alternative 6.2.4. The harvest reduction under Alternative 6.2.5 may approximate that of Alternative 6.2.1 more than that of Alternative 6.2.4. However, Alternative 6.2.5 would impose a higher cost on vessels that may not be fishing in the reserves, since these vessels would not be allowed to traverse the reserves on their way to and from open reef fish fishing grounds. In addition, those vessels fishing within the reserves for species other than

reef fish would incur additional labor cost as harvested reef fish would have to be culled from their other catches, or these vessels have to select areas within the reserves where there is less likelihood of catching reef fish. This particular negative aspect of Alternative 6.2.5 is addressed by Alternative 6.2.7, which allows vessels with reef fish on board to transit the reserves under certain conditions, but this alternative would result in slightly larger landing and revenue reductions. In terms of impacts on vessels, the alternatives under Group 1 may be ranked, from lowest to highest negative impacts, in the following order: Alternative 6.2.4, Alternative 6.2.1, Alternative 6.2.7 and Alternative 6.2.5.

All alternatives under Group 2 would allow the harvest of HMS species only, but they potentially vary in their overall impacts. Alternatives 6.2.2 and 6.2.6 have virtually the same effects, although Alternative 6.2.6 would entail slightly lower administrative costs. However, if under Alternative 6.2.2, NMFS approves the Council request to implement compatible closures in the reserves, this Alternative would result in a larger harvest reduction than Alternative 6.2.6 and for that matter also Alternative 6.2.3. Alternative 6.2.3 has potentially higher negative impacts than the other two alternatives (assuming NMFS does not implement a compatible closure for HMS species under Alternative 6.2.3), because it would disallow the use of other fishing methods to harvest HMS species. Some fishermen may be more skillful using fishing methods other than trolling so that forcing them to switch gear in harvesting HMS species would impose higher costs not only in terms of gear cost but also in terms of fishing time. If NMFS does not implement a compatible closure for HMS species, the alternatives under Group 2 may be ranked, from lowest to highest negative impacts, as follows: Alternative 6.2.6, Alternative 6.2.2, and Alternative 6.2.3. If NMFS decides to close the reserves to fishing for HMS species, Alternative 6.2.2 would entail the highest negative impacts among the alternatives.

Table 6 shows the total revenue effects of the various alternatives for restricting fishing within the reserves when considered in conjunction with the various alternatives for extending the duration of the marine reserves. Although the two reserves and corresponding fishing restrictions have been in effect since June 2000, the calculations of revenue impacts shown in Table 6 assume that the various alternatives would begin to take effect in June 2004. This is why zero entries are found in the row for the status quo alternative which does not extend the duration of the marine reserves (Alternative 6.1.7). This approach lends ready interpretation of the non-zero entries as impacts relative to the status quo of not extending the duration of the marine reserves. Implicit in all these is the assumption that fishing restrictions in the Madison-Swanson and Steamboat Lumps sites are coterminous with the duration of the marine reserve designation.

Revenue losses would range from $1.236 million to $1.323 million if fishing restrictions within the marine reserves were extended for another four years. Revenue losses would more than double if the term of extension were 10 years. The

effects of the Proposed Alternative for fishing restriction (Alternative 6.2.7) would fall within the mentioned range, regardless of the choices for extension of the marine reserve designation. As can be expected, the revenue reductions under the Proposed Alternative of extending the marine reserve designation for six years (Alternative 6.1.2) would fall between those for four and 10 years. This rather monotonic increase in revenue losses over the years abstracts from any potential increase in harvests around the marine reserves.

For the period 1993-2002, an average of 356 vessels caught reef fish and other species in Statistical Areas 6 or 8 (see Table 3). These vessels comprise the universe that would be directly affected by fishing restrictions within the reserves. Understandably, there are vessels that would be minimally affected and some that would experience larger reductions in harvests if prohibited from fishing in certain parts of the two statistical areas. Most of these vessels catch a greater portion of their landings from Statistical Area 6. There are reported to be 60 to 70 vessels that catch most of their fish from 30 to 50 fathoms of water in Statistical Area 6. The average crew size for these vessels is approximately 2 to 3 persons.

Of the 356 vessels harvesting reef fish and other species in Statistical Areas 6 and 8, only some are likely to be highly dependent on catches from the two marine reserves. Any reductions in vessel catch and income would tend to materially affect the fishing operations of these vessels and the livelihood of the crew. Waters (1996) reported that, on average, a high-volume vessel (top 25% in landings) with vertical lines in the eastern Gulf earned approximately $53,000 per year while low-volume boats (bottom 25% in landings) earned $21,000 per year. In addition, the captain and crew of high-volume vessels together earned $24,000 per year or 45 percent of total revenues while those of low-volume vessels earned $8,000 per year or 38 percent of total revenues. To compensate for any potential revenue reduction due to fishing restrictions in an area, affected vessels would have to fish in other areas and compete with other commercial vessels and recreational vessels. This practice would likely not fully offset revenue losses and would likely increase fishing costs, as well as potentially adversely affect the fishing of other vessels in the area.

In addition to the vessels that would be affected by any fishing restrictions within the reserves, dealers receiving fish from the affected vessels will also experience adverse impacts. Table 7 shows the number of dealers that handled reef fish and other species caught in Statistical Areas 6 and 8. For the period 1993-2002, an average of 87 dealers received reef fish that were harvested in the two mentioned statistical areas. Some dealers received less than 100 pounds while others received more than 200,000 pounds. These dealers comprise the universe of dealers that would be directly affected by the fishing restrictions within the reserves. As with the case for vessels, there are dealers that would be minimally affected and there are those that would face large reductions in fish received from various vessels fishing in the area that would be

subject to fishing restrictions. Alternative supply sources may not be readily available, or if available, the fish supplied may cost more or be of lower quality.

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

One other group that would be affected by fishing restrictions on the two marine reserves is the recreational sector, including for-hire vessels. There is very little information on the activities of this sector within the reserves. It can be inferred from the lawsuit brought by the CCA in response to the original establishment of the reserves, however, that there has traditionally been a good deal of recreational fishing activities within the two marine reserves. Current rules (Alternative 6.2.6 or Alternative 6.2.2) only allow the harvest of HMS species by both the commercial and recreational sector, and these species can be harvested by any allowable methods of fishing. To the extent that the recreational sector also used to harvest other species in these areas, such as reef fish and coastal migratory pelagics, the establishment of the reserves and accompanying restrictions must have negatively affected both the harvest of fish and overall fishing experience of anglers within the reserves. Continued losses in consumer surplus would likely result from adoption of any of the alternatives for fishing restrictions within the reserves. In addition, if some anglers reduced or cancelled trips through the for-hire vessels as a result of fishing restrictions within the reserves, the for-hire fishery would also experience reductions in revenues and potentially profits. If trolling is an important fishing method by recreational anglers fishing within the marine reserves, then allowing this fishing method within the reserves, as in Alternatives 6.2.1 and 6.2.4 would result in lower negative impacts to the recreational fishery than the other alternatives.

The long-term benefits from the fishing restrictions within the two marine reserves would be those that accrue to the enhancement and protection of the stocks, the long-term sustainability of the stocks, and enhanced harvest or other use opportunities of the fishery dependent on these stocks. While gag is the major species intended to be protected, other species (e.g., red grouper) would also be protected. The magnitude of these benefits cannot be estimated with available information. However, total SWG commercial have ranged from 6.2 mp to 9.4 mp from 1993 through 2002, averaging 7.1 mp from 1993-99 (pre-marine reserve) and 8.4 mp in 2001-2002, while recent recreational harvests of just red grouper and gag have averaged approximately 4.5 mp. Thus, the resource that this proposed amendment is attempting to protect and

enhance has supported a fishery in excess of 12 mp annually, and over $15 million in ex-vessel revenues.

Fishing restrictions, such as those considered for the two marine reserves that impose limitations on a sub-sector of the fishery participants for the purpose of providing long-term benefits to the overall stock and all fishing participants, introduce, in addition to the direct impacts discussed above, the issues of equity and allocation. Where restrictions are localized, as in the proposed action, it is typical that certain sectors of the fishery are more dependent upon the stock in those areas, such as the commercial and recreational fishery participants described above, and would be more constrained by the proposed restrictions. Benefits, however, would accrue immediately to those who receive non-use benefits and who bear none of the costs of the restriction, while benefits that accrue to enhanced stock abundance, resulting in potentially relaxed harvest restrictions or higher or more economically produced harvests elsewhere are received by the general fishery. Thus, a situation is created whereby any net benefits that may result from fishing restrictions within the reserves would be distributed in a disproportional manner because a certain segment of the fishery bears the greater costs of the restrictions.

Another issue that accompanies fishing restrictions within the two marine reserves relates to the costs of monitoring and enforcing the restrictions. Certainly, the more areas closed the higher the costs would be, particularly if the closed areas are individually small in geographical scope. Both intentional and unintentional violations would be high in such a situation. Also, it is easier and less costly to observe fishing restriction violations in a marine reserve where all fishing is prohibited compared to a reserve where only certain fishing methods or species prohibitions apply. Additionally, enforcement decisions in a fishing prohibited reserve requires simply observation of the boundaries of the reserve and determination that these boundaries have been violated by fishing effort as opposed to also having to determine whether a specific fishing practice (gear and/or species) has been also violated. A vessel monitoring system (VMS) may be developed to enhance enforcement, but understandably, there are costs that would be expended by both the government and industry with this type of a system (see Amendment 16A to the Reef Fish FMP for a discussion of the costs involved in developing and maintaining a VMS). For the present time, enforcement of the proposed area closures would be included as part of the routine enforcement activities around this area.

8.4.4 Seasonal Regulations

There are three alternatives considered under this section. The Proposed Alternative, Alternative 6.3.3 would continue the current annual application of harvest restrictions and prohibit fishing within the two marine reserves year-round. Alternative 6.3.1 would apply fishing restrictions within the reserves only during the peak gag

spawning season of February through March. Alternative 6.3.2 would apply fishing restrictions within the reserves during the entire gag spawning season, December through May.

The alternatives to the Proposed Alternative would cushion the negative effects of the fishing restrictions within the reserves. Whether or not shorter periods of harvest restrictions within the reserves would still achieve the intended protection to spawning aggregations and adult male depends on whether there are significant variations in the spawning months from year to year. This would be more of a problem for Alternative 6.3.1 than for Alternative 6.3.2. A year-round applicability of fishing restrictions (Alternative 6.3.3) would eliminate this problem. If the shorter periods can accomplish the intended job, then they would be the more preferable alternatives from an economic standpoint, because the benefits would still be achieved at a lower cost to participants.

Table 8 presents 1993-1999 average monthly harvests and revenues of commercial vessels fishing in Statistical Areas 6 and 8. Although data for 2000, 2001, and 2002 are available, they are not used to arrive at monthly averages shown in Table 8 since these years encompass the period during which the current restrictions have been in place, thus altering historic harvest patterns. Assuming that fishing restrictions apply to all three groups of species and recalling that the Steamboat Lumps site accounts for 7.3% of total catches from Statistical Area 6 and the Madison-Swanson site accounts for 14.2% of total catches from Statistical Area 8, Alternative 6.3.1 would reduce harvest by 11,000 pounds of SWG, 2,000 pounds of ORF, and 400 pounds of CMP in Statistical Area 6; by 7,000 pounds of SWG, 4,000 pounds of ORF, and 2,000 pounds of CMP in Statistical Area 8. Total annual harvest reductions under Alternative 6.3.1 would amount to about 26,000 pounds, with an ex-value of $47,000. Alternative 6.3.2 would reduce harvest by 41,000 pounds of SWG, 8,000 pounds of ORF, and 1,000 pounds of CMP in Statistical Area 6; by 22,000 pounds of SWG, 12,000 pounds of ORF, and 7,000 pounds of CMP in Statistical Area 8. Total harvest reductions under Alternative 6.3.2 would be about 93,000 pounds for an ex-vessel value of $169,000.

Table 9 shows the revenue effects of the various alternatives for restricting fishing within the reserves on a seasonal basis when considered in conjunction with the various alternatives for fishing restrictions within the reserves and various alternatives for extending the duration of the marine reserves. Although the two reserves and corresponding fishing restrictions have been in effect since June 2000, the calculations of revenue impacts shown in Table 9 assume that the various alternatives would start to take effect in June 2004. This is why zero entries are found in the row for the status quo alternative which does not extend the duration of the marine reserves (Alternative 6.1.7). This approach lends ready interpretation of the non-zero entries as impacts relative to the status quo of not extending the duration of the marine reserves. Implicit in all these is the assumption that fishing restrictions

in the Madison-Swanson and Steamboat Lumps sites are coterminous with the duration of the marine reserve designation.

Alternative 6.2.7 is not included in Table 9 because it already has its own unique seasonal component with respect to the applicability of fishing restrictions within the marine reserves. Combining it with any of the three alternatives on seasonal regulations would give rise to certain inconsistencies, depending on how the combination is interpreted, or one of the alternatives is superfluous. Consider, for example, the combination of Alternative 6.2.7 and Alternative 6.3.1. Both alternatives prohibit fishing, including trolling for coastal pelagics (and HMS species) in February and March, and both alternatives also allow trolling for coastal pelagics from May through October, so in this case there is no inconsistency. But in the months of November through January and April, one alternative would prohibit fishing of any species and any gear type while the other would allow fishing and any gear type. If in this case Alternative 6.2.7 supersedes Alternative 6.3.1, the latter alternative becomes unnecessary. A similar situation arises for the other alternatives on seasonal fishing regulations. Considering that both Alternatives 6.2.7 and 6.3.3 are Proposed Alternatives, one effective way of combining the two alternatives but avoiding inconsistencies is to consider Alternative 6.2.7 as superseding Alternative 6.3.3.

Fishing restrictions under Alternatives 6.3.1 and 6.3.2 may be expected to be accompanied by an increase in effort before and after the effective period of the restrictions. The two marine reserves, in particular, would likely experience intensive fishing pressure when the restrictions are lifted, and depending on variability of the spawning period, the effectiveness of the reserves in protecting spawning aggregations would be lessened. Male gag that remain offshore after the spawning period are particularly susceptible to being caught. This may partially negate the intent of the reserves to protect the male gag population. However, it should be noted that fishing costs may be lower when fishermen have access to a portion of the spawning aggregations.

In the absence of more refined information, it is assumed that the same number of commercial vessels and dealers as in the previous section would be affected by the various seasonal alternatives. It should be noted that the negative impacts on these entities would be less when fishing restrictions apply only for a part of the year. The recreational fishery would also experience less negative impacts when restrictions are limited to only a portion of the year, such as those under Alternative 6.3.1 and 6.3.2

The various alternatives on seasonal applicability of fishing restrictions within the reserves entail different enforcement implications. A year-round applicability, such as under Alternative 6.3.3, provides more flexibility to enforcement personnel in terms of scheduling activities to enforce the regulations, particularly in the face of limited enforcement resources for fishery-related matters. Enforcement activities for

the marine reserves may be conducted in conjunction with other enforcement activities. A shorter period when restrictions are in place would demand the allocation of resources to enforce regulations within the reserves. Overall, though, a shorter the period requiring enforcement activities may entail lower total enforcement costs.

8.5 Public and Private Costs of Regulation

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 amendment include:

Council costs of document preparation, meetings, public hearings, and information dissemination..... $57,732

NMFS administrative costs of document preparation, meetings and review..... $15,000

Law enforcement costs..... unknown

The Council and NMFS costs of document preparation are based on staff time, travel, printing, and any other relevant items where funds would be expended directly for this specific amendment. The NOAA office for law enforcement, Southeast Enforcement Division, does not have an enforcement presence at either Steamboat Lumps or Madison Swanson. Therefore their costs are presently considered minimal. The United States Coast Guard is responsible for at-sea enforcement, which includes the two Marine Protected Areas of this amendment, and the United States Coast Guard receives approximately $500 million annually for Magnuson Act enforcement (Steele 2002, personal communication).

8.6 Determination of Significant Regulatory Action

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

For the period 1993-2002, a total of 1,338 boats reported landings of reef fish caught in the Gulf of Mexico. Of this number, an average of 356 boats reported fish caught in Statistical Areas 6 or 8. These boats took 2,598 trips to fish at least partly in the two statistical areas, harvesting a total of 2.8 million pounds of all species for an ex-vessel value of $5.3 million. Considering this size of the commercial fishery that would be affected by any fishing restrictions within the two reserves, a $100 million annual impact on the economy due to this amendment is very unlikely to arise.

Based on available information, the largest annual reduction that may result from this proposed amendment is 201,000 pounds of fish with an ex-vessel value of $365,000. Relative to the entire reef fish fishery or shallow-water grouper fishery, this harvest reduction is relatively minuscule such that any impacts on prices of groupers in particular and reef fish in general to the consumers would be relatively small to non-existent. Some vessels may experience cost increases as they try to recoup losses in harvest and revenues due to fishing restrictions within the reserves. Some may also have to travel farther to fish and thus incur higher fishing costs. Although no quantitative estimate of such cost increase can be made, it is likely that such cost increases may not be substantial. The reserves and accompanying fishing regulations have been in effect since June 2000, and very likely some of the affected vessels may have adapted to the changes. Since the overall changes in revenues and costs are likely to be small, most vessels are likely to continue participating in the fishery. As shown in Table 3, the number of vessels fishing in Statistical Areas 6 or 8 slightly fell from an average of 354 before the establishment of the reserves to 348 after the establishment of the reserves. As discussed in Section 8.4.3, such decline in the number of boats cannot be attributed to the establishment of the marine reserves. In addition, those vessels that may have ceased fishing in the two statistical areas may have shifted their effort to other areas. In view of this, employment and investment in the commercial fishery and support industries are expected to be minimally affected. With minimal effects on the operations of vessels and their support industries, communities where such operations are located are unlikely to face any major change in activities.

Measures in this amendment do not interfere or create inconsistency with an action of another agency, including state fishing agencies. This was the finding when the two marine reserves were established in June 2000, and since then no action by a state or another federal agency has been identified for which continuation of the restrictions within the two marine reserves would be inconsistent. Part of the settlement entered into by NMFS and CCA as a result of the lawsuit brought by the latter group held in abeyance the Council's request to NMFS to implement compatible regulations with respect to fishing activities within the reserves pending the undertaking of certain research studies on the two marine reserves. The alternatives considered in this amendment are broad enough to afford the Council flexibility to select options that may not contravene the provisions of the settlement. In fact, the Proposed

Alternative to allow trolling for coastal pelagics (and possibly HMS species) would likely satisfy the objections raised by the recreational sector.

At present, none of the entities involved in the fishery in Statistical Areas 6 or 8 and affected by this amendment participate in any government sponsored entitlement, grants, user fees, or loan programs. Permit fees are the only fees that may approximate user fees. Since eligibility to renew permits is partly based on the more than 50% income requirement from commercial or charter fishing, there is a possibility that those adversely affected by measures in this amendment would not meet that requirement. However, such possibility is remote considering the size of harvest and revenue reductions from the measures in this amendment. In addition, such possibility is inherent in any fishery regulatory actions that would impose limits on certain types of fishing activities. In this manner, the measures in this amendment would not materially alter the permit fee system established for the commercial reef fish fishery. It is then concluded that measures in this amendment do not affect any entitlements, grants, user fees, or loan programs.

The measures in this amendment do not raise novel legal or policy issue. The two marine reserves in question and their accompanying regulations have been in place since June 2000. Thus, marine reserves are no longer a new management tool that would raise specific policy issues not yet encountered to date.

The foregoing discussions relative to the various issues enumerated in E.O. 12866 lead to the conclusion that, if enacted, the set of actions in this amendment would not constitute a significant regulatory action.

9.0 REGULATORY FLEXIBILITY ACT ANALYSES

9.1 Introduction

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

With certain exceptions, the RFA requires agencies to conduct an Initial Regulatory Flexibility Analysis (IRFA) for each proposed rule. The IRFA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. An IRFA is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." 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.

9.2 Description of the Reasons Why Action by the Agency Is Being Considered

The need and purpose of the actions are set forth in Section 3 of this document and are incorporated herein by reference. In summary, the two marine reserves and accompanying fishing restrictions within these areas were established in June 2000 and will sunset in June 2004. This amendment is primarily intended to address the expiration of the marine reserve designation and the fishing restrictions within the marine reserves.

9.3 Statement of the Objectives of, and Legal Basis for, the Proposed Rule

The specific objectives of this action are described Section 3 of this document and are incorporated herein by reference. The two marine reserves and accompanying fishing restrictions are intended to continue to protect gag spawning aggregations and a portion of the male population that remain offshore after the spawning period. Additionally, the continuation of the marine reserves and accompanying fishing restrictions can provide a platform for undertaking research on the effectiveness of marine reserves as a fishery management tool.

The M-SFCMA, as amended, provides the legal basis for this proposed rule.

9.4 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 reef fish 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 commercial reef fish fishery in the U.S. Gulf of Mexico. Although permits are tied to vessels so that at any one time a one-

to-one correspondence exists between permits and vessels, some vessels may not fish in one year. This is borne out by information provided in Table 3 which shows, on an annual basis, the number of vessels submitting logbooks and reporting some landings. For the period 1993-2002, an annual average of 1,338 boats reported landing reef fish caught in the Gulf of Mexico. Of this number, an average of 356 boats reported landing fish caught in Statistical Areas 6 or 8. These boats took 2,598 trips to fish, at least partly, in the two statistical areas and harvested a total of 2.8 million pounds of all species for an ex-vessel value of $5.3 million. It cannot be ascertained as to how many of the vessels that fished in Statistical Areas 6 or 8 actually fished inside the two marine reserves before the fishing restrictions took effect in June 2000.

Various gear types are used to fish in Statistical Area 6 or 8. The dominant gear types are vertical lines, longlines, and fish traps. Nets, diving with or without powerheads, and trolling accounted for a very small amount of catches in Statistical Area 6 or 8. According to TIP data used to assign catches by water depths, a relatively small amount of trap catches were made in depths 30 fathoms or greater. In this case, it is very likely that of the dominant gear types, longlines and vertical lines were the ones used in fishing within the two reserves. Of the other gear types, trolling is perhaps the only gear used in fishing within the reserves. Thus, the continuation of the marine reserves and their accompanying fishing restrictions would mainly affect longline and vertical line vessels. Vessels trolling for HMS and coastal migratory pelagics would, however, also bear part of the burden of the proposed measures in this amendment.

Also affected by the measures proposed in this amendment are fish dealers, particularly those that receive fish from vessels that harvest or used to harvest fish within the two reserves. About 431 dealers located in the five Gulf states received groupers from participants in the reef fish fishery. Of this number, about 87 dealers, all of which are located in Florida, would be directly affected by the measures in this amendment. About 54 of the 87 dealers generally receive less than 10,000 pounds of fish each year while 11 dealers generally receive more than 80,000 pounds of fish.

Longline vessels are reported to have sold their grouper catches to dealers located in various locations in Florida, notably Key West (11 vessels), Fort Myers Beach (10 vessels), Cortez (11 vessels), Madeira Beach (54 vessels), St. Petersburg (34 vessels), Treasure Island (16 vessels), Apalachicola (11 vessels), Port St. Joe (11 vessels), and Panama City (15 vessels). Vertical line vessels sell their catch to dealers located in such places as Islamorada (23 vessels), Key Largo (17 vessels), Key West (115 vessels), Marathon (37 vessels), Summerland Key (49 vessels), Tavernier (12 vessels), Fort Myers (15 vessels), Fort Myers Beach (13 vessels), Cortez (11 vessels), Tampa (38 vessels), Madeira Beach (21 vessels), Redington Shores (13 vessels), St. Petersburg (26 vessels), Tarpon Springs (38 vessels), Treasure Island (14 vessels), Hudson (14 vessels), Crystal River (20 vessels), Gainesville (17 vessels), Steinhatchee (20 vessels), Tallahassee (22 vessels), Panacea (24 vessels), St. Marks

(19 vessels), Apalachicola (48 vessels), Eastpoint (30 vessels), Port St. Joe (27 vessels), Panama City (48 vessels), and Destin (31 vessels). Notable locations of dealers to whom fish trap vessels sell their catch are Naples (10 vessels), Crystal River (10 vessels), and Steinhatchee (9 vessels).

The measures in this amendment would also affect for-hire vessels, although there is no information to determine how many of these vessels historically fish within the two reserves. For-hire vessels that fish for reef fish, coastal migratory pelagics, or HMS species within the reserves would bear most of the effects of the measures in this amendment. Once displaced from the reserves, affected vessels would have to fish elsewhere and compete with other for-hire vessels as well as commercial vessels. As is the case with the commercial sector, most of the effects will be borne by for-hire vessels based in Florida.

Holland et al. (1999) considered the following as major activity centers for charterboats in Florida: Miami and Fort Lauderdale on the Atlantic; Naples and Fort Myers/Fort Myers Beach on the Peninsula Gulf; Destin, Panama City/Panama City Beach and Pensacola on the Panhandle Gulf; and, Key West, Marathon and Islamorada in the Florida Keys. The major activity centers for headboats are: Miami on the Atlantic; Clearwater and Fort Myers/Fort Myers Beach on the Peninsula Gulf; Destin and Panama City/Panama City Beach on the Panhandle Gulf; Islamorada, Key West and Marathon in the Florida Keys. Among these activity centers, those in the Gulf area of Florida are likely to be affected by the proposed rule more than those in other areas.

9.5 Description of the Projected Reporting, Record-keeping and Other Compliance Requirements of the Proposed Rule

The proposed rule would not impose any changes in record-keeping for affected entities. Compliance requirements would change slightly with respect to the use of trolling within the reserves, with the Proposed Alternative allowing the use of this gear to harvest coastal migratory pelagics (and HMS species depending on the decision of NMFS) within the reserves during the months of May through October. In addition, there are requirements that vessels have to comply with when transiting the two marine reserves. These requirements are stipulated in Section 6.2 and incorporated herein by reference. In essence, these requirements would aid in reducing travel costs by allowing vessels with reef fish on board to transit the two reserves.

9.6 Identification of All Relevant Federal Rules Which May Duplicate, Overlap or Conflict with the Proposed Rule

No duplicative, overlapping, or conflicting Federal rules have been identified. However, it deserves mentioning that while the Council has jurisdiction on managed

species within the two reserves, NMFS-HMS has jurisdiction over HMS species in general regardless of where the species are caught and fishing method used. Coordination with respect to fishing of HMS species within the reserves has be to achieved. The approach proposed in this amendment is to request NMFS-HMS to implement compatible regulations. However, the issue pertaining to trolling for HMS species within the reserves may still present coordination problems between the two groups.

9.7 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 for-hire industry (charter boats and headboats) as a firm with receipts of up to $6 million per year. The SBA benchmark for a fish dealer or processing facility is a business with fewer than 500 employees.

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

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

In view of the fact that mainly those vessels fishing in Statistical Areas 6 or 8 would be affected by the proposed rule, the more relevant vessel descriptions depicted above are those for the eastern Gulf vertical line vessels, bottom longline vessels, and fish trap vessels. The affected vessels can also be narrowed down to vertical line and bottom longline vessels, since fish traps are unlikely to be used within the two marine reserves.

There are 1,515 for-hire vessels with permits to fish for reef fish only or reef fish and coastal pelagics in the Gulf. Holland et al. (1999) reported that in Florida the average

annual receipts of charter vessels, as reported by respondents, total $56,000 and those of headboats, $140,000. However, based on fees, number of passengers and number of trips, average annual receipts total $68,000 for charterboats and $324,000 for headboats. Charterboats have an average length of 37 feet and headboats, 62 feet.

Average employment information per reef fish dealer is not known. Although dealers and processors are not synonymous entities, Keithly and Martin (1997), however, reported total employment for reef fish processors in the Southeast at approximately 700 individuals, both part and full time. It is assumed that all processors must be dealers, yet a dealer need not be a processor. Further, processing is a much more labor intensive exercise than dealing. Therefore, given the employment estimate for the processing sector, it is assumed that the average dealer employment would not surpass the SBA employment benchmark.

Based on the gross revenue and employment profiles presented above, all fishing vessels and reef fish dealers potentially affected by the proposed regulations are classified as small entities. Based on this determination and on the earlier discussion regarding the number of vessels affected by the proposed rule, it is concluded that the proposed rule would affect a substantial number of the small entities.

9.8 Significant Economic Impact Criterion

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

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

All 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 some variations among fishing operations in terms of vessel revenues and size, as described above. However, there is not enough information to determine which type and size of vessels would be affected more than others by continuing the marine reserves and their accompanying fishing restrictions.

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

Holland et al. (1999) provided no estimates of net revenue or profit for the for-hire vessels in Florida. In addition, the extent of for-hire vessel participation within the marine reserves is unknown. It is, therefore, not possible to provide even a general estimate of the impacts of the two marine reserves on the profitability of for-hire vessels.

Waters (1996) reported the following net income (defined as gross receipts less routine trip costs) information from commercial reef fish vessels, with numbers in parentheses representing percent to gross receipts:

High-volume vessels using vertical lines:		
Northern Gulf:	$28,466	(26)
Eastern Gulf:	$23,822	(35)
Low-volume vessels using vertical lines:		
Northern Gulf:	$6,801	(28)
Eastern Gulf:	$4,479	(18)
High-volume vessels using bottom longlines:		
Both areas:	$25,452	(22)
Low-volume vessels using bottom longlines:		
Both areas:	$14,978	(17)
High-volume vessels using fish traps:	$19,409	(21)
Low-volume vessels using fish traps:	$21,025	(24)

As with the for-hire vessels, there is little information regarding the specific profitability of operations of commercial vessels fishing within the two marine reserves. But some information discussed in the RIR taken in conjunction with the information above on net revenues may provide some insights into the impacts of fishing restrictions within the reserves on vessel profitability.

There are about 356 vessels that may be affected by fishing restrictions within the two marine reserves. The Proposed Alternative on fishing restrictions is expected to reduce revenues by about $352,000 annually. If all vessels are affected equally by the proposed fishing restrictions, each vessel would stand to lose approximately $989 of revenues per year. This figure represents approximately 1%-4% of average gross revenues for fishery participants across all gear types. As noted above, however, mainly the longline and vertical line vessels would be affected by the continuing the fishing restrictions within the reserves. Assuming only longline and vertical line vessels operate in these areas, the number of vessels affected by the proposed regulations would be reduced to 297 (356 minus 59). The revenue loss per boat would then be approximately $1,185 per year. This figure represents approximately 2%-5% of average gross revenues for fishery participants that use these gear types. Thus, although these losses cannot be directly translated into losses in profits, it does not appear that a significant loss in profits should be expected. It is possible that some vessels would be affected more severely than others, but it cannot be determined as to how many vessels would fall in this category. In general, however, it is determined that the profitability criterion would not be met.

The profit profile for dealers is not known. The projected reduction in ex-vessel sales ($352,000) as a result of the proposed rule equals approximately 11% of total SWG revenues generated from harvests in Statistical Areas 6 and 8. It is unlikely, however,

that any dealer with substantial business operations would be wholly dependent upon harvests from just these areas. Thus, the potential reductions in harvests as a result of the proposed rule should minimally affect dealers.

9.9 Description of the Significant Alternatives to the Proposed Rule and Discussion of How the Alternatives Attempt to Minimize Economic Impacts on Small Entities

There are no direct adverse impacts expected to occur as a result of the designation of two proposed areas as marine reserves. Therefore, the discussion of significant alternatives to this action is not relevant.

There are six alternatives to the Proposed Alternative that would establish harvest restrictions in the reserves. The Proposed Alternative, Alternative 6.2.7, would allow surface trolling within the reserves for coastal migratory pelagic species from May through October, request NMFS-HMS to prohibit fishing for HMS species, except to allow surface trolling for HMS from May through October, and prohibit fishing and possession for all reef fish species within the reserves. Alternative 6.2.6 would continue current restrictions, prohibiting fishing for any species, except HMS species, within the reserves. Alternative 6.2.1 would allow trolling within the reserves for coastal migratory pelagic species and blackfin tuna, not renew request to NMFS that they implement compatible closure for species under their jurisdiction, and prohibit fishing for all other species. Alternative 6.2.2 would prohibit all fishing within the reserves and request NMFS-HMS to implement a compatible closure for species under their jurisdiction. Alternative 6.2.3 would prohibit trolling within the reserves and prohibit fishing using other fishing methods for any species, except HMS species. Alternative 6.2.4 would allow only surface trolling within the reserves. Alternative 6.2.5 would prohibit the possession of any reef fish within the reserves.

In terms of impacts on revenues of small entities, these alternatives may be grouped into two groups, with the Proposed Alternative falling approximately in the middle of the two groups with regards to fishing restrictions. The different impacts, however, do not differ substantially from one alternative to another. The Proposed Alternative provides for a middle-of-the-road approach with respect to trolling for coastal migratory pelagic species (and HMS species) by allowing the gear to be used within the reserves to harvest these species for six months out of every year. Allowing trolling year-round would have reduced the negative impacts on small entities, but would possibly interfere with the ability of the reserves to achieve the Council's goal of protecting gag spawners during the spawning months of December through May, with a peak in February and March. The Proposed Alternative was, therefore, selected since it was expected to best achieve the Council's objectives at the lowest cost.

Three alternatives were considered on seasonal duration of the proposed fishing restrictions. Alternative 6.3.3, the Proposed Alternative, would continue the current annual application of the fishing restrictions and prohibit fishing within the two marine reserves year-round. Alternative 6.3.1 would apply fishing restrictions within the reserves only during the peak gag spawning season of February through March. Alternative 6.3.2 would apply fishing restrictions within the reserves during the entire gag spawning season, December through May.

Limiting the seasonal duration of the fishing restrictions would reduce the negative effects of the fishing restrictions within the reserves. However, reducing the seasonal duration of the fishing restrictions reduces the protection of the stocks, particularly through increasing the likelihood that the restrictions will not capture the potential seasonal variability of the spawning months for the target species. A year-round applicability of fishing restrictions (Alternative 6.3.3) would eliminate this problem. Thus, the Council concluded that an annual application of the fishing restrictions was necessary to achieve their objectives.

9.10 Conclusion

Although a substantial number of small entities are likely to be affected by the measures in this amendment, the impacts of these measures on profitability are not expected to be significant. It is, therefore, concluded that the proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities.

10.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

Madison-Swanson and Steamboat Lumps comprise a portion of a broad area off the Gulf coast of Florida that comprises a variety of habitats, much of which is suitable for reef fish. In general, reef fish are widely distributed in the Gulf of Mexico, occupying both pelagic and benthic habitats during their life cycle. A planktonic larval stage lives in the water column and feeds on zooplankton and phytoplankton. Juvenile and adult reef fish are typically demersal and usually associated with bottom topographies on the continental shelf (<100m) which have high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. For example, juvenile red snapper are common on mud bottoms in the northern Gulf, particularly off Texas through Alabama. Also, some juvenile snapper and grouper such as mutton, gray, red, dog, lane, and yellowtail snappers, jewfish, and red, gag, and yellowfin groupers have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems. More detail on hardbottom substrate and coral can be found in the Fishery Management Plan (FMP) for Corals and Coral Reefs (GMFMC and SAFMC, 1982) and in the

Generic Amendment for Addressing Essential Fish Habitat Requirements (GMFMC 1998b).

The marine reserve at Madison-Swanson is a 115 square nautical mile area that was described by Moe under the name Whoopie Grounds. Moe's (1963) fishing survey denoted the area as having rock ledges with relief up to five fathoms (9 m). There is also plenty of recent anecdotal fishing information from port samplers (Debbie Fable, pers. Comm.). This site also shows confirmed outcrops of limestone and reef fish habitat from the reef fish survey (Chris Gledhill, Pascagoula NMFS lab, pers. comm.). Also, transects through this area by Ludwick and Walton (1957) showed pinnacle trends. Some of these formations have names- Madison and Swanson's Rocks (Chris Gledhill and Chris Koenig, pers. comm.). Substrate was dominated by sand-clay (40% - 95%), but rock (30%) and soft corals (14%) were found in greatest amounts along the Ridge at the 74 meter isobath, and at the Pinnacles and the Snake strata (presentation by Andrew David to Gulf Council, May 12, 2003).

The marine reserve at Steamboat Lumps is a 104 square nautical mile area due west of Clearwater, Florida. and southwest of the Middle Grounds at a depth of 40-50 fathoms. These are prominent features reported to be low relief areas with limestone rock (Chris Gledhill and Chris Koenig, pers. comm.). Substrate was dominated by sand-clay (60% - 95%), but diverse composition was found along the Ridge, which had rock (4%) and soft coral (7%) (presentation by Andrew David to Gulf Council, May 12, 2003).

Note: The area described as Steamboat Lumps in this document (and in Appendix A) differs in location from the area described as Steamboat Lumps described by Moe (1963). The area described by Moa as Steamboat Lumps is centered at 27°55' N latitude, 84°30' W longitude. This puts it southeast of the area described as Steamboat Lumps in this document, by about ten nautical miles to the nearest edge or 17 nautical miles center-to-center. Consequently, the description of Steamboat Lumps given by Moe (1963) may not be applicable to the area in this document[20]. The descriptions given in this section and in the appendices to this document are applicable, however.

Research has been conducted at both Madison-Swanson and Steamboat Lumps by Andrew David and Christopher Gledhill of NMFS during February and April, 2001, using panoramic video camera arrays, digital cameras, chevron traps, and an underwater remotely operated vehicle (ROV). At Madison-Swanson, spawning aggregations of gag and/or scamp were confirmed at 11 sites and suspected at five others through video surveillance from 20 ROV dives. Researchers observes a total

[20] Moe (1963) described Steamboat Lumps as flat bottom of sand and shell with mild relief caused by flat limestone rock; the rocky area covers a few square miles; many colonial tunicates cover the rocks. Fishes taken in the area include red grouper, red snapper, black grouper (gag), and scamp.

of 55 fish taxa in 2001, and 66 fish taxa in 2002. Species collected included gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red grouper (*Epinephelus morio*), snowy grouper (*Epinephelus niveatus*), speckled hind (*Epinephelus drummondhayi*), red snapper (*Lutjanus campechanus*), silk snapper (*Lutjanus vivanus*), red porgy (*Pagrus pagrus*), knobbed porgy (*Calamus nodosus*), gray triggerfish (*Balistes capriscus*), and greater amberjack *(Seriola dumerili*).

Research on Steamboat Lumps by Andrew David and Christopher Gledhill of NMFS during February and April, 2001[21], resulted in observations of 53 fish taxa in 2001, and 50 fish taxa in 2002. Sandy substrates in the central portion of the reserve harbored honeycomb moray (*Gymnothorax saxicola*), and bandtail puffer *(Sphoeroides spengleri*). Sites sampled in the northeast region of the reserve, with habitat consisting of sandy substrates, fish burrows or rocky outcrops were dominated by honeycomb moray, bank sea bass (*Centropristis ocyurus*), red porgy, vermilion snapper (*Rhomboplites aurorubens*), scamp and red grouper (*Epinephelus morio*).

For more information on the habitat and description of the areas affected by this document, refer to Appendix A (Reef Fish Habitat Sites Off of Gulf Coast of Florida), Appendix B (Scoping Document), Appendix D (Research Reports Presented at the May 2003 Gulf Council Meeting), Appendix E ((Research Report Presented at the July 2003 Gulf Council Meeting) or the *Generic Amendment for Addressing Essential Fish Habitat Requirements* (GMFMC 1998b).

11.0 ENVIRONMENTAL CONSEQUENCES

Preliminary results from the first two years of the reserves suggest that they are effective in protecting spawning aggregations of gag and scamp, and in enhancing fishing in the waters surrounding the reserves. Increases in abundance and number of taxa have generally been observed by researchers within the reserves, but increases in abundance have also been observed in an open fishing area that is being monitored for comparison. In addition, it is too early in the monitoring process to determine if any trends are developing. An overview of the observed and potential benefits is discussed in Section 3.2 (What is the Overall Effect of the Reserves on the Stocks and Local Ecosystem?) and is incorporated into this section by reference.

In the following sections, the discussion specific to the proposed alternatives is in bold for ease in locating those sections.

[21] Andrew David and Christopher Gledhill. 2002. Survey of Fish Assemblages and Habitat within Two Marine Protected Areas on the West Florida Shelf. Abstract, Florida Chapter, American Fisheries Society, 19th Annual Meeting, February 12-14, 2002, Brooksville, Florida.

11.1 Physical Environment

Section 6.1 - Continuation of Marine Reserves

All of the alternatives in this section, except for Status Quo (Alternative 6.1.7) extend the time frame for the marine reserves at Madison-Swanson and Steamboat Lumps to exist. Since reef fish fishing uses bottom type gear, including longlines and fish traps, this will provide continued protection within the reserve areas for the bottom habitat from gear impacts, but the duration of the protection will vary for each alternative. Alternatives 6.11, **6.12 (Proposed Alternative)**, and 6.13 **provide fixed time periods of** four, **six**, and ten **years** respectively. Alternatives 6.14 and 6.1.5 tie the duration to biological reference points with an indeterminate time frame. Alterative 6.16 does not have a sunset provision, and continues the reserves indefinitely. Therefore this alternative provides the greatest protection over time. Alternative 6.1.7, status quo, allows the reserves to expire after June 16, 2004, and therefore provides no protection for the physical environment. However, one of the bottom gear types used in reef fish fishing, fish traps, will be phased out after February 2007, which will benefit bottom habitat throughout the range where fish traps are currently allowed (east of Cape San Blas, Florida and outside of the stressed area boundary).

Section 6.2 - Fishing Restrictions Within the Reserves

Alternative 6.2.1 allows fishing for species found in the water column (coastal pelagic species and HMS species). The alternative prohibits fishing for species found on the bottom. While it does not explicitly prohibit the use of bottom type gear, the use of such gear to target pelagic species would be pointless. This alternative therefore effectively eliminates bottom gear from the reserves, providing protection for the bottom habitat. However, the trolling methods used for pelagic fishing can be adapted to deep-water trolling, which could impact the bottom habitat. Although this alternative will benefit the physical environment within the reserves, the potential for pelagic fishing methods to be adapted to bottom fishing makes this alternative slightly less beneficial than a total prohibition on fishing within the reserves, and will provide the least protection for bottom habitat of the alternatives in this section.

Alternative 6.2.2 continues the existing prohibition on fishing for all species except HMS species, and renews the Council's request to the NMFS HMS Division to implement a compatible closure on HMS species. If the HMS Division concurs, then all fishing within the reserves will be prohibited, providing the greatest possible benefits to the bottom habitat within the reserves. If the HMS Division does not concur, or if implementation is delayed for administrative or legal reasons, then this alternative continues the existing protections and will have the same benefits as the status quo alternative, i.e., the alternative will benefit the physical environment within the reserves, but the potential for pelagic fishing methods to be adapted to bottom

fishing makes this alternative slightly less beneficial than a total prohibition on fishing within the reserves. However, since this alternative eliminates one class of fishing that is allowed under Alternative 6.2.1 (fishing for species in the Coastal Pelagic FMP) regardless of any HMS action, the amount of pelagic fishing within the reserves will less than under Alternative 6.2.1, and the potential for bottom fishing will be reduced correspondingly.

Alternative 6.2.3 continues the existing prohibition on fishing for all species except HMS species, and adds a gear prohibition on the use of trolling methods regardless of target species, but allows HMS fishing using other methods. This alternative eliminates fishing methods that impact the bottom habitat, or that have the potential to impact bottom habitat. It will provide essentially the same amount of protection to bottom habitat as a total prohibition on fishing, i.e, Alternative 6.2.2 if the NMFS HMS Division implements a closure to HMS species. If the NMFS HMS Division does not implement a closure under Alternative 6.2.2, then Alternative 6.2.3 provides the greatest protection of the alternatives in this section to the bottom habitat .

Alternative 6.2.4 allows surface trolling within the reserves, and defines surface trolling gear in a manner designed to prevent the gear from fishing deep in the water column. If the trolling gear is kept up in the water column as intended by this alternative, it will have no impact on bottom habitat. However, if the gear is capable of fishing deeper, deep-water trolling gear can get caught up on the bottom and impact bottom habitat. Lost fishing line has been observed in the reserves by researchers studying the reserves[22], and trolling gear became hung up and lost by the researchers while studying the impact of trolling on reef fish[23]. In addition, the researchers evaluated the ability of enforcement officers to estimate the depth of trolling gear from an adjacent vessel, and concluded that enforcement personnel have great difficulty determining depth of trolled lines from adjacent vessels. If the gear cannot be prevented from fishing deep in the water column, or if prohibiting deep-water trolling while allowing surface trolling cannot be enforced, then this alternative will provide no better protection for bottom habitat than Alternative 6.2.1.

Alternative 6.2.5 prohibits possession of reef fish while in the reserves. Fishing for other species is allowed with no restriction on allowable gear. Other bottom or near-bottom species that could be targeted by fishers include sharks, grunts and porgies (grunts and porgies were removed from the Reef Fish FMP by Amendment 15 1998 and are not currently managed in federal waters). Since reef fish comprise the bulk of the bottom or near-bottom fish likely to be targeted, bottom fishing in the reserves

[22]Comment from NMFS biologist Andrew David during a marine reserves enforcement workshop, May 15-16, 2003, in Panama City, FLorida.

[23] Presentation on the evaluation of trolling in marine reserves by Andrew Davis, Gulf Council meeting, May 12, 2003, Panama City Beach, Florida.

would be expected to be reduced substantially, but not eliminated. Researchers conducting studies in the marine reserve at Madison-Swanson reported seeing lost fishing line on the bottom, much of which appeared to be fairly old and covered with growth[6], a clear indication that bottom fishing has had an impact on the physical environment prior to fishing being prohibited in the reserves. This alternative would provide a benefit to the bottom habitat relative to having no harvest restrictions, but would provide less protection than the status quo of prohibiting all fishing except for HMS species.

Alternative 6.2.6, status quo, continues the existing prohibition on fishing for all species except HMS species. This is similar to Alternative 6.2.1, except that Alternative 6.2.1 allows fishing for species in the Coastal Pelagic FMP, whereas this alternative prohibits it. The impact of this alternative is identical to that of Alternative 6.2.2 if the NMFS HMS Division does not implement a closure under that alternative. This alternative eliminates one class of fishing that is allowed under Alternative 6.2.1 (fishing for species in the Coastal Pelagic FMP), and the potential for bottom fishing and adverse bottom impacts is correspondingly less than under Alternative 6.2.1.

Alternative 6.2.7 (Proposed Alternative) allows fishing only for migratory coastal pelagic and HMS species, and only by surface trolling from May through October. According to public testimony, most HMS trolling occurs during May through October. Opening the reserves to fishing for migratory coastal pelagics as well as HMS species during May through October may increase the overall fishing activity during that period. Lost fishing line has been observed in the reserves by researchers studying the reserves[24], and the NMFS researchers themselves reported having fishing lines become hung up on the bottom when trolling at low speeds (1.5 to 4 knots). However, NMFS research (Appendix E) and public testimony indicates that fishing lines are unlikely to encounter the bottom when trolled at speeds greater than about 4 knots. Thus the requirement that only surface trolling can be used in the reserves minimizes the possibility of fishing lines impacting the bottom habitat. It will also eliminate the potential use of bottom longlines to target sharks.

Section 6.3 - Seasonal Regulations

The alternatives in this section determine whether the reserve fishing restrictions selected in Section 6.2 are in effect year-round (Alternative 6.3.3 - Proposed Alternative) or for only a portion of the year (Alternatives 6.3.1 and 6.3.2). **Since the only difference between the alternatives is the seasonal duration, the longer the**

[24]Comment from NMFS biologist Andrew David during a marine reserves enforcement workshop, May 15-16, 2003, in Panama City, FLorida.

season the more protection it provides to the bottom habitat. Therefore, the ranking of relative benefits to the bottom habitat by each alternative is:

Alternative 6.3.3 (year-round restrictions) - greatest benefits (Proposed Alternative),
Alternative 6.3.2 (6-month restriction) - moderate benefits,
Alternative 6.3.1 (2-month restriction) - less benefits, but greater than no closure.

It should be pointed out, however, that Alternatives 6.3.1 and 6.3.2 are centered around the gag spawning season. The 1994 gag stock assessment (Schirripa and Goodyear 1994) reported that, based on an examination of logbook records, targeting of gag may be very seasonal for some vessels, which may target them only when they are easier to catch (i.e, in spawning aggregations). Thus, the relative benefits of Alternatives 6.3.1 and 6.3.2 are greater than $^1/_6$ and ½ that of a year-round closure.

11.2 Biological Environment

Section 6.1 - Continuation of Marine Reserves

Alternative 6.1.1 provides protection from fishing activities for organisms and habitat within the reserves for four years beyond the four-year time frame originally established for the reserves. Although reef fish may remain resident on a reef for a period of time, they move about, so the reserves will protect individual fish for only as long as they remain within the reserve. Despite the transient nature of the protection afforded to individual fish, preliminary research observations from the first four-year period (June 2000 - June 2004) indicates that reef fish within the reserves are larger and more abundant than outside the reserves. Thus, the reserves appear to have success in increasing overall size and abundance within the populations. Egg production is related to size of fish, so egg production within the reserves is likely to be improved. In the case of gag, males in the population tend to stay offshore year-round, while females redistribute back toward shallower water when not spawning. It is likely that male gag will receive greater relative benefits from the reserves than females, reducing concerns that low abundance of male gag could result in some females being unable to spawn or to a loss of genetic diversity. Areas that remain open to fishing may benefit from increased size and spawning success within the reserves in two ways. First, as some of the larger individuals within the reserves migrate out into open waters, they will provide enhanced fishing opportunities in the form of larger fish becoming available to the fishery in the adjacent waters even if fishing pressure, which normally eliminates the larger fish in a population, remains high. Second, eggs and larval fish spawned within the reserves will be carried by currents to other areas where the fish will eventually grow large enough to be recruited to the fishery. This trend can be expected to continue for an additional four

years, but may reverse itself at the end of the time period if fishing vessels are allowed to resume fishing on aggregations within the reserves. At the time that this evaluation is being written, the only confirmed benefits of the reserves are the observations of increased size and abundance within the reserve borders. Additional research is needed to determine if the additional benefits suggested are realized, and to what level. While a formidable amount of research has been conducted in the reserves, this is a very short time period in which to evaluate their effect on species that can live for 20 years or more.

Alternative 6.1.2 (Proposed Alternative) provides protection from fishing activities for organisms and habitat within the reserves for 6 years beyond the four-year time frame originally established for the reserves. The biological impacts are similar to Alternative 6.1.1, but for an additional two years. This will allow further increases in size and abundance of organisms within the reserves, unless equilibrium is reached in less than 6 years. As with Alternative 6.1.1, the trend toward increasing size and abundance may reverse itself at the end of the time period if fishing vessels are allowed to resume fishing on aggregations within the reserves. It will also allow additional time to conduct research into the effectiveness of the reserves.

Alternative 6.1.3 provides protection from fishing activities for organisms and habitat within the reserves for ten years beyond the four-year time frame originally established for the reserves. The biological impacts are similar to Alternative 6.1.1, but for an additional 6 years. This will allow further increases in size and abundance of organisms within the reserves, unless equilibrium is reached in less than ten years. As with Alternative 6.1.1, the trend toward increasing size and abundance may reverse itself at the end of the time period if fishing vessels are allowed to resume fishing on aggregations within the reserves. It will also allow additional time to conduct research into the effectiveness of the reserves.

Alternative 6.1.4 would discontinue the reserves once gag had reached a stock status at which it is capable of sustaining OY for two or more years. The definition of OY for reef fish is currently ambiguous. The Council does not have an accepted definition of OY for most reef fish species (NMFS rejected an SPR based proposed definition), but it does have an accepted maximum fishing mortality rate (MFMT). The MFMT for reef fish other than red snapper, Nassau grouper, and goliath grouper was set in the 1999 Generic Sustainable Fisheries Act Amendment (GMFMC 1999b) at the fishing mortality rate equivalent to 30 percent static SPR ($F_{30\% SPR}$). Until an acceptable definition of OY or OY proxy is developed by the Council that takes into account relevant economic, social and ecological factors, the NMFS recommended default OY is fishing at a fishing mortality rate equivalent to 75% of the fishing mortality rate that can sustain maximum sustainable yield. Based on the 2001 gag stock assessment (Turner et al. 2001) and supplemental analyses done at the 2001 RFSAP meeting (GMFMC 2001):

$F_{30\% \text{ static SPR}} = 0.45$
$75\% * F_{30\% \text{ static SPR}} = F_{OY} = 0.34$
Current F (1997-1999 geometric mean) = 0.23

Therefore, the gag stock is already being fished at less than the current value of F_{OY}, and has been since 1999, although the stock biomass has probably not reached equilibrium. If a strict interpretation of Alternative 6.1.4 is used, then this alternative is moot, since the gag stock has been sustaining F_{OY} (as currently defined) for more than two years. However, if the alternative is intended to refer to OY at equilibrium, then the alternative will result in the reserves remaining in place for an indefinite period.

The RFSAP, in its 2001 report, recommended that F_{max} be used as the F_{MSY} proxy for gag rather than $F_{30\% \text{ SPR}}$. For gag stocks, this is a more conservative proxy that corresponds to about $F_{50\% \text{ SPR}}$. Using that proxy:

$F_{max} = 0.25$
$75\% * F_{max} = F_{OY} = 0.19$
Current F (1997-1999 geometric mean) = 0.23

Based on F_{max}, the current fishing mortality rate would need to be reduced by 17% to get below F_{OY}. However, new management measures were implemented for gag in June 2000. These included an increase in the commercial minimum size limit from 20 to 24 inches total length (TL), an increase in the recreational minimum size limit from 20 to 22 inches TL, a commercial closed season from February 15 to March 15 (currently being considered for repeal), and the establishment of the two closed areas (with a 4-year sunset provision) in areas known to support spawning aggregations of gag and other reef fishes. These actions were implemented too late for their impacts to be reflected in the 2001 gag stock assessment, but it is reasonable to assume that they will in future assessments help to further reduce fishing mortality, resulting in a likelihood that the stock is being fished below F_{OY} even if the more conservative proxy is adopted.

Because Alternative 6.1.4 requires that the entire gag stock be at OY before the reserves are terminated, it will assure that the stocks are at the target health levels set in the FMP. However, if the reserves are a contributing factor to achieving OY, this alternative could result in the stock dropping back below OY levels once the reserves are no longer in place.

Alternative 6.1.5 would discontinue the reserves once the proportion of male gags had reached 17% of the spawning stock within the reserve. This percentage is meaningful only if it is expressed in terms of a particular time period, e.g., during peak spawning season. Male gag tend to stay offshore year-round while females disperse toward shallower water outside of spawning season. Thus, the male-to-

female ratio within the reserves will vary seasonally. In addition, gag are protogynous hermaphrodites. Because they start out as females and switch to males at an older age, the sex ratio can undergo short-term fluctuations when a strong year-class (i.e., young females) enters the fishery. The RFSAP estimated that male gag comprised about 5% of the stock in 2000, although there is substantial uncertainty about that estimate. If fished at F_{max}, they estimated that the proportion of males at equilibrium would rise to 19%. The current fishing mortality rate is well below F_{max} ($F_{current} = 0.23$, $F_{max} = 0.25$), so the stock-wide male-to-female ratio should gradually rise above the target of 17% male if the current fishing mortality rate is maintained, although the time frame for this to occur is not known at this time. However, Alternative 6.1.5 stipulates the proportion of male gag be measured "within the reserves". Since the fishing mortality rate within the reserves is zero, the proportion of male gag in the reserves should rise much faster than in the open access areas where fishing mortality is occurring. One caveat is that the RFSAP postulated that at least some of the lower ratio of males in the 2000 population was due to the relatively strong recruitment to the population in recent years (GMFMC 2001). Conversely, a high male-to-female ratio could be an indicator of weak recruitment. Thus, while this alternative could very quickly trigger a termination of the reserves, it could also be counterproductive, resulting in eliminating the reserves at the point when year-class recruitment is weakest.

Alternative 6.1.6 makes the reserves a permanent management tool, unless modified or removed by a later plan amendment. The biological impacts are similar to Alternative 6.1.1, but continue indefinitely. This will allow further increases in size and abundance of organisms within the reserves until equilibrium is reached regardless of how long it takes, and subsequent maintenance of equilibrium levels unless equilibrium is reached in less than six years. Unlike the other alternatives, there will be no reversal of the increased size and abundance may reverse due to termination of the reserves. Increased egg production from the larger, more abundant females in the reserve will help to maintain overall stock spawning potential and reduce the likelihood of stocks becoming overfished. Increased male abundance will help to assure spawning success if spawning is dependent upon a sufficient number of males. It may help to avoid triggering some females to transition to males at an early age (and subsequent loss of spawning potential) if the transition is socially induced. If some of the larger individuals within the reserves migrate out into open waters, they will provide enhanced fishing opportunities in the form of larger fish becoming available to the fishery in the adjacent waters even if fishing pressure, which normally eliminates the larger fish in a population, remains high.

Alternative 6.1.7, status quo, would allow the marine reserves at Madison-Swanson and Steamboat Lumps to expire after June 16, 2004. Increases in size and abundance of fish within the reserves will likely be reversed once fishing vessels are again allowed to target spawning aggregations within the areas, and will revert to the levels found in waters outside the reserves The potential benefits to increased egg

production and enhanced availability of large fish in waters adjacent to the reserves will not be realized. On the other hand, gag stock assessments have not, to date, included the impact of the reserves on future abundance levels. The 2001 gag stock assessment assumed that the average 1986-1996 recruitment would continue in the future, and based its projections on establishing and maintaining appropriate overall fishing mortality rates. With the gag stock having been reclassified in 2002 as neither overfished nor undergoing overfishing even without considering any impact from the reserves, the impact to the biological environment from discontinuing the reserves may be considered neutral (rather than adverse).

Section 6.2 - Fishing Restrictions Within the Reserves

Note: If compliance and enforcement of the reserve's fishing restrictions are effective, then all of the alternatives in this section will benefit the bottom biological environment by providing protection from fishing activities. They differ primarily in the likelihood of effective enforcement. Research conducted by NMFS into the impacts of trolling on reef fish and the habitat within the reserves concluded that trolling gear can reach depths capable of catching reef fish when trolled at slow speeds (1.5 to 4 knots), but at high speeds (12 to 15 knots) the fishing gear stays near the surface (Appendices D and E). Intermediate speed (5 to 11 knots) were not evaluated in the NMFS study, although these speeds are commonly used when trolling.

Alternative 6.2.1 allows fishing for HMS species and coastal pelagic species, and prohibits fishing for other species. Provided that fishing activities are conducted in the water column and that surface trolling does not impact reef fish or the habitat, this alternative will protect reef fish and other bottom species and habitat from fishing pressure. However, the allowance for surface trolling introduces the possibility that vessel could, either inadvertently or deliberately, be fishing on the bottom, which could reduce any benefits from the reserves.

Alternative 6.2.2 prohibits all fishing activity within the reserves assuming that NMFS HMS concurs with the Council's request. If NMFS HMS does not concur, then the impact of this alternative is effectively the same as status quo. Since this alternative eliminates all fishing within the reserves, enforcement is simplified and the likelihood of bottom fishing occurring, whether inadvertently or deliberately, is minimized relative to the other alternatives, and this alternative will protect reef fish and other bottom species and habitat from fishing pressure.

Alternative 6.2.3 allows fishing for HMS species using methods other than trolling, and prohibits all trolling and fishing for other species by any methods. While methods other than trolling can be used for bottom fishing, trolling covers a larger area since it is from a moving vessel, and would have greater potential for impact on the bottom environment. Because there is a possibility that a vessel using non-

trolling methods could be either inadvertently or deliberately fishing on the bottom, this alternative has slightly less benefits to the bottom biological environment than Alternative 6.2.2, but more benefits than the other alternatives.

Alternative 6.2.4 allows surface trolling within the reserves, and defines surface trolling gear in a manner designed to prevent the gear from fishing deep in the water column. If the trolling gear is kept up in the water column as intended by this alternative, it will result in harvest continuing for HMS species as currently allowed, and will additionally allow harvest of coastal pelagic species and wahoo, which is prohibited under status quo. Reef fish species that rise up from the bottom could also be subject to harvest. Underwater video taken by researchers studying the reserves showed gag swimming up to meet the cameras as much as 80 feet off the bottom[25]. The reserves are in depths of 35 to 45 fathoms (210 to 270 feet), so the gag observed in the underwater video are still fairly deep in the water column. If the restrictions on what constitutes surface trolling successfully keep the gear up in the water column, impacts on gag and reef fish species will be minimized, but if the gear is allowed to drift down, it could impact reef fish without reaching the bottom.

Alternative 6.2.5 prohibits possession of reef fish while in the reserves. This alternative effectively prohibits targeting of reef fish in the reserves. Although catch-and-release fishing could possibly be attempted (and would produce poor release survival due to the depths of the reserves), it is unlikely given the distance that anglers would need to travel to reach the reserves. Fishing for other species that are currently prohibited within the reserves, including other bottom or near-bottom species, would be unrestricted. Other bottom or near-bottom species that could be targeted by fishers include sharks, grunts and porgies (grunts and porgies were removed from the Reef Fish FMP by Amendment 15 1998 and are not currently managed in federal waters). Bycatch of reef fish caught while targeting other species would produce poor release survival due to the depths of fishing. However, the bottom and near-bottom species other than reef fish are of limited recreational and commercial interest, and it is unlikely that many fishers would travel to the reserves for the purpose of targeting them. Nevertheless, this alternative does not provide as conclusive a protection for reef fish as a prohibition on all fishing or all bottom fishing within the reserves.

Alternative 6.2.6, status quo, retains the existing prohibition on fishing for all species except HMS species. Provided that fishing activities are conducted in the water column and that surface trolling does not impact reef fish or the habitat, this alternative will protect reef fish and other bottom species and habitat from fishing pressure. However, the allowance for surface trolling introduces the possibility that vessel could, either inadvertently or deliberately, be fishing on the bottom, which

[25] Presentation on the evaluation of trolling in marine reserves by Andrew Davis, Gulf Council meeting, May 12, 2003, Panama City Beach, Florida.

could reduce any benefits from the reserves. Since this alternative allows surface trolling for fewer species than Alternative 6.2.1, it is less likely to result in adverse impacts from potential bottom fishing activities than Alternative 6.2.1, but more likely than the other two alternatives.

Alternative 6.2.7 (Proposed Alternative) allows surface trolling for coastal pelagic and H MS species within the marine reserves during May through October. Other fishing methods and targeting of other species is prohibited during this period, and all fishing activity is prohibited during November through April. Gag spawn from December to May, and scamp, which also form spawning aggregations in the reserves, spawn from March to May. Therefore, this alternative will protect spawning aggregations of gag and scamp from fishing activity during most of their spawning seasons, except for May.

For the May through October surface trolling season, the impacts of this alternative on reef fish depend upon the definition and enforceability of "surface trolling". Coast Guard representatives at the Council meetings stated that the definition of surface trolling contained in Alternative 6.2.4[26] is not enforceable. If the fishing gear succeeds in reaching within 92 feet of the bottom (118 to 178 feet from the surface within the reserves), there is potential for the gear to encounter gag, which have been observed that far off the bottom (Appendix E). NMFS research found that trolling gear can reach these depths when trolled at slow speeds (1.5 to 4 knots), but will stay on or near the surface when trolled at high speeds (12 to 15 knots) (Appendices D and E). Trolling at intermediate speeds (5 to 11 knots) was not evaluated by NMFS, but public testimony indicated that trolling gear will stay near the surface at these speeds, minimizing any potential impact on reef fish.

Bycatch of pelagic species other than coastal pelagic and HMS species may occur during the surface trolling season, i.e., wahoo and blackfin tuna. Wahoo were caught by NMFS researchers while surface trolling in the reserves (Appendix E). Under Alternative 6.2.7, it is illegal to catch these species while fishing in the reserves. However, there is no prohibition on possessing these species (only reef fish are prohibited), so this restriction is probably unenforceable. The Council is considering adding wahoo and blackfin tuna to the Coastal Pelagics FMP (through Coastal Pelagics Amendment 15, currently under development). If these species are added to the FMP, it would become legal to catch them during the surface trolling season.

Section 6.3 - Seasonal Regulations

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[26] Alternative 6.2.4 defines surface trolling as fishing with lines trailing behind a vessel which is in constant motion with a visible wake at speeds in excess of four knots. Such trolling may not involve the use of downriggers, wire lines, planers, or similar devices.

Alternative 6.3.1 implements the reserves for two months (February through March) each year. This is the peak spawning time for gag, but the total gag spawning season extends from December through May, so only a portion of the spawning aggregations will be protected. In addition, only a small amount of protection will be afforded to the male gag that stay offshore year-round. For other reef fish species that utilize the reserves for spawning, such as scamp, this seasonal reserve only partially overlaps peak spawning season, or not at all, and will provide minimal benefits. Since the reserve will be open to fishing for most of the year, benefits from having larger, more abundant and more fecund fish are unlikely to accrue. The primary benefit will be the elimination of concentrated fishing pressure on gag spawning aggregations within the reserve. However, the reserves cover only one fifth of the area identified by Koenig et al. (1996) as the dominant spawning grounds for gag, and likely less than fifth of the total spawning grounds. Because of the limited impact of the reserves in protecting gag spawning aggregations, both spatially and temporally, benefits to the resource will be minimal.

Alternative 6.3.2 implements the reserves for six months (December through May) each year. This encompasses the total spawning season for gag, and overlaps but may not totally cover the spawning seasons for other reef fish. Male gag that stay offshore and in the reserves year-round will get greater protection than under Alternative 6.3.1, but will still be vulnerable to fishing six months each year. Because the reserve will be open to fishing for half of the year, benefits from having larger, more abundant and more fecund fish are not as likely to accrue as with a year-round closure, but there may be some benefit compared to a two-month closure. The primary benefit will be the elimination of concentrated fishing pressure on gag spawning aggregations within the reserve. However, the reserves cover only a fifth of the area identified by Koenig et al. (1996) as the dominant spawning grounds for gag, and likely less than fifth of the total spawning grounds. Because of the limited impact of the reserves in protecting gag spawning aggregations spatially, benefits to the resource will be limited. However, these benefits will be greater than the benefits afforded by Alternative 6.3.1 since the closures will be effective for the entire gag spawning season.

Alternative 6.3.3 (Proposed Alternative) prohibits fishing in the reserves year-round. This will protect spawning aggregations of all species that utilize the reserves regardless of when they spawn. Furthermore, it will allow species that stay resident in the reserves for extended periods to achieve larger sizes and greater abundance within the reserves. Therefore, this alternative will provide the greatest overall benefits to the biological environment.

11.3 Human Environment

Additional information on the impacts on the human environment are contained in Sections 6.0 (Management Alternatives), 8.0 (Regulatory Impact Review), and 9.0 (Regulatory Flexibility Act Analysis) and are incorporated herein by reference.

Section 6.1 - Continuation of Marine Reserves

Alternative 6.1.1 provides an additional four years for research into the impacts of reserves. This allows time for further investigation of the short-term impacts of reserves, but because many reef fish species can live for 20 years or more, it does not allow sufficient time to investigate impacts over a complete life-span. Fishermen who utilized the reserve areas prior to their creation in June 2000 will continue to be displaced for an additional four years. However, if populations in the reserves continue to become more abundant, the waters immediately adjacent to the reserves may offer enhanced fishing opportunities as a result of fish migrating out of the reserves. Due to the distance of the reserves from shore, the reserve designation and proposed harvest restrictions will impact primarily commercial vessels. However, some recreational vessels, particularly in the for-hire sector, may also continue to be displaced. If the reserves are not extended again beyond the 4 years of this alternative, they will become open access fishing areas and will likely provide above average fishing success until they are fished down to abundance levels commensurate with areas that were never closed.

Alternative 6.1.2 (Proposed Alternative) provides an additional six years for research into the impacts of reserves. This allows a longer time period for further investigation of the short-term impacts of reserves, but still does not allow sufficient time to investigate impacts over a complete life-span. However, a subsequent reauthorization of the reserves is expected to be considered before this extension expires. Impacts on fishermen will be similar to those described for Alternative 6.1.1, but will continue for six years rather than four years.

Alternative 6.1.3 provides an additional ten years for research into the impacts of reserves. This allows a longer time period for further investigation of the short-term impacts of reserves. While it does not allow sufficient time to investigate impacts over a complete life-span, it may approach the generation time, particularly when combined with the initial four-year time period established by the original designation (gag generation time has not been calculated, but generation time is usually between a third and half of the maximum age). Impacts on fishermen will be similar to those described for Alternative 6.1.1, but will continue for ten years rather than four years.

Alternative 6.1.4 links the termination of the reserves to the status of the gag stock in terms of OY. As discussed previously, a biomass OY level has not yet been

established for gag, but an OY fishing mortality rate of $75*F_{30\% SPR}$ has been established. It is possible that the gag stock is already being fished at the current definition of F_{OY}, but that cannot be confirmed until the next assessment, nor can the time frame for achieving equilibrium be estimated. No date has been set for the next gag assessment, and consequently, it will be difficult for researchers to design projects that depend on the reserves remaining closed for an unknown period of time. Fishermen who utilized the reserve areas prior to their creation in June 2000 will continue to be displaced, but the time frame for the continued displacement is indeterminate. Impacts on fishermen will be similar to those described for Alternative 6.1.1, but will continue for an indeterminate period of time. If the reserves are reopened upon a finding that the gag stock is sustainable at F_{OY}, they will likely provide above average fishing success until they are fished down to abundance levels commensurate with areas that were never closed.

Alternative 6.1.5 links the termination of the reserves to the status of the gag population within the reserves in terms of male-to-female ratio. As with the previous alternative, the length of this closure is undetermined. The RFSAP (GMFMC 2001) estimated that male gag comprised about 5% of the mature gag population in 2000, and that percentage would eventually rise to 19% at equilibrium if fished at F_{max}. The current fishing mortality rate is less than F_{max}, so this is likely to happen, although the time frame to reach this ratio is not known. However, since the fishing mortality rate within the reserves is zero, the proportion of gag within the reserve can be expected to rise much faster than in the open access areas where fishing mortality is occurring, and will likely occur before the stock reaches equilibrium biomass at OY. As with the previous alternative, fishermen who utilized the reserve areas prior to their creation in June 2000 will continue to be displaced, but the time frame for the continued displacement is indeterminate. Impacts on fishermen will be similar to those described for Alternative 6.1.1, but will continue for an indeterminate period of time. If the reserves are reopened upon a finding that the proportion of male gag within the reserves has reached 17%, they will likely provide above average fishing success until they are fished down to abundance levels commensurate with areas that were never closed.

Alternative 6.1.6 leaves the reserves in place permanently (or until repealed by a plan amendment). This will provide a basis for continuing research into the impacts of fishing compared to unfished areas. Fishermen who utilized the reserve areas prior to their creation in June 2000 will continue to be displaced. However, if populations in the reserves continue to become more abundant, the waters immediately adjacent to the reserves may offer enhanced fishing opportunities as a result of fish migrating out of the reserves.

Section 6.2 - Fishing Restrictions Within the Reserves

Alternative 6.2.1 relaxes the current fishing restrictions by allowing coastal migratory pelagic species and blackfin tuna to be fished by surface trolling along with the current allowance for highly migratory species. This will create additional fishing opportunities for fishermen targeting those species. The continuing prohibition on fishing for all other species will continue to displace fishermen who historically fished in the reserves. However, if populations in the reserves continue to become more abundant than outside the reserves, the waters immediately adjacent to the reserves may offer enhanced fishing opportunities as a result of fish migrating out of the reserves.

The impacts of Alternative 6.2.2 depend upon how the NMFS HMS division responds to the Council's request to prohibit fishing for HMS species within the reserves. If they agree to the request and implement the requested regulations, this alternative will increase the current fishing restrictions by prohibiting all fishing within the reserves, and will displace fishermen who currently fish for HMS species in the reserves. It is not known how many fishermen this would affect. If populations of species in the reserves that remain resident for extended periods (e.g., reef fish) continue to become more abundant than outside the reserves, the waters immediately adjacent to the reserves may offer enhanced fishing opportunities as a result of fish migrating out of the reserves. However, migratory species are unlikely to remain in the reserves long enough to increase in abundance or size, and therefore this potential benefit will not extend to those species. If regulations to prohibit fishing for HMS species are not implemented, the impacts of this alternative will be identical to the status quo alternative.

Alternative 6.2.3 adds a prohibition on fishing by trolling regardless of species to the current prohibition on fishing for all species other than HMS species. Although fishing for HMS species would still be allowed using non-trolling methods, trolling is the primary fishing method for those species. This alternative will displace fishermen who currently fish for HMS species in the reserves, or will force them to adopt non-trolling methods while fishing in the reserves. It is not known how many fishermen this would affect. The impacts of this alternative will be similar to those of Alternative 6.2.2, except that HMS fishermen will have the option of using non-trolling methods in order to fish in the reserves.

Alternative 6.2.4 allows surface trolling within the reserves, and defines surface trolling gear in a manner designed to prevent the gear from fishing deep in the water column. If the trolling gear is kept up in the water column as intended by this alternative, it will result in harvest continuing for HMS species as currently allowed, and will additionally allow harvest of coastal pelagic species and wahoo, which is prohibited under current harvest restrictions. Impacts on the human environment will be similar to those for Alternative 6.2.1.

Alternative 6.2.5 prohibits possession of reef fish while in the reserves. This alternative will allow a resumption of fishing within the reserves for all species except reef fish, and will increase access to the non-reef fish resources. However, vessels with reef fish on board that were caught elsewhere will be forced to detour around the reserves rather than being able to traverse the reserves, as is currently allowed. This could increase travel time and costs for some vessels, and could create safety concerns in the case of bad weather or mechanical problems.

Alternative 6.2.6, status quo, retains the existing prohibition on fishing for all species except for HMS species. This will continue the existing displacement of fishermen other than those fishing for HMS species from the reserves. However, if populations in the reserves continue to become more abundant than outside the reserves, the waters immediately adjacent to the reserves may offer enhanced fishing opportunities as a result of fish migrating out of the reserves.

Alternative 6.2.7 (Proposed Alternative) allows surface trolling in the reserves for coastal pelagic and HMS species (provided NMFS HMS Division implements compatible regulations) for six months of the year (May through October) and prohibits all fishing for the remainder of the year. Currently, fishing for HMS species is allowed year-round. However, according to public testimony presented to the Council, May through October are the primary months for recreational HMS fishing, and the closure for the remainder of the season is expected to have little impact on fishermen. The addition of coastal pelagic species to the species allowed to be fished by surface trolling creates additional fishing access for six months of the year for fishermen who target those species. However, according to U.S. Coast Guard representatives, allowing surface trolling while prohibiting other fishing activities is not enforceable because the depth of fishing cannot be determined by enforcement officers observing the fishing activity, and allowing some fishing activity within the reserves increases the opportunity for illegal fishing to occur. In order to address this problem, Alternative 6.2.7 includes a prohibition on possession of reef fish within the reserve except by vessels transiting the reserve. The transiting provision eliminates the need for vessels with reef fish caught in other areas to travel around the reserves while returning to port. However, enforcement may be problematic, since it requires at-sea inspection of a vessel's catch. Furthermore, a vessel illegally fishing for reef fish must be caught in the act of fishing, since possession of reef fish in the reserves is not illegal if the vessel is underway without the fishing gear being deployed. Nevertheless, this alternative is more restrictive than the current regulations, which do not prohibit possession of reef fish while fishing for HMS species.

Section 6.3 - Seasonal Regulations

Alternative 6.3.1 applies the reserve fishing restrictions for only two months per year, February through March. During the rest of the year the reserve areas are open to all fishing. This provides a relatively small disruption to fishermen who utilize the areas, but it leaves the reserves closed during the most desirable fishing period, the peak of the gag spawning season. The reserves only cover about one fifth of the primary gag spawning grounds (and less than one fifth of the total spawning area), and would only be in effect for about a third of the gag spawning season, so opportunities will continue to exist for fishermen to target gag spawning aggregations in other areas, and in the reserve areas outside of the two-month closure.

Alternative 6.3.2 applies the reserve fishing restrictions for six months per year, December through May. During the rest of the year the reserve areas are open to all fishing. This displaces fishermen from the reserves during the entire gag spawning season. The reserves only cover about one fifth of the primary gag spawning grounds (and less than one fifth of the total spawning area), so opportunities will continue to exist for fishermen to target gag spawning aggregations in other areas. Fishermen can also target gag and other species in the reserves outside of the six-month closure. Gag spawning aggregations may be few during this period, but aggregations of other species[27], such as scamp, will occur during parts of the open six-month period.

Alternative 6.3.3 (Proposed Alternative) leaves the fishing restrictions in the reserves in place year-round (other than the allowance in Alternative 6.2.7 to surface troll for coastal pelagic and HMS species from May through October). This will continue the year-round displacement of reef fish fishermen who utilized the areas prior to the June 2000 creation of the reserves. However, as discussed for other alternatives, opportunities will continue to exist for fishermen to target spawning aggregations in other areas. By leaving the fishing restrictions for species other than coastal pelagic and HMS species in place year-round, this alternative is the most likely to realize the benefit of enhanced fishing in waters immediately adjacent to the reserves as a result of protected populations within the reserves becoming larger and more abundant, with subsequent migration of some of those fish into the adjacent waters.

11.4 Administrative Environment

Section 6.1 - Continuation of Marine Reserves

None of the alternatives in this section impose any paperwork or permit requirements on fishermen beyond currently existing requirements. However, fishermen in the

[27] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

vicinity of the reserves will need to be aware of their existence and coordinates for the duration of the reserves so that they can comply with the fishing restrictions. Enforcement of the reserves requires at-sea enforcement, which requires that the USCG monitor the area and intercept vessels fishing in violation of the reserve restrictions. Anecdotal information during the scoping process suggested that fishing violations are occurring within the reserves. However, the USCG has reported some success in intercepting violators[28].

Alternative 6.1.1 results in the need for fishermen to be aware of the reserves, and the USCG to be aware of enforcement requirements for a four-year period beyond the existing four-year period.

Alternative 6.1.2 (Proposed Alternative) results in the need for fishermen to be aware of the reserves, and the USCG to be aware of enforcement requirements for a six-year period beyond the existing four-year period.

Alternative 6.1.3 results in the need for fishermen to be aware of the reserves, and the USCG to be aware of enforcement requirements for a ten-year period beyond the existing four-year period.

Alternative 6.1.4 results in the need for fishermen to be aware of the reserves, and the USCG to be aware of enforcement requirements for an indefinite period. Fishermen, researchers, and the Coast Guard will need to periodically monitor NMFS and Council announcements for news of when the biological targets have been achieved and the reserves terminated.

Alternative 6.1.5 also results in the need for fishermen to be aware of the reserves, and the USCG to be aware of enforcement requirements for an indefinite period. Fishermen, researchers, and the Coast Guard will need to periodically monitor NMFS and Council announcements for news of when the biological targets have been achieved and the reserves terminated.

Alternative 6.1.6 results in an ongoing need for fishermen to be aware of the reserves, and the USCG to be aware of enforcement requirements.

Alternative 6.1.7 allows the reserves to expire after June 2004. It will relieve fishermen of the need to be aware of the reserves, and will reduce the requirement for enforcement activities by the USCG.

[28] e.g., USCG press release no. 173-02: Coast Guard Seizes More than 1,300 Pounds of Illegally-caught Fish off Florida.

Section 6.2 - Fishing Restrictions Within the Reserves

Alternative 6.2.1 allows the surface trolling for HMS species, blackfin tuna, and coastal pelagic species within the reserves. Allowing some fishing activities while prohibiting other fishing activities is more difficult to enforce than allowing or prohibiting all fishing. This will create more enforcement difficulties than the other alternatives because it allows more types of lawful fishing than the other alternatives. However, it will eliminate the need for fishermen and enforcement personnel to differentiate between species that can be caught with surface trolling gear.

Alternative 6.2.2 prohibits all fishing in the reserves if the NMFS HMS Division implements the Council's request to prohibit fishing for HMS species within the reserves. This will simplify enforcement and voluntary compliance because it will eliminate the need to differentiate between lawful and unlawful fishing activities. If the NMFS HMS Division does not implement the Council's request to prohibit fishing for HMS species within the reserves, then the impact of this alternative will be identical to the status quo alternative.

Alternative 6.2.3 prohibits trolling, prohibits fishing for species other than HMS species, and allows fishing for HMS species using non-trolling methods. It is likely that most vessels targeting HMS species will be equipped with surface trolling gear and will avoid fishing in the reserves. However, vessels fishing in the reserves will be using vertical gear that is capable of being fished at either the surface or the bottom. Consequently, this will increase enforcement difficulties in the reserves.

Alternative 6.2.4 allows surface trolling within the reserves, and defines surface trolling gear in a manner designed to prevent the gear from fishing deep in the water column. This will require fishermen to become familiarized with the legal differences between surface trolling and other trolling methods, and will require that enforcement officers be able to differentiate between surface and deep-water trolling. NMFS researchers evaluated the ability of enforcement officers to estimate the depth of trolling gear from an adjacent vessel, and concluded that enforcement personnel have great difficulty determining depth of trolled lines from adjacent vessels[29]. Thus, this alternative will likely increase the complexity of enforcement and may be difficult to enforce.

Alternative 6.2.5 prohibits possession of reef fish while in the reserves. This alternative will require vessel operators with reef fish aboard to be aware of the prohibition regardless of where the fish were caught, and even if they do not fish the area. It will simplify at-sea enforcement, but may not be enforceable from airplanes, since any fish on board will likely be in an ice chest or in a hold and not visible.

[29] Presentation on the evaluation of trolling in marine reserves by Andrew Davis, Gulf Council meeting, May 12, 2003, Panama City Beach, Florida.

Alternative 6.2.6, status quo, allows fishing for HMS species but prohibits fishing for other species. Allowing some fishing activities while prohibiting other fishing activities is more difficult to enforce than allowing or prohibiting all fishing. This will create enforcement difficulties because it allows some types of fishing while prohibiting other types. Furthermore, when surface fishing, it requires that fishermen and enforcement personnel be able to differentiate between lawful fishing for HMS species and unlawful fishing for coastal pelagic species or blackfin tuna. Consequently, this alternative complicates enforcement and voluntary compliance.

Alternative 6.2.7 (Proposed Alternative) creates a total closure to fishing in the reserves during November through April, but allows surface trolling for coastal pelagic and HMS species during May through October (provided NMFS HMS Division implements compatible regulations). This will create enforcement difficulties because it allows some types of fishing while prohibiting other types. Furthermore, when surface fishing, it requires that fishermen and enforcement personnel be able to differentiate between lawful fishing for coastal pelagic and HMS species and unlawful fishing for other species. It will require that surface troll fishermen and enforcement officers be aware of which set of regulations is in effect at a given time, and be aware of which species are in the management units of the Coastal Pelagic and HMS FMPs. This list of species is subject to change, as the Council is currently considering adding wahoo and blackfin tuna to the Coastal Pelagics FMP management unit. Researchers evaluating the effect of the marine reserves will need to devise methods to incorporate estimates of the amount and lev el of impact of fishing activity into their analyses. Overall, this alternative provides a access to the resource within the reserves consistent with protection of reef fish, but creates the most complex enforcement and compliance environment of any of the alternatives in this section.

Section 6.3 - Seasonal Regulations

Alternative 6.3.1 applies the reserve restrictions for just two months out of the year. This eliminates the need for enforcement and compliance during most of the year, but fishermen and enforcement officers will need to be aware of when the reserves are open and when they are closed, complicating enforcement.

Alternative 6.3.2 applies the reserve restrictions for six months out of the year. This eliminates the need for enforcement and compliance during half of the year, but fishermen and enforcement officers will need to be aware of when the reserves are open and when they are closed, complicating enforcement.

Alternative 6.3.3 (Proposed Alternative) applies the reserve restrictions year-round, except that surface trolling for coastal pelagic and HMS species is allowed for six months. This requires that the USCG monitor the reserves for

enforcement purposes year-round, and complicates enforcement by having different regulations at different times of the year. Fishermen and enforcement officers will need to be aware of when the reserves are open to surface trolling and when they are closed, and which species may be caught by surface trolling, complicating enforcement. In addition, enforcement officers will need to differentiate between surface trolling and deep-water trolling or other fishing methods, which NMFS research indicated is difficult (Appendix D).

11.5 Cumulative Effects

Regulatory actions with respect to implementation of area restrictions and to grouper management are detailed in Section 2 of this amendment and are incorporated herein by reference.

Section 6.1 - Continuation of Marine Reserves

Alternative 6.1.1 - The RFSAP (GMFMC 2001) reported that, as of 1999, the current fishing mortality rate for gag is below both the current definition of overfishing ($F_{30\% SPR}$) and the more conservative level (F_{max}) recommended by the Panel. However, the proportion of male gag on the population remains low, at about 5% in 2000. The RFSAP warned that the use of $F_{30\% SPR}$ as the overfishing proxy, which is based on the potential egg production of females, implies that sperm limitation is not occurring, which may not be the case at very low levels of male biomass. Protection of a portion of the male gag population within the reserves will help to protect against sperm limitation, in addition to the general reduction in fishing mortality resulting from previous actions. Alternative 6.1.1 will continue this protection, although only for another four years beyond the initial four-year period for the reserves. Red grouper were classified as overfished in 2001. Although a more recent stock assessment found that the red grouper stock is now above the minimum stock size threshold (GMFMC 2002), the stock remains below the level capable of producing maximum sustainable yield (B_{MSY}), and remains subject to a ten-year maximum rebuilding plan to recover the stock biomass to the B_{MSY} level. Red grouper do not form large spawning aggregations like gag, but the reserves will protect those spawners within the reserve area and will help to continue the recovery. Scamp are also known to utilize the reserves for spawning. The status of the scamp stock is unknown, however, a scamp stock assessment is expected in 2004. The current regulations allow scamp to continue to be caught under the deep-water grouper quota once the shallow-water grouper quota has been filled. Thus, scamp do not have the same protection that other groupers have under current regulations. Continuation of the reserves will help to provide an added layer of protection for a portion of the scamp spawning aggregations. Alternative 6.1.1 will continue these additional protections to traditional fishing regulations, but only on a temporary basis. The protections will cease after the four-year extension unless the reserves are again extended through a subsequent plan amendment.

Alternative 6.1.2 (Proposed Alternative) will continue the protections to the resource described for Alternative 6.1.1, but for a longer time period of six years. This should allow additional recovery of stocks before the reserves are terminated.

Alternative 6.1.3 will continue the protections to the resource described for Alternative 6.1.1 and 6.1.2, but for a longer time period than either of the other two alternatives, years. This should allow additional recovery of stocks beyond that afforded by either of the previous two alternatives before the reserves are terminated.

Alternative 6.1.4 will continue the protections to the resource described for Alternative 6.1.1 but only until the gag stock has reached a level capable of sustaining OY for two or more years. This alternative assures that the reserves will remain in place until the cumulative impact of the reserves along with the previously implemented regulations (size limit, bag limit, quota) results in the gag target stock levels are reached. However, if the reserves serve as an effective part of establishing the gag stock at OY levels, their termination upon reaching stock target level may necessitate the need to implement other future management measures to replace the loss of the reserves. Furthermore, neither this alternative nor previous management actions explicitly address the need to protect the male portion of the gag population. This alternative does not address protection of other species[30] that utilize the reserves, although those species will benefit for the duration of the reserves.

Alternative 6.1.5 will continue the protections to the resource described for Alternative 6.1.1 but only until the male gag within the reserves have reached 17% of the gag population within the reserves. The selection of 17% male gag as a target is based on the proportion found in studies conducted in the 1970's. However, gag had already been exploited for many years, so this does not represent an unfished proportion. While it is higher than the current estimate of 5% male gag, there is no benchmark to use to determine whether this is a high, low, or moderate proportion for gag. Since this target applies only within the reserve, the target can be achieved independently of the status of the stock in open access areas, and can decline as rapidly as it builds once the reserves are eliminated. Since this alternative treats the reserves as a self-contained entity, it ignores the cumulative effects of all management measures.

Alternative 6.1.6 makes the reserves a permanent part of the management process. This provides continuous ongoing protection for a portion of the male gag, and spawning aggregations of gag and other species that utilize the reserves. The increase in egg production that can be expected within the reserve as a result of a greater abundance and size of fish, in conjunction with other management actions previously

[30] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

taken, should help to make gag and other reef fish stocks more resistant to overfishing.

Alternative 6.1.7, status quo, allows the reserves to expire after June 2004. Gag were recently reclassified as neither overfished nor undergoing overfishing. That determination was based on a stock assessment that did not take into account recent management actions including the creation of the reserves and the increase in the minimum size limit for gag. Hence, eliminating the reserves will likely not result in stocks becoming overfished. However, factors that are not addressed by traditional management measures, such as the low proportion of male gag, will continue to be unaddressed or addressed only as a peripheral impact of reducing overall fishing mortality.

Section 6.2 - Fishing Restrictions Within the Reserves

Alternative 6.2.1 relaxes the current fishing restrictions within the reserves by allowing surface trolling for coastal pelagic species and blackfin tuna in addition to HMS species. Coastal pelagic species are managed in a separate FMP, and blackfin tuna is under consideration to be added to the Coastal Pelagics FMP. Migratory species gain little benefit from relatively small reserves because of the small amount of time that they spend in them. However, allowing additional legal fishing in the reserves increases the complexity of enforcing regulations on the restricted species. Following the terrorist attack of September 11, 2001 against the New York World Trade Center, the USCG shifted its mission emphasis toward national security. Consequently, USCG resources are less available for fisheries enforcement, and introducing complexity by allowing additional legal fishing will further degrade enforceability of the reserve fishing restrictions.

Alternative 6.2.2 attempts to prohibit all fishing by asking the NMFS HMS Division to prohibit fishing for HMS species within the reserves. The HMS Division has established restricted fishing zones for pelagic longlines in large areas that are known to be nursery grounds for juvenile swordfish or areas of billfish concentrations, but the marine reserves at Madison-Swanson and Steamboat Lumps do not fall within these regions. Migratory species gain little benefit from relatively small reserves because of the small amount of time that they spend in them, thus, there would be little benefit to HMS species from adding these reserves to the areas already restricted by the HMS regulations. However, allowing legal fishing in the reserves increases the complexity of enforcing regulations on the restricted species. As discussed above, USCG resources for fisheries enforcement have been reduced in the wake of the September 11, 2001 terrorist attack, and reducing the amount of legal fishing will reduce the complexity of the restrictions and enhance fisheries enforcement. If the NMFS HMS Division does not implement an HMS species fishing prohibition, the cumulative effects of this alternative will be identical to the status quo alternative.

Alternative 6.2.3 adds a prohibition on trolling, regardless of target species, to the prohibition on fishing for species other than HMS species. While HMS species can still be targeted inside the reserves using fishing methods other than trolling, it is likely that most HMS fishermen will avoid the reserves in order to troll in the open access areas. Thus this alternative will eliminate most fishing within the reserves. As discussed above, USCG resources for fisheries enforcement have been reduced in the wake of the September 11, 2001 terrorist attack, and reducing the amount of legal fishing will reduce the complexity of the restrictions and enhance fisheries enforcement.

Alternative 6.2.4 allows surface trolling within the reserves, and defines surface trolling gear in a manner designed to prevent the gear from fishing deep in the water column. This will reopen the reserves to fishers who historically fished the areas for coastal pelagic species and other fish commonly found in the upper water column such as wahoo. It will require USCG vessels to determine if a vessel is fishing in the reserves, and if so, whether it is surface trolling and deep-water trolling. NMFS research into the ability of enforcement officers to estimate the depth of trolling gear from an adjacent vessel concluded that enforcement personnel have great difficulty determining depth of trolled lines from adjacent vessels[31]. Thus, this alternative will likely increase the complexity of enforcement and may be difficult to enforce.

Alternative 6.2.5 prohibits possession of reef fish while in the reserves. This will reopen the reserves to fishers who historically fished the areas for coastal pelagic species and other fish commonly found in the upper water column such as wahoo, plus bottom fish other than reef fish. This alternative provides the most lenient allowance for fishing in the reserves of all the alternatives other than allowing the reserves to expire. It will be relatively easy to enforce at-sea, but will not be enforceable from airplanes, and will increase the necessity for effective at-sea enforcement. Given the shift in priorities for the USCG toward homeland security in recent years, and the limited amount of at-sea enforcement resources this alternative may receive a low priority and consequently reduce overall enforcement of the reserves.

Alternative 6.2.6, leaves in place the prohibition on fishing in the reserves for all species except HMS species. Anecdotal information presented during the scoping meetings for this amendment indicates that violations of the reserves are occurring. However, the USCG has succeeded in intercepting at least one vessel found violating the fishing restrictions. The current level of enforceability can be expected to continue under this alternative.

[31] Presentation on the evaluation of trolling in marine reserves by Andrew Davis, Gulf Council meeting, May 12, 2003, Panama City Beach, Florida.

Alternative 6.2.7 (Proposed Alternative) allows surface trolling in the reserves for coastal pelagic and HMS species during May through October, prohibits all fishing during November though April, and prohibits possession of reef fish in the reserves except by vessels that are transiting through the reserves. Opening up the reserves to fishing for coastal pelagic species for six months of the year could slightly increase fishing pressure on those species, including king mackerel, which are classified as undergoing overfishing (NMFS 2003). Wahoo and blackfin tuna, which can be caught by surface trolling, cannot be kept if caught in the reserves. Consequently, there may be an increase in bycatch and bycatch mortality of these species. However, the Council is considering adding wahoo and blackfin tuna to the Coastal Pelagics management unit through Coastal Pelagics Amendment 15 (currently under development). If added to the management unit, these species would subsequently be legal to catch during the surface trolling open season. Fishermen fishing for HMS species will need to be aware of a new HMS permit requirement which took effect in March 2003. Enforceability and research into the effects and usefulness of the reserves as a management tool will be complicated by allowing some fishing methods and species but not others. However, allowing limited access to the reserves by surface trolling for six months of the year was supported by many fishermen and fishing groups giving public testimony to the Council. This support may result in increased voluntary compliance for the regulations.

Section 6.3 - Seasonal Regulations

Alternative 6.3.1 reduces the time that the reserve restrictions are in effect to just two months per year. Although these two months are the peak spawning season for gag, they cover just a portion of the six-month long total gag spawning season and only about a fifth of the dominant spawning grounds for gag. Less protection will be afforded to spawning aggregations of other species[32], such as scamp, that utilize the reserves but spawn at different times of the year. Thus, this alternative will result in little change to the cumulative impacts of existing regulations.

Alternative 6.3.2 reduces the time that the reserve restrictions are in effect to six months per year. These six months encompass the entire spawning season for gag, but the reserves cover only about one fifth of the dominant spawning grounds for gag. Less protection will be afforded to spawning aggregations of other species, such as scamp, that utilize the reserves but spawn at different times of the year. However, protection of spawning aggregations may provide some enhancement to the stock egg production beyond that provided by traditional management measures since fishing often concentrates on aggregations and can disrupt spawning activities.

[32] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

Alternative 6.3.3 (Proposed Alternative) retains the reserves as year-round restricted areas, but with differing sets of restrictions for May through October and November through April as a result of Alternative 6.2.7. The November though April season, when all fishing is prohibited in the reserves, covers most of the spawning season for gag and scamp, except for May. While the traditional management measures previously implemented may help to control current fishing mortality rates, the reserves will add protection for specific spawning aggregations in the reserves from disruption by fishing activities. Abundance of reef fish and other bottom species appears to be increasing inside the reserves based on preliminary reports presented by researchers to the Council. Continuing the year-round closure on bottom fishing will allow these trends to continue.

12.0 OTHER APPLICABLE LAW

Habitat Concerns

Reef fish habitats and related concerns were described in the FMP and updated in Amendments 1 and 5 and in the Generic Amendment for Addressing Essential Fish Habitat Requirements in the Fishery Management Plans of the Gulf of Mexico. The habitat of the offshore regions of the Gulf of Mexico have generally not been well mapped. However, detailed mapping projects using state of the art sonar equipment have been conducted in the marine reserves at Madison-Swanson and Steamboat Lumps as a result of the initial four-year time period. These mapping projects in combination with research on habitat that is protected from fishing activities will facilitate a greater understanding off the offshore habitat and the role that it plays in ecosystems and fisheries. The alternatives in this amendment will provide an immediate benefit to the habitat within the affected areas by protecting them from bottom fishing activities, and will provide a long-term benefit by increasing our knowledge about the habitat within the reserves.

Vessel Safety Considerations

A determination of vessel safety with regard to compliance with 50 CFR 600.355(d) will be requested from the USCG. Since vessels with reef fish aboard can transit the reserves rather than have to detour around provided they do not fish within the reserves, actions in this amendment are not expected to adversely affect vessel safety. Alternatives that require the use of VMS could benefit vessel safety by providing vessels in distress with an alternate means of communication and by providing the USCG with precise coordinates of the vessel.

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 the marine reserves at Madison-Swanson and Steamboat Lumps affect specific geographical areas that are entirely within the EEZ of the Gulf of Mexico will make no changes in federal regulations that are inconsistent with the objectives of either existing or proposed state regulations.

This amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi and Texas to the maximum extent possible. This determination will be 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.

Effect on Endangered Species and Marine Mammals

Endangered Species Act

The Council will request that NOAA conduct a consultation under Section 7 of the Endangered Species Act on the impacts of the actions in this amendment on endangered species and marine mammals.

An April 28, 1989, biological opinion (BO) on the effects of commercial fishing activities under the Reef Fish FMP in the Gulf of Mexico found that mortalities of endangered and threatened species are uncommon from the hook-and-line and bottom longline gear used in the reef fish fishery and were not likely to jeopardize the continued existence of threatened or endangered species. Assessments of the level of take were not considered a high priority, and the BO concluded that the activities under this FMP would not jeopardize the continued existence of threatened or endangered species under NMFS purview. In addition, informal consultations have been conducted on the original Reef Fish FMP and for Amendments 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16A, 16B, 17, 19 (Generic Tortugas Reserves Amendment), and 20 (Reef fish, and associated regulatory amendments. Amendments 10 and 18 are not included in the preceding list. (A Section 7 consultation was initiated for Amendment 10, but that Amendment was not submitted to NMFS. Amendment 18 is currently under development and a Section 7 consultation will be requested at the appropriate time.) These consultations concluded that the fishery management actions were not likely to adversely affect any threatened or endangered species under NMFS jurisdiction. They also determined that FMP or amendment actions were not expected to change the prosecution of this fishery in a manner that will significantly alter the potential impacts to endangered and threatened species and their habitats previously considered. The previous Section 7 consultations are incorporated herein by reference.

Among the species observed in the marine reserves during studies conducted since their implementation were several species of deep-water grouper including warsaw grouper (*Epinephelus nigritus*), speckled hind (*Epinephelus drummondhayi*), and snowy grouper (*Epinephelus niveatus*)[33]. Little is known about these species, and warsaw grouper and speckled hind are on the NMFS list of candidate species for possible future listing under the Endangered Species Act. Warsaw grouper in the reserves were observed to exhibit a color change, that might be associated with possible spawning (personal comm. Chris Koenig). Continuation of the marine reserves, particularly year-round continuation, will help to protect these species and possible spawning habitat . None of the actions in this amendment are expected to jeopardize the recovery of endangered or threatened species or their critical habitat.

[33] Source: presentation to the Gulf Council by Dr. Chris Koenig at the May 2001 Council meeting.

Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 (MMPA) is the principal Federal legislation that guides marine mammal species protection and conservation policy. The 1994 Amendments to the MMPA introduced substantial changes to the provisions of the MMPA, including the establishment of a new regime governing interactions between marine mammals and commercial fisheries. Under section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery. NMFS classifies each U.S. fishery according to whether it has a frequent (Category I), occasional (Category II), or a remote likelihood of (Category III) incidental mortality and serious injury to marine mammals. The categorization of a fishery in the LOF determines whether participants in that fishery may be required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements.

The Gulf of Mexico reef fish bottom longline/hook and line fishery is currently classified as Catagory III, meaning that there is a remote likelihood or no known serious injuries or mortalities of marine mammals in the fishery.

Effect on Essential Fish Habitat (EFH)

Research has been conducted at both Madison-Swanson and Steamboat Lumps by NMFS during February and April, 2001, using panoramic video camera arrays, digital cameras, chevron traps, and an underwater remotely operated vehicle (ROV). At Madison-Swanson, spawning aggregations of gag and/or scamp were confirmed at 11 sites and suspected at five others through video surveillance from 20 ROV dives. Species collected at Madison-Swanson included gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red grouper (*Epinephelus morio*), snowy grouper (*Epinephelus niveatus*), speckled hind (*Epinephelus drummondhayi*), red snapper (*Lutjanus campechanus*), silk snapper (*Lutjanus vivanus*), red porgy (*Pagrus pagrus*), knobbed porgy (*Calamus nodosus*), gray triggerfish (*Balistes capriscus*), and greater amberjack *(Seriola dumerili*). In Steamboat Lumps, sandy substrates in the central portion of the reserve harbored honeycomb moray (*Gymnothorax saxicola*), and bandtail puffer *(Sphoeroides spengleri*). Sites sampled in the northeast region of the reserve, with habitat consisting of sandy substrates, fish burrows or rocky outcrops were dominated by honeycomb moray, bank sea bass (*Centropristis ocyurus*), red porgy, vermilion snapper (*Rhomboplites aurorubens*), scamp and red grouper (*Epinephelus morio*).[34] It can therefore be presumed that Madison-Swanson and Steamboat Lumps contain EFH for these species.

[34] Andrew David and Christopher Gledhill. 2002. Survey of Fish Assemblages and Habitat within Two Marine Protected Areas on the West Florida Shelf. Abstract, Florida Chapter, American Fisheries Society, 19th Annual Meeting, February 12-14, 2002, Brooksville, Florida.

The presence of red grouper in the reserves is of particular interest because this species not only utilizes the habitat, but creates habitat that it and other species can use. Red grouper act a environmental engineers, excavating sandy substrata to expose carbonate rock. These excavations can serve as refuge for many species of fish and invertebrate species, including snowy grouper, vermilion snapper, black grouper and spiny lobster (Coleman and Williams 2002).

The Generic Amendment for Addressing EFH Requirements (GMFMC 1998b) states that adult gag occupy 10 to 100 m depths (large adults occur in greater depths), selecting hard bottoms, offshore reefs and wrecks, coral, and live bottom. Adult red grouper prefer depths of 30 to 120 m and select rocky outcrops, wrecks, reefs, ledges, crevices and caverns of rock bottom, as well as "live bottom" areas. Adult black grouper are found from shore to depths of 150 m and are associated with wrecks and rocky coral reefs. Reef Fish Amendment 1 (GMFMC 1989) describes habitat damage by bottom longlines as similar to anchor damage (e.g. break hard and soft corals and scar reefs). A continued areal closure will not have a negative effect on the bottom and may actually be beneficial to EFH because fishing activities will be excluded within the closed area.

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.

One of the alternatives under Buffer Zones (Section 6.3) would, if implemented, require certain vessels to be equipped with VMS gear in order to provide electronic monitoring of the vessel location. This would be a voluntary measure, since vessels could avoid the VMS requirement by not fishing within the buffer zone. Although this would be a form of information collection, it would not require the submission of written reports. The NMFS and Council do not propose, through this amendment, to establish any paperwork reporting requirements or burdens.

Federalism

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

13.0 FINDING OF NO SIGNIFICANT IMPACT

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. The preferred actions considered in this regulatory amendment are expected to have minimal adverse effects on the fishery in the Gulf and the country as a whole. 40§1508.27(b) identifies ten concepts that are needed to evaluate intensity. They are discussed below in conclusive form for the actions proposed in this amendment.

(1) Beneficial and Adverse Impacts: Although research into the effects of the marine reserves at Madison-Swanson and Steamboat Lumps is ongoing, preliminary observations by researchers indicate that fish within the reserves are larger and more abundant since the reserves were implemented. The prohibition on most forms of fishing within the reserves is protecting the bottom habitat, which includes spawning habitat for gag, scamp and other species, from interactions with fishing gear. Thus, at least within the reserves, beneficial impacts are occurring. At the same time, the results of a 2001 gag stock assessment indicated that the gag stock was in improved condition, leading NMFS to reclassify the stock in 2002 from undergoing overfishing to neither overfished nor undergoing overfishing. This change was due in large part to other management measures implemented concurrently with the reserves, specifically an increase in the minimum size limit. It remains to be determined, through continuing research, whether and to what extent the beneficial impacts observed within the reserves will produce benefits beyond the reserve borders. However, with the improved stock condition, no adverse impacts to the stock have been observed or are expected to occur from continuation of the reserves.

(2) Public Safety: Although most forms of fishing are prohibited within the reserves, vessels may transit the reserves rather as long as they do not stop to fish. Therefore, the actions in this amendment are not expected to affect vessel safety.

(3) Unique geographic areas: Madison-Swanson and Steamboat Lumps were selected as reserve sites specifically because of their unique geographic characteristics. Their physical locations and descriptions are provided in Appendix A. The bottom habitat in Madison-Swanson and Steamboat Lumps provides hard bottom relief that is suitable spawning and living habitat for numerous species. Summaries of some of the underwater research conducted in the reserves included in the Scoping Document (Appendix B, included herein by reference) list species that have been observed within the reserves. Because of their importance as habitat to gag and other reef fish, selection of these areas over other locations provides the greatest likelihood of producing beneficial impacts to the resource and minimizing negative impacts from fishing activities.

(4) Controversial effects on Human Environment: Unlike more traditional management measures (e.g., size limits, bag limits, etc.) which generally impact only

a single stock and have readily quantifiable impacts, reserves affect the entire ecosystem within a geographic area, and their impact on single stock fishery resources are more difficult to quantify. Given the more generalized nature of marine reserve regulations, some fishermen consider reserves to be an infringement on their freedom to fish. However, when faced with increasingly restrictive traditional management measures and the need to protect essential fish habitat, an increasing number of fishermen and others concerned with protecting the resources are supportive of actions to evaluate the effectiveness of marine reserves as a fishery management tool, as indicated in the comments received during the scoping process for this amendment. That is exactly what the alternatives in this amendment are designed to do, through the establishment and continuation of the reserves for a fixed time period during which the impacts of the reserves will be evaluated. Although there was some controversy to the initial establishment of the marine reserves at Madison-Swanson and Steamboat Lumps, continuation of the existing reserves is not as controversial.

While there is broad agreement on the rationale for prohibiting bottom fishing to protect spawning aggregations of gag and other reef fish, the question of whether to allow or prohibit trolling within the reserves for pelagic species is controversial. Research into the impact of trolling on reef fish and the enforceability of fishing regulations by depth of fishing has been conducted, with results with results presented to the Council at its May 2003 meeting (Appendix D) and July 2003 meeting (Appendix E). The research found that, when fished at slow speeds (less than 4 knots), trolling gear is capable of fishing at depths deep enough to catch reef fish. However, surface trolling vessels typically fish at faster speeds. At speeds of 12 to 15 knots, the research found that the gear remained near the surface and no reef fish were caught. The research also found that enforcement officers were unable to determine the depth at which gear was being fished from visual observations. Because reef fish are unlikely to be caught when the gear is fished in an appropriate manner for surface trolling, the Council adopted Preferred Alternative 6.2.7, which allows surface trolling for coastal pelagic and HMS species during May through October, outside of most of the gag spawning season and during the primary months for surface trolling. However, due to the enforcement concerns during the gag spawning season, when aggregating fish may attract poachers, the proposed alternative prohibits all fishing during November through April. Furthermore, the possession of reef fish is prohibited onboard vessels within the reserves except when transiting the reserves. This alternative avoids displacing fishermen who troll for highly migratory species from their traditional fishing grounds during their primary fishing season. However, due to the distance from shore of Madison-Swanson and Steamboat Lumps, the number of recreational fishermen affected is expected to be small. Furthermore, the migratory nature of the target species means that the highly migratory species spend little time within the reserves and become available to fishermen once they migrate out of the reserves. Thus, the impact on fishing for highly migratory species is expected to be minor.

(5) Uncertain, Unknown, or Unique Risks: Although there has been an observed increase in the size and abundance of fish within the reserves, their impact on the overall stock is unknown and has not been quantified, and their impacts have not been incorporated into stock assessments to date. To the extent that the reserves are beneficial to the stock, this could result in the assessment projections underestimating the future status of the stock. Evaluating the effect of the marine reserves is identified in this amendment as a research need and is one of the purposes of the proposed actions to continue the reserves for a fixed time period rather than indefinitely. The increased abundance and size of fish within the reserves could be an incentive to illegally fish within the reserve boundaries. This could increase the risk of creating enforceabiltity issues and could reduce the effectiveness of the reserves.

(6) *Precedence*: The proposed actions do not establish new precedence. The marine reserves at Madison-Swanson and Steamboat Lumps already exist. This amendment simply proposes to extend the time period for their existence.

(7) *Cumulative impacts*: The continuation of the marine reserves at Madison-Swanson and Steamboat Lumps will continue to displace fishermen who historically used these areas as fishing grounds. However, their continuation will allow the protections provided by them to continue for gag spawning aggregations, male gag, and other species[35] that use the habitat, as well as provide protection for reef fish habitat. In addition, continuation of the reserves will allow additional research into the effects of the reserves on the resource and habitat. The reserves, in combination with other traditional management measures, may improve the status of gag and other stocks, resulting in improved fishing opportunities and greater ability to sustain the resources. The research opportunities provided by the reserves will improve the general knowledge of reef fish and of the habitat within the reserves, ultimately leading to improved management of the resource.

(8) Adverse effects on resources: The displacement of fishermen from the areas affected by the reserves could increase fishing pressure in other locations. However, this displacement occurred with the initial creation of the reserves in June 2000. Continuation of the reserves will not change the existing impacts, except that if the fishing restrictions are increased to include a prohibition on trolling for highly migratory species, there could be some additional fishermen who are displaced. Only a displacement of existing fishing mortality, not an increase in overall fishing mortality, will result from the reserves. Aside from the possibility of some localized increase in fishing pressure, the proposed alternatives are not expected to have any adverse effects on resources.

[35] See Section 10.0 (Description of the Affected Environment) for a summary of the species most frequently observed in Madison-Swanson and Steamboat Lumps.

(9) Endangered Resources: The Council will request that NOAA conduct a consultation under Section 7 of the Endangered Species Act on the impacts of the actions in this amendment on endangered species and marine mammals. In previous consultations, it was determined the FMP or amendment actions were not likely to jeopardize the continued existence of threatened or endangered animals or result in the destruction or adverse modification of habitat that may be critical to those species. These previous Section 7 consultations are listed in Section 12 (Other Applicable Law) and are incorporated herein by reference. Warsaw grouper and speckled hind are on the NMFS list of candidate species for possible future listing under the Endangered Species Act, and have been observed in the reserves. To the extent that these species utilize the reserves, they will be protected, which may reduce the possibility of their eventually being listed as endangered or threatened. Since the proposed actions in this amendment protect habitat and resources, no negative impacts on species or habitat is expected.

(10) Other environmental laws: The continuation of the marine reserves at Madison-Swanson and Steamboat Lumps do not have an impact on state or local regulations outside the EEZ, and do not create a conflict with any other federal law or regulation applicable to the EEZ. In 2001, the Council learned that a proposed construction route for a natural gas pipeline (Buccaneer Gas Pipeline) would take the pipeline through the marine reserves at Madison-Swanson and Steamboat Lumps. In response to concerns raised by the Council in comments on the pipeline EIS, the contractor modified the route so that it circumvented the reserves.

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 biological, 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

14.0 PUBLIC REVIEW

Scoping Meetings

Scoping meetings were held to accept public input into whether there is a need to initiate an amendment to the Reef Fish FMP to continue the marine reserves at Madison-Swanson and Steamboat Lumps, and what the scope of alternatives should be if an amendment is initiated. These meetings were held from 7:00 p.m. to 10:00 p.m. at the following locations and dates.

June 19, 2002
National Marine Fisheries Service
Panama City Laboratory
3500 Delwood Beach Road
Panama City, Florida

June 20, 2002
Tampa Airport Hilton
2225 Lois Avenue
Tampa, Florida

Public Hearings

A public hearing of the draft amendment was held on from 7:00 p.m. to 10:00 p.m. at the following date and location:

April 9, 2003
Tampa Airport Hilton
2225 Lois Avenue
Tampa, Florida

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

May 14, 2003, 8:45 a.m. - noon
Edgewater Beach Resort
11212 Front Beach Road
Panama City Beach, Florida

July 16, 2003, 2:15 p.m. - 4:30 p.m.
Naples Beach Hotel and Golf Club
851 Gulf Shores Boulevard North
Naples, Florida

Final action was taken at the Naples meeting following the public testimony.

15.0 LIST OF PREPARERS

Gulf of Mexico Fishery Management Council
- Steven Atran, Population Dynamics Statistician
- Tim Goode, Economist
- Antonio Lamberte, Economist

16.0 LIST OF AGENCIES CONSULTED

The following public agencies and groups were be consulted during development of the amendment.

National Marine Fisheries Service
Southeast Regional Office
Southeast Fisheries Science Center

Gulf of Mexico Fishery Management Council
Reef Fish Advisory Panel
Standing and Special Reef Fish Scientific and Statistical Committee

United States Coast Guard, 7th and 8th Districts

17.0 RESPONSIBLE AGENCY

Gulf of Mexico Fishery Management Council
The Commons at Rivergate
3018 North U.S. Highway 301, Suite 1000
Tampa, Florida 33619-2272
(813) 228-2815 (Phone)
(813) 225-7015 (Fax)
gulfcouncil@gulfcouncil.org (e-mail)

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19.0 TABLES

Table 1. Shallow-water grouper commercial harvests and revenues per logbook records.

Landings (thousand pounds of eviscerated weight)										
	Statistical Area 6					Statistical Area 8				
	Red	**Gag**	**Black**	**OSWG**	**Total**	**Red**	**Gag**	**Black**	**OSWG**	**Total**
1993	846	154	139	36	1,175	54	25	79	12	170
1994	1,032	163	131	29	1,355	89	32	110	22	253
1995	690	104	81	22	897	77	36	62	26	201
1996	793	148	139	34	1,114	110	49	93	27	279
1997	1,116	232	134	44	1,526	133	47	84	36	300
1998	734	373	180	35	1,322	116	121	210	20	467
1999	1,422	387	155	39	2,003	117	67	125	25	334
2000	1,487	472	134	61	2,154	188	130	109	21	448
2001	1,299	588	145	48	2,080	157	196	136	37	526
2002	1,294	391	115	38	1,838	126	137	138	23	424
Ave. 93-99	948	223	137	34	1,341	99	53	109	24	286
Ave. 01-02	1,296	489	130	43	1,959	141	166	137	30	475
Ex-Vessel Revenues (thousand dollars)										
	Statistical Area 6					Statistical Area 8				
	Red	**Gag**	**Black**	**OSWG**	**Total**	**Red**	**Gag**	**Black**	**OSWG**	**Total**
1993	1,384	325	268	71	2,048	89	54	153	25	321
1994	1,845	372	276	65	2,558	161	74	232	48	515
1995	1,150	244	179	47	1,620	132	79	133	53	397
1996	1,516	355	320	76	2,267	213	118	215	66	612
1997	2,105	565	306	101	3,077	250	115	187	84	636
1998	1,398	905	419	81	2,803	224	297	487	50	1,058
1999	2,794	964	360	96	4,214	231	168	297	50	758
2000	2,966	1,232	327	151	4,676	372	334	270	62	1,026
2001	2,605	1,515	360	122	4,602	323	517	344	50	1,274
2002	2,462	978	291	97	3,828	251	347	359	90	1,015
Ave. 93-99	1,741	532	304	77	2,655	185	129	243	53	613
Ave. 01-02	2,533	1,246	325	109	4,215	287	432	351	70	1,144

Source of basic data: Waters (2003).

Table 2. Commercial harvest of species other shallow-water grouper in all areas and commercial harvest of shallow-water grouper in areas other than statistical areas 6 and 8 (thousand pounds of eviscerated weight).

	Harvest of Other Species			Harvest of SWG in All Areas Exclusive of Areas 6 and 8			
	Area 6	Area 8	Other Areas	Red	Gag	Black	OSWG
1993	442	239	14,120	4,420	506	617	348
1994	528	586	14,623	3,983	549	543	323
1995	336	207	14,795	3,965	642	651	307
1996	567	395	13,330	3,536	529	533	257
1997	603	487	12,995	3,694	560	489	361
1998	510	443	12,942	3,487	1,023	709	299
1999	555	517	14,423	4,632	914	477	289
2000	510	575	12,961	4,418	1,036	547	310
2001	508	595	13,535	4,417	1,480	657	279
2002	441	446	10,197	3,328	1,130	522	207
Ave. 93-99	506	410	13,889	3,959	674	574	312
Ave. 01-02	474	520	11,866	3,872	1,305	589	243

Source of basic data: Waters (2003).

Table 3. Number of boats and number of trips boats took in various areas.

	Number of Boats				Number of Trips			
	Area 6	**Area 8**	**Area 6 or 8**	**All Areas**	**Area 6**	**Area 8**	**Area 6 or 8**	**All Areas**
1993	264	77	324	1,551	1,411	419	1,830	22,527
1994	289	120	379	1,643	1,797	722	2,519	25,734
1995	240	92	315	1,604	1,244	389	1,633	23,960
1996	237	106	322	1,278	1,566	740	2,306	16,721
1997	272	115	358	1,216	1,895	800	2,695	15,820
1998	283	138	395	1,265	2,033	968	3,001	16,271
1999	282	133	391	1,251	2,280	1,086	3,366	17,775
2000	286	125	383	1,269	2,197	1,046	3,242	17,773
2001	261	125	357	1,212	1,871	1,129	2,998	17,374
2002	244	114	340	1,093	1,548	845	2,392	13,394
Ave. 93-99	266	111	354	1,401	1,746	732	2,478	19,829
Ave. 01-02	252	119	348	1,152	1,709	987	2,695	15,384
Ave. 93-02	266	115	356	1,338	1,784	814	2,598	18,735

Source of basic data: Waters (2003).

Table 4. Harvest and revenues of commercial vessels fishing in statistical areas 6 or 8.

Harvests (thousand pounds of eviscerated weight)						
	Area 6			Area 8		
	SWG	ORF	CMP	SWG	ORF	CMP
1993	1,175	247	70	170	167	22
1994	1,355	288	56	253	267	182
1995	897	188	6	201	127	7
1996	1,114	290	14	279	172	70
1997	1,526	269	26	300	149	138
1998	1,322	245	105	467	161	99
1999	2,003	323	25	334	199	194
2000	2,154	265	29	448	274	111
2001	2,080	271	38	526	250	93
2002	1,838	261	21	424	278	39
Ave. 93-99	1,341	264	43	286	177	102
Ave. 01-02	1,959	266	30	475	264	66
Ex-vessel Revenues (thousand dollars)						
			Area 6			Area 8
	SWG	ORF	CMP	SWG	ORF	CMP
1993	2,048	277	45	321	220	28
1994	2,558	331	42	515	361	236
1995	1,620	230	7	397	183	9
1996	2,267	333	19	612	252	115
1997	3,077	305	33	636	210	219
1998	2,803	295	67	1,058	250	139
1999	4,214	462	33	758	351	303
2000	4,676	392	40	1,026	588	188
2001	4,602	409	31	1,274	468	146
2002	3,828	386	32	1,015	500	61
Ave. 93-99	2,655	319	35	613	261	149
Ave. 01-02	4,215	398	32	1,144	484	103

Source of basic data: Waters (2003).

SWG: shallow-water grouper
ORF: other reef fish
CMP: coastal migratory pelagic

Table 5. Annual commercial harvest and revenue reductions under various alternatives for restricting fishing within the marine reserves

	Harvest (thousand pounds)	Revenues (thousand dollars)
Alternative 6.2.1	183	341
Alternative 6.2.2	201	365
Alternative 6.2.3	201	365
Alternative 6.2.4	183	341
Alternative 6.2.5	183	341
Alternative 6.2.6	201	365
Alternative 6.2.7	191	352

Source of basic data: Waters (2003).

Table 6. Present values of revenue reductions from various alternatives for the duration of and fishing restrictions within the marine reserves (thousand dollars; 7% discount rate).

Alternatives for Marine Reserve Duration	Alternatives for Fishing Restrictions Within the Marine Reserves						
	Alt. 6.2.1	**Alt. 6.2.2**	**Alt. 6.2.3**	**Alt. 6.2.4**	**Alt. 6.2.5**	**Alt. 6.2.6**	**Alt. 6.2.7**
Alt. 6.1.1 (4 years)	1,236	1,323	1,323	1,236	1,236	1,323	1,276
Alt. 6.1.2 (6 years)	1,729	1,862	1,862	1,729	1,729	1,862	1,795
Alt. 6.1.3 (10 years)	2,563	2,743	2,743	2,563	2,563	2,743	2,645
Alt. 6.1.4 (unknown)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alt. 6.1.5 (unknown)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alt. 6.1.6 (indefinite)	4,871	5,214	5,214	4,871	4,871	5,214	5,029
Alt. 6.1.7 (0 years)	0	0	0	0	0	0	0

Source of basic data: Waters (2003).

Table 7. Number of dealers receiving reef fish and other species harvested from statistical areas 6 or 8.

Annual Receipts (Pounds)	Number of Dealers										
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Average**
< 10,000	37	44	43	48	54	66	54	76	47	74	54
10,000 < 20,000	10	5	10	9	8	8	3	5	9	6	7
20,000 < 40,000	11	6	4	4	5	3	13	9	3	9	7
40,000 < 60,000	4	5	3	6	5	6	2	0	6	3	4
60,000 < 80,000	2	3	5	7	2	3	1	3	2	4	3
≥ 80,000	8	12	7	8	13	11	15	15	12	10	11
Total	72	75	72	82	87	97	88	108	79	106	87

Source: Waters (1999).

Table 8. Average monthly (1993-1999) harvest and revenues of commercial vessels fishing in statistical areas 6 or 8.

Harvests (thousand pounds of eviscerated weight)						
	Area 6			Area 8		
	SWG	ORF	CMP	SWG	ORF	CMP
January	80	16	3	34	17	10
February	68	14	2	21	12	7
March	80	16	3	25	14	8
April	78	16	3	20	12	7
May	155	30	5	29	17	10
June	162	32	5	22	17	10
July	173	32	5	24	18	10
August	150	30	3	16	14	8
September	99	20	3	17	13	7
October	91	19	3	21	14	8
November	102	21	3	28	15	8
December	103	20	3	29	16	9
Ex-vessel Revenues (thousand dollars)						
	Area 6			Area 8		
	SWG	ORF	CMP	SWG	ORF	CMP
January	158	19	2	73	25	14
February	134	17	2	44	17	10
March	158	20	2	54	20	12
April	155	19	2	44	17	10
May	307	36	4	61	25	14
June	321	38	4	46	25	14
July	343	39	4	52	26	15
August	297	36	4	34	21	12
September	196	24	3	36	19	11
October	180	22	2	45	20	12
November	203	25	3	60	22	12
December	203	25	3	63	23	13

Source of basic data: Waters (2003).

SWG: shallow-water grouper
ORF: other reef fish
CMP: coastal migratory pelagic

Table 9. Present values of revenue reductions from various alternatives for the duration of, fishing restrictions, and seasonal regulations within the marine reserves (thousand dollars; 7% discount rate).

Alternative 6.3.1: February - March Effectivity						
Alternatives for Marine Reserve Duration	**Alternatives for Fishing Restrictions Within the Marine Reserves**					
	Alt. 6.2.1	**Alt. 6.2.2**	**Alt. 6.2.3**	**Alt. 6.2.4**	**Alt. 6.2.5**	**Alt. 6.2.6**
Alt. 6.1.1 (4 years)	157	169	169	157	157	169
Alt. 6.1.2 (6 years)	220	238	238	220	220	238
Alt. 6.1.3 (10 years)	325	350	350	325	325	350
Alt. 6.1.4 (unknown)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alt. 6.1.5 (unknown)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alt. 6.1.6 (indefinite)	617	666	666	617	617	666
Alt. 6.1.7 (0 years)	0	0	0	0	0	0
Alternative 6.3.2: December - May Effectivity						
	Alternatives for Fishing Restrictions Within the Marine Reserves					
	Alt. 6.2.1	**Alt. 6.2.2**	**Alt. 6.2.3**	**Alt. 6.2.4**	**Alt. 6.2.5**	**Alt. 6.2.6**
Alt. 6.1.1 (4 years)	571	612	612	571	571	612
Alt. 6.1.2 (6 years)	803	862	862	803	803	862
Alt. 6.1.3 (10 years)	1,184	1,270	1,270	1,184	1,184	1,270
Alt. 6.1.4 (unknown)	n.a	n.a	n.a	n.a	n.a	n.a
Alt. 6.1.5 (unknown)	n.a	n.a	n.a	n.a	n.a	n.a
Alt. 6.1.6 (indefinite)	2,250	2,414	2,414	2,250	2,250	2,414
Alt. 6.1.7 (0 years)	0	0	0	0	0	0
Alternative 6.3.3: Year-Round Effectivity						
	Alternatives for Fishing Restrictions Within the Marine Reserves					
	Alt. 6.2.1	Alt. 6.2.2	Alt. 6.2.3	Alt. 6.2.4	Alt. 6.2.5	Alt. 6.2.6
Alt. 6.1.1 (4 years)	1,236	1,323	1,323	1,236	1,236	1,323
Alt. 6.1.2 (6 years)	1,729	1,862	1,862	1,729	1,729	1,862
Alt. 6.1.3 (10 years)	2,563	2,743	2,743	2,563	2,563	2,743
Alt. 6.1.4 (unknown)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alt. 6.1.5 (unknown)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alt. 6.1.6 (indefinite)	4,871	5,214	5,214	4,871	4,871	5,214
Alt. 6.1.7 (0 years)	0	0	0	0	0	0

Source of basic data: Waters (2003).

20.0 FIGURES

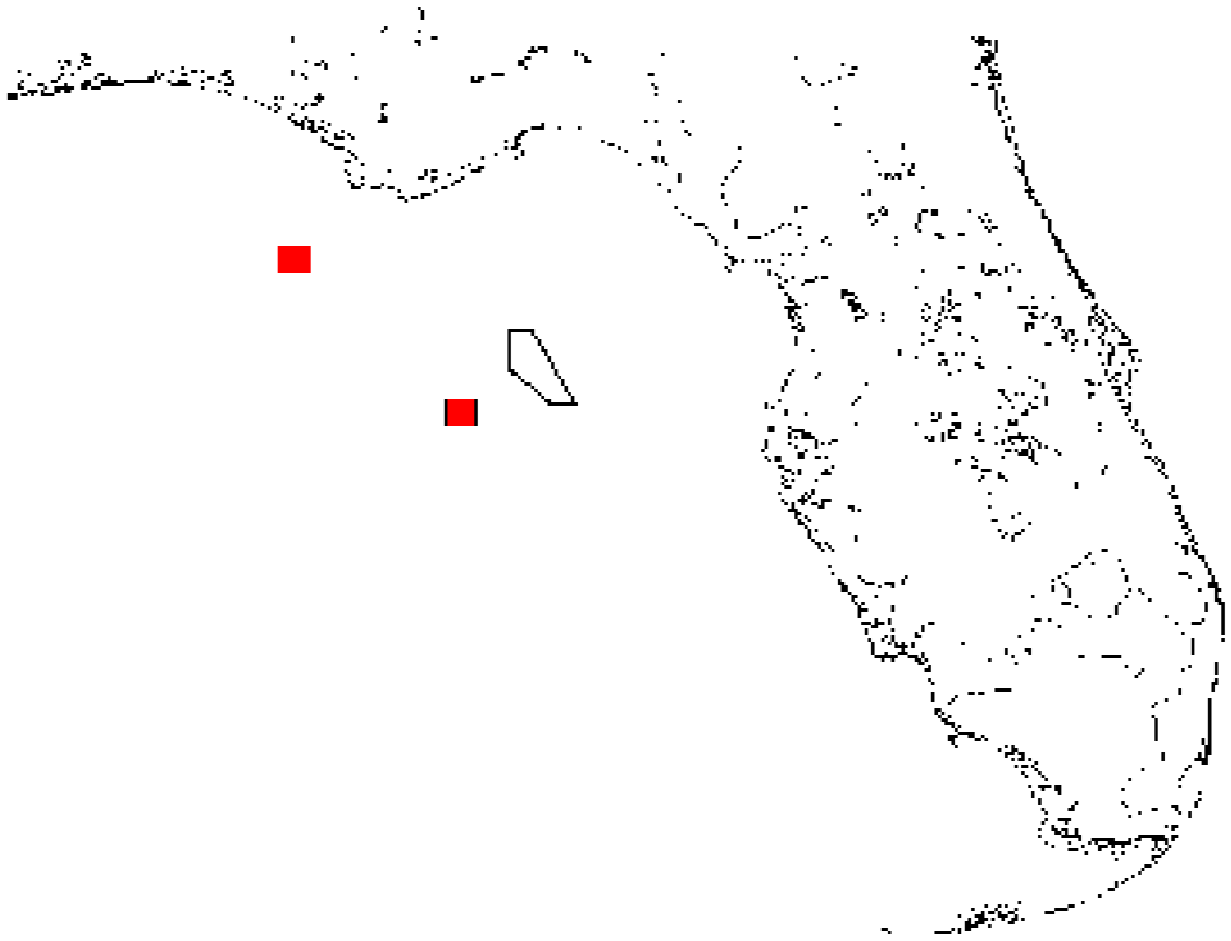

Figure 1. No-take zones created June 2002. Upper rectangle is Madison/Swanson site. Lower rectangle is Steamboat Lumps. Florida Middle Grounds HAPC is also shown for comparison.

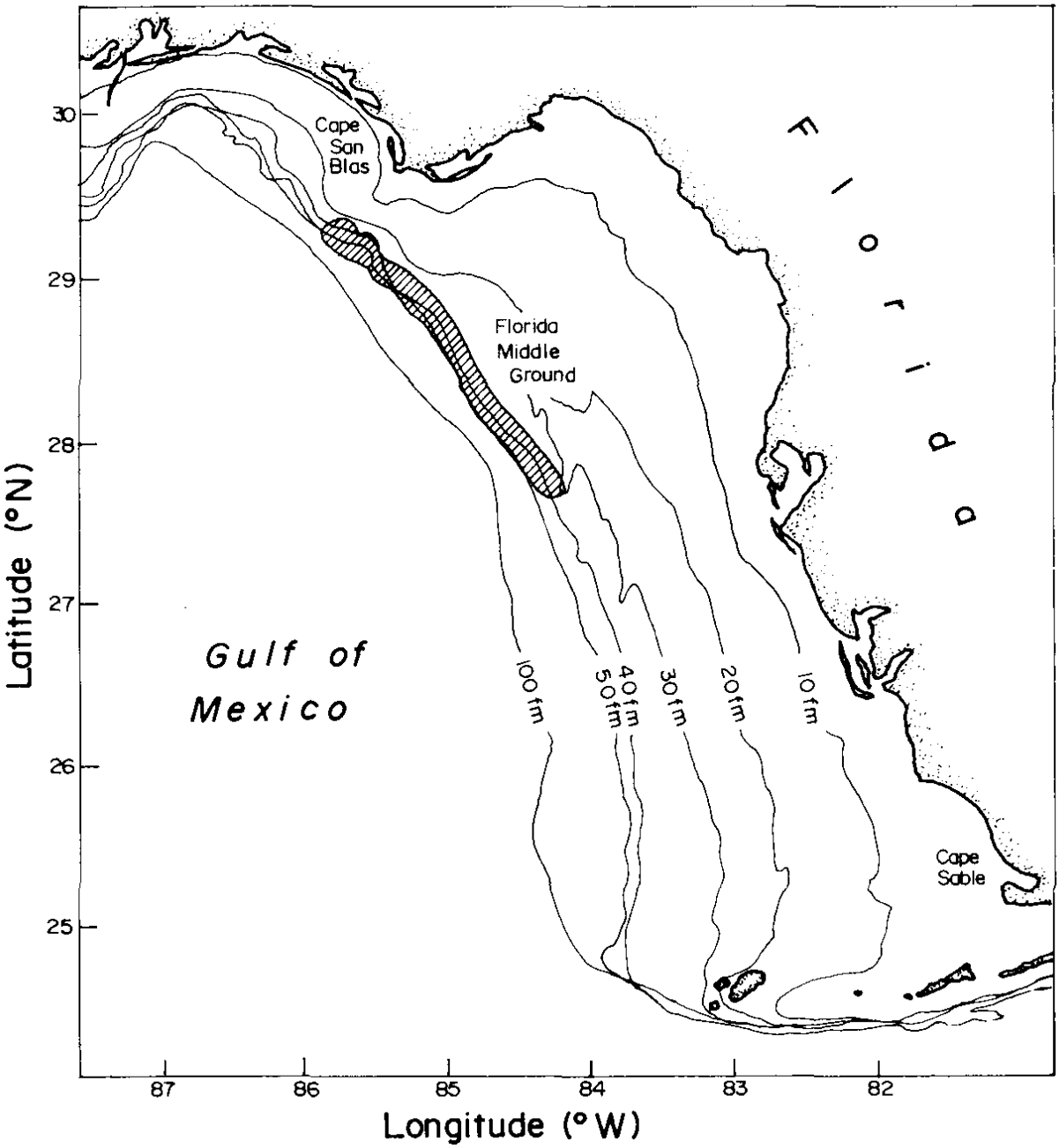

Figure 2. Dominant spawning grounds for gag off the Gulf coast of Florida (source: Koenig et al. 1996)

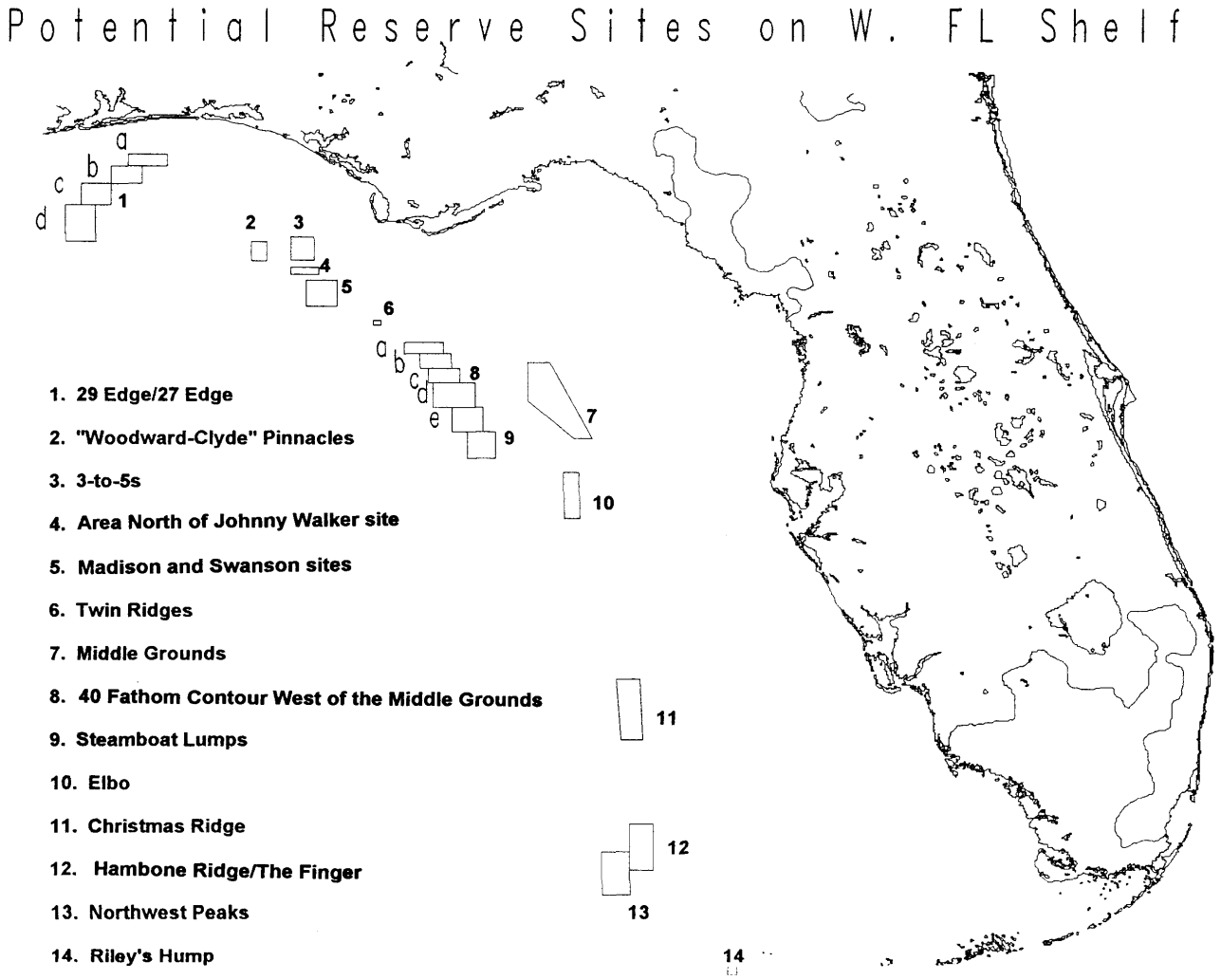

Figure 3. Potential reserve sites on west Florida shelf (source: Chris Koenig and Gary Fitzhugh)

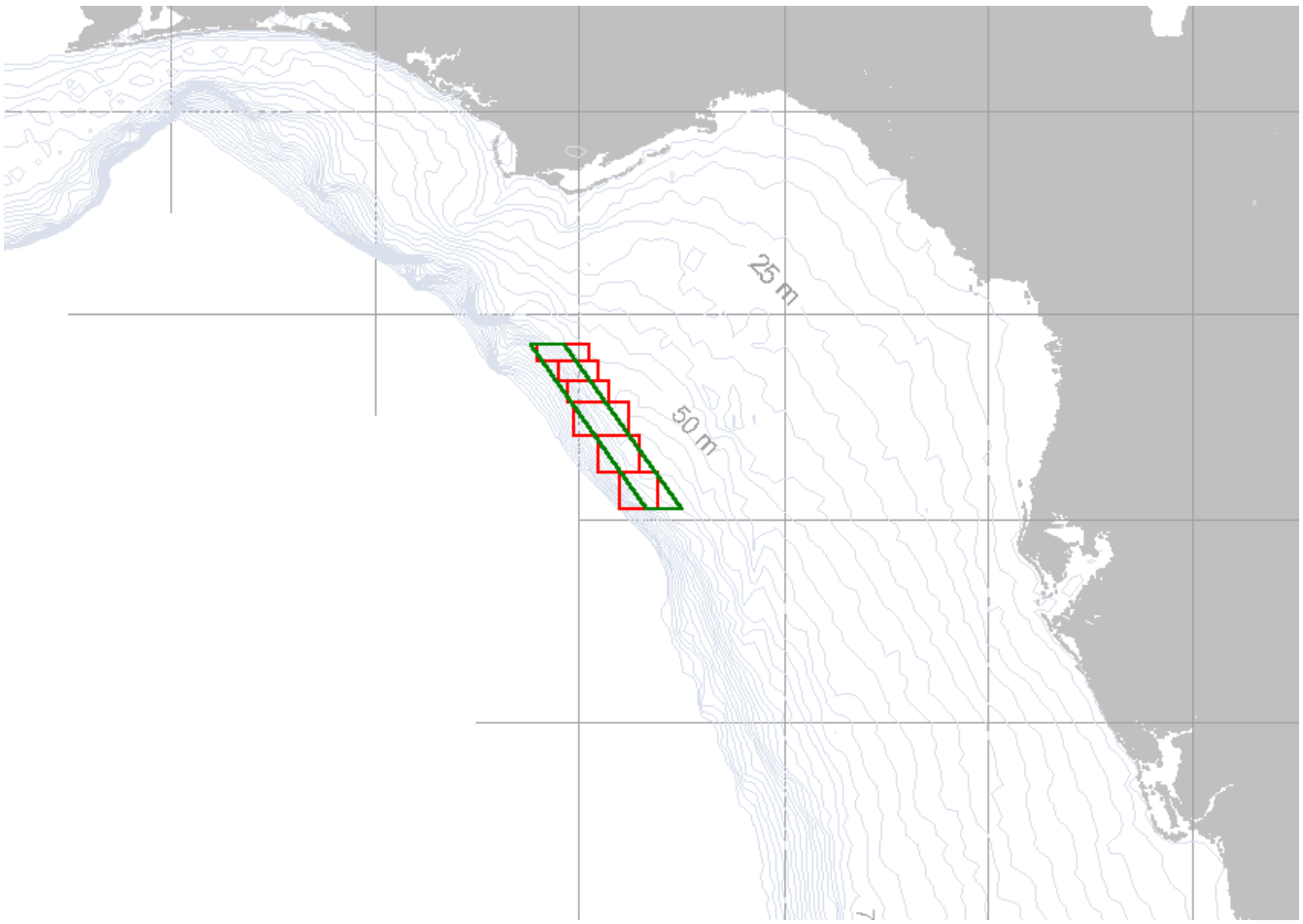

Figure 4. Original proposed gag area closure. The boxes represent Dr. Chris Koenig's sites 8(a-e) and 9. The oblong region is the simplified version of the proposed closed area.

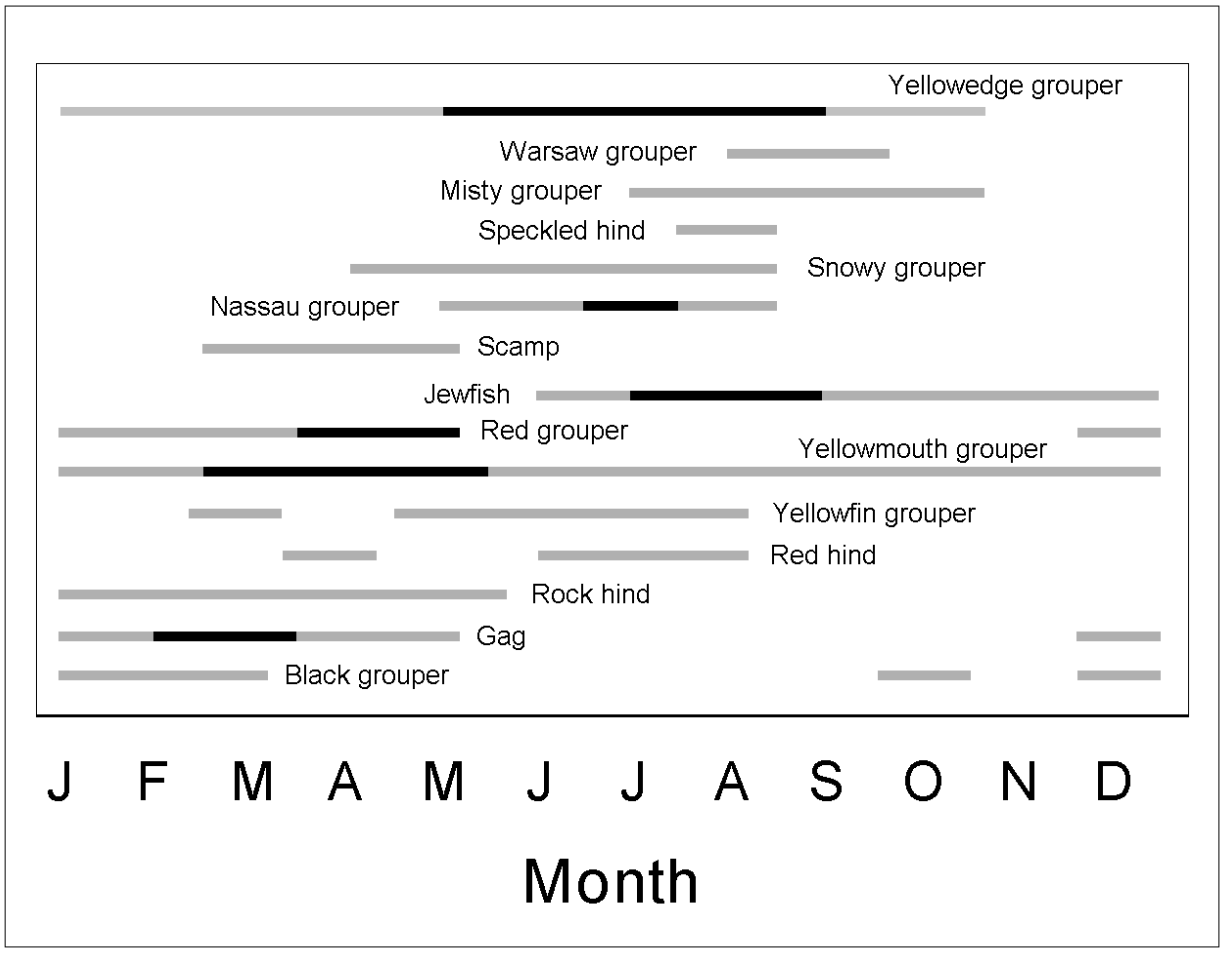

Figure 5. Spawning seasons of grouper species caught in the Gulf of Mexico. Gray lines represent when spawning is occurring and black lines represent peak spawning.

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

The following are descriptions of habitat sites identified by Dr. Chris Koenig and Chris Gledhill on Figure 2. Most of these sites are far offshore and generally in 20 to 50 fathoms. Site locations are identified both by latitude/longitude boundaries and by USGS lease blocks and the discussion is that of Chris Gledhill and Chris Koenig. The size of each area in square nautical miles was calculated by Kathy Scanlon, U.S. Geological Survey.

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

Area A (62 sq. naut. mi), USGS lease blocks 853-857, 897-901;
boundaries: N= 30º 09'N, S= 30º 04'N, E=86º 43'W, W=86º 58'W;
Area B (75 sq. naut. mi), USGS lease blocks 939-942; 983-986, 15-18;
boundaries: N=30º 04'N, S=29º 57'N, E=86º 53'W, W=87º 05'W;
Area C (86 sq. naut. mi), USGS lease blocks 57, 58, 101, 102, 145, 146;
boundaries: N=29º 57'N, S=29º 48'N, E=87º 05'W, W=87º 16'W;
Area D (144 sq. naut. mi), USGS lease blocks 185-188, 229-232, 273-276, 317-320, 361-364.
boundaries: N=29º 48'N, S=29º 33'N, E=87º 11'W, W=87º 22'W.

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

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

2. "Woodward-Clyde" Pinnacles (42 sq. naut. mi)
Destin Dome USGS lease blocks 473, 474, 516, 517, 518, 562.
boundaries:

NW= 29º 33'N, 86º 11'W	**NE= 29º 33'N, 86º 05' W**
SW= 29º 25'N, 86º 11'W	**SE= 29º 25'N, 86º 05'W**

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

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

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

boundaries:

NW= 29º 35'N, 85º 56'W	**NE= 29º 35'N, 85º 47'W**
SW= 29º 25'N, 85º 56'W	**SE= 29º 25'N, 85º 47'W**

.

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

4. Area North of Johnny Walker site (denoted as Mud Banks by Moe 1963) (28 sq. naut. mi)

Apalachicola USGS lease blocks 654, 617, 618, 619.

boundaries:

NW= 29º 22'N, 85º 56'W	**NE = 29º 22'N, 85º 45'W**
SW = 29º 19'N, 85º 45'W	**SE = 29º 19'N, 85º 5'W**

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

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

boundaries:

NW= 29º 17'N, 85º 50'W	**NE= 29º 17'N, 85º 38' W**
SW= 29º 06'N, 85º 50'W	**SE= 29º 06'N, 85º 38'W**

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

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

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

boundaries:

NW= 29º 00'N, 85º 24'W **NE= 29º 00'N, 85º 21'W**

SW= 28º 58'N, 85º 24'W **SE= 28º 58'N, 85º 21'W**

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

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

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

boundaries::

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

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

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

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

boundaries:

NW= 28º 51'N, 85º12'W **NE= 28º 51'N, 84º 57'W,**

SE= 28º 46'N, 84º 57'W SW= 28º 46'W, 85º 12'W;

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

boundaries:

NW= 28º 46'N, 85º06'W **NE= 28º 46'N, 84º 54'W,**

SE= 28º 40'N, 84º 54'W SW= 28º 40'W, 85º 06'W;

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

boundaries:

NW= 28º 40'N, 85º03'W NE= 28º 40'N, 84º 51'W,

SE= 28º 34'N, 84º 51'W SW= 28º 34'W, 85º 03'W;

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

boundaries:

NW= 28º 34'N, 85º01'W NE= 28º 34'N, 84º 45'W,

SE= 28º 24'N, 84º 45'W SW= 28º 24'W, 85º 01'W;

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

boundaries:

NW= 28º 24'N, 84º54'W NE= 28º 24'N, 84º 42'W,

SE= 28º 14'N, 84º 42'W SW= 28º 14'W, 84º 54'W;

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

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

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

boundaries:

NW= 28 14'N, 84 48'W NE= 28 14'N, 84 37'W

SW= 28 03'N, 84 48'W SE= 28 03'N, 84 37'W

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

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

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

boundaries

NW= 27 57'N, 84 11'W NE= 27 57'N, 84 05'W

SW= 27 38'N, 84 11'W SE= 27 38'N, 84 05'W

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

11. "Christmas Ridge". (191 sq. naut. mi).
Charlotte Harbor USGS lease blocks 444, 445, 446, 488, 489, 490, 532, 533, 534, 576, 577, 578, 620, 621, 622, 664, 665, 666, 708, 709, 710, 752, 753, 754, 796, 797, 798;
boundaries:

NW= 26º 31'N, 83º 51'W	**NE= 26º 31'N, 83º 41'W**
SW= 26º 06'N, 83º 49'W	**SE= 26º 06'N, 83º 42'W**

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

12. "Hambone Ridge/the Finger". (153 sq. naut. mi).
Pulley Ridge USGS lease blocks 445, 446, 447, 489, 490, 491, 533, 534, 535, 577, 578, 579, 621, 622, 623, 665, 666, 667, 709, 710, 711;
boundaries:

NW= 25º 31'N, 83º 46'W	**NE= 25º 31'N, 83º 37'W**
SW= 25º 12'N, 83º 46'W	**SE= 25º 12'N, 83º 37'W**

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

13. " Northwest Peaks". (182 sq. naut. mi).
Pulley Ridge USGS lease blocks 617, 618, 619, 620, 661, 662, 663, 664, 705, 706, 707, 708, 749, 750, 751, 752, 793, 794, 795, 796, 837, 838, 839, 840, 881, 882, 883, 884.
boundaries:

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

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

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

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

Discussion: This area is a rise between the 20 and 30 fathom isobaths southwest of the Dry Tortugas and it covers about one lease block of area This area was designated as a mutton snapper spawning grounds in Amendment 5 (supplement) of the Reef Fish FMP (1993), and no fishing was allowed in May and June. The area was subsequently encompassed by the Tortugas South marine reserve (60 sq. naut. miles) which was implemented in July 2001 by Reef Fish Amendment 19 (also known as the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves).

APPENDIX B- Scoping Document

5/29/2002

SCOPING DOCUMENT

FOR A POTENTIAL AMENDMENT 21 TO THE

REEF FISH FISHERY MANAGEMENT PLAN

June 2002

Gulf of Mexico Fishery Management Council
The Commons at Rivergate
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813-228-2815
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This is a publication of the Gulf of Mexico Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. NA17FC2203.

TABLE OF CONTENTS

ABBREVIATIONS USED IN THIS DOCUMENT

FMP	Fishery Management Plan
FSU	Florida State University
GMFMC	Gulf of Mexico Fishery Management Council
HAPC	Habitat Area of Particular Concern
HBOI	Harbor Branch Oceanographic Institute
HMS	Highly Migratory Species (tunas, swordfish, oceanic sharks, and billfishes)
MARFIN	Marine Fisheries Initiative (a NMFS program for funding marine fishery research)
MPA	Marine Protected Area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
RFSAP	Reef Fish Stock Assessment Panel
ROV	Remotely Operated Vehicle
SMZ	Special Management Zone
USGS	United States Geological Survey

1.0 INTRODUCTION

In June 2000, NMFS implemented a series of management actions proposed under the August 1999 Regulatory Amendment to the Reef Fish Fishery Management Plan to Set 1999 Gag/Black Grouper Management Measures (Revised) (GMFMC 1999). These actions included raising the minimum size limit for gag from 20 inches total length to 22 inches for recreational harvest and 24 inches for commercial harvest, closing the commercial fishery to harvest of red, gag and black grouper during February 15 to March 15, and creating two areas, Steamboat Lumps and Madison/Swanson site (Figure 4) that are closed to all fishing except for the highly migratory species (tunas, swordfish, oceanic sharks, and billfishes). These actions were taken in response to a 1997 gag stock assessment (Schirripa and Legault 1997) and recommendation from the Reef Fish Stock Assessment Panel (RFSAP) that gag, while not overfished, may be undergoing overfishing (GMFMC 1998).

In an earlier report (GMFMC 1997), the RFSAP expressed concern over the practice of fishing on gag spawning aggregations. They felt that this type of activity can cause:

1. **Increased focus of the fishery on large breeders.** Koenig et al. (1996) has shown that the largest fish in the stock concentrate in the spawning groups. Fishing these groups depletes the large breeders rapidly as noted from a dramatic decrease in mean size in only 10-15 years of fishing the spawning aggregations.

2. **A decrease in the proportion of males.** Coleman et al. (1996) showed that a decrease from 17% males in the late 1970s to 1-4% in the early 1990s occurred in the gag stocks of the Atlantic and the Gulf of Mexico. A similar decrease in the proportion of males was shown in scamp aggregations, but not for red grouper, which do not aggregate to spawn.

3. **Disruption of the social structure of the spawning groups.** A fishing-induced disruption of spawning was suggested by Shapiro (1987) and Coleman et al. (1996). The evidence indicates that social interaction is at the base of the sex-change process; disruption of this process inhibits the sex change process.

4. **Complete loss of the spawning groups.** C.C. Koenig FSU, C.B. Grimes NMFS and R.G. Gilmore, HBOI (unpublished data), based on visual surveys from submersibles, observed the loss of a gag spawning group and the decimation of a scamp spawning groups on a shelf-edge site off Ft. Pierce, FL (Oculina Banks) after 15 years of fishing.

To address these problems, the RFSAP recommended that the Council close a significant area of known gag spawning habitat and establish no-take marine fishery reserves . They felt that creating only seasonal closed areas during the spawning season would not protect the males which would be subject to fishing outside of the spawning season, as males are known to remain offshore during non-spawning times of the year (L.A. Collins, NMFS, unpublished data).

The closed area provision was not without controversy. Scientists debated whether sex change was induced by social or environmental factors and whether fishing disruptions of spawning activity contributed to changes in sex ratio (Kenchington 1999, Koenig et al. 1996). In addition, the original Council proposal would have set aside about 50% of the dominant gag spawning grounds (Figure 1). The original proposal was for a single continuous closed area covering the areas shown as Site 8a-e (40 fathom contour west of Middle Grounds) plus site 9 (Steamboat Lumps) (Figure 2). After simplifying the area to

be a four-sided parallelogram for ease of enforcement (Figure 3), this proposal would have covered 423 nautical square miles. As a result of strong public protests and questions about the science describing the benefits of closed areas to gag populations (Kenchington 1999), the Council reconsidered its proposal and decided that a study on the effects of closed areas and their utility to protect gag populations would be prudent.

To study the potential effects of area closures on gag spawning aggregations, the Council selected two areas for year-round closure to all fishing where gag spawning is known to occur. Figure 2 and the area descriptions in Appendix I describe 14 areas under consideration for reef fish reserves, out of which 8 sites (sites 3 to 10) were considered suitable gag spawning habitat. Because the Council was interested in evaluating the efficacy of area closures to protect gag spawning aggregations and male gag, sites 5 (Madison/Swanson site) and 9 (Steamboat Lumps) were selected (Figure 4). They are approximately the same size (115 and 104 square nautical miles, respectively) and they represent high relief (site 5-Madison/Swanson) and low relief (site 9 - Steamboat Lumps) sites. This would allow evaluation of the effectiveness of areal closures as well as the relative importance of site type (high vs. low relief).

It was the Council's intent to prohibit the use of any fishing gear within the closed areas in order to maximize enforceability of the closed area as well as minimize the negative impact from incidental catch and release of reef fish while targeting other species. For this reason, the Council asked that the NMFS Highly Migratory Species (HMS) Division implement compatible closed area regulations for the species under their management jurisdiction (tunas, swordfish, oceanic sharks, and billfishes). This led to a legal challenge from a recreational fishing organization. The recreational organization felt that the no-take areas unfairly restricted access to the resource by recreational fishermen, and that restrictions on fishing for migratory species higher up in the water column were unwarranted because they would have no impact on the bottom reef fish species. As part of a settlement to the legal challenge, NMFS agreed to hold the Council's request to implement an HMS closure in abeyance, while research is conducted into the impact of the no-take areas, the effect of pelagic trolling on and ability to reach reef fish species, and the impact on enforceability by allowing pelagic trolling in the not-take areas.

A four-year sunset clause was included in the proposed alternative to give the NMFS and Council time to evaluate the utility of closed areas. As a result, if the Council chooses to continue the Madison/Swanson and Steamboat Lumps marine reserves beyond June 2004, it must do so through a Reef Fish plan amendment. Non-action will result in the two reserves expiring on June 16, 2004, and the areas re-opening to all fishing.

This scoping document is intended to provide background information to the public during a series of scoping meetings on the question of whether to initiate development of a plan amendment to continue the Madison/Swanson and Steamboat Lumps reserves, and if so, what the scope of alternatives to be considered should be.

2.0 HISTORY OF AREA RESTRICTIONS IN REEF FISH MANAGEMENT

The Florida Middle Ground Habitat Area of Particular Concern (HAPC) and the West and East Flower Garden Banks HAPC were established in August, 1984, under the Gulf and South Atlantic Councils' Corals and Coral Reefs FMP. Within these areas, fishing with a bottom longline, bottom trawl, dredge, pot, or trap is prohibited year-round.

The Reef Fish Fishery Management Plan (FMP) was implemented in November 1984. The original FMP established the first area restrictions on fishing for reef fish, i.e., prohibitions on the use of fish traps, roller trawls, and powerhead-equipped spear guns within an inshore stressed area.

Amendment 1 to the Reef Fish FMP, implemented in 1990, expanded the stressed area boundary to cover the entire Gulf coast. This amendment also established a longline and buoy gear boundary inshore of which the directed harvest of reef fish with longlines and buoy gear was prohibited and the retention of reef fish captured incidentally in other longline operations (e.g. shark) was limited to the recreational bag limit.

Amendment 5, implemented in February 1994, created a special management zone (SMZ) off the coast of Alabama within Alabama's general permit area for creating artificial reefs. Within this SMZ, reef fish fishing was limited to gear with no more than three hooks per line. This amendment also closed Riley's Hump (a mutton snapper spawning aggregation area) to all fishing during May and June.

An August 1999 regulatory amendment, implemented June 19, 2000, established two marine reserves on areas suitable for gag and other reef fish spawning aggregations sites that are closed year-round to fishing for all species under the Council's jurisdiction. The two sites cover 219 square nautical miles near the 40-fathom contour, off west central Florida.

A request from the Council to the NMFS Highly Migratory Species Division (HMS) to adopt a compatible closure for species under HMS jurisdiction (tunas, sharks, sailfish and swordfish) was held in abeyance by NMFS as part of a settlement of a legal challenge from the Coastal Conservation Association. NMFS also agreed to conduct research within the closed areas during May 2001 to May 2003 to address the potential trolling impacts. Most of the biological research is being carried out under MARFIN.

Amendment 19 (also known as the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves), implemented July 2001, created two marine reserves: Tortugas South (60 square nautical miles) and Tortugas North (125 square nautical miles) near the Dry Tortugas, Florida. Tortugas South encompasses Riley's Hump. Fishing is prohibited in both areas and non-consumptive diving is also prohibited in Tortugas South.

3.0 DESCRIPTIONS OF CLOSED AREAS

Madison and Swanson sites (Area 5 on Figure 2) (denoted as Whoopie Grounds by Moe 1963) (115 sq. naut. mi). Apalachicola USGS lease blocks 706, 707, 708, 709, 750, 751, 752, 753, 794, 795, 796, 797, 838, 839, 840, 841.

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

Madison and Swanson (site 5) is approximately 40 nautical miles southwest of Apalachicola, Florida. This area is denoted in Moe's (1963) fishing survey as having rock ledges with relief up to five fathoms (9 m). There is also plenty of recent anecdotal fishing information from port samplers

(Debbie Fable, pers. Comm.). This site also shows confirmed outcrops of limestone and reef fish habitat from the reef fish survey (Chris Gledhill, Pascagoula NMFS lab, pers. comm.). Also, (2) transects through this area by Ludwick and Walton (1957) showed pinnacle trends. Some of these formations have names- Madison and Swanson's Rocks.

"Steamboat lumps" (area 9 on Figure 2) (104 sq. naut. mi.) .
Florida Middle Grounds USGS lease blocks 771, 772, 816, 860, 861, 862, 906
boundaries: NW= 28 14'N, 84 48'W NE= 28 14'N, 84 37'W
SW= 28 03'N, 84 48'W SE= 28 03'N, 84 37'W

Steamboat Lumps (site 9) is approximately 95 nautical miles west of Tarpon Springs, Florida and southwest of the Middle Grounds at a depth of 40-50 fathoms. These are prominent features reported to be low relief areas with limestone rock.

The two closed areas (Madison/Swanson and Steamboat Lumps) combined cover approximately a fifth of the area identified by Koenig et al. (1996) as the dominant spawning grounds for gag (Figure 1), and provide contrasting habitats. Madison/Swanson is near the northern part of the primary spawning range and has high relief habitat, while Steamboat Lumps is near the southern part of the primary spawning range and has low relief habitat. However, gag may also form spawning aggregations outside of this region, so the total proportion of spawning aggregations protected by the proposed closed area is likely less than one fifth. The Council considered a total of 8 potential reserve sites within the area where gag spawning aggregations may occur (Areas 3-10 in Figure 2 and Appendix I). The total of all the areas under consideration for closure was 1,205 square nautical miles.

4.0 POSSIBLE ALTERNATIVES FOR CONSIDERATION

Establish a new sunset provision (evaluation period), during which additional research on the effectiveness of the area closures will be carried out. The additional period will be for:

a. 4 years (sunset in June 2008)
b. 10 years (sunset in June 2014)
c. Other time period
d. Closed area rules will continue until repealed
e. Status quo, closed area rules expire after June 16, 2004

Allow fishing for certain species within the closed areas as follows:

a. Allow surface trolling for coastal migratory pelagic species (mackerel, wahoo, cobia and dolphin) as well as HMS species
b. Prohibit all fishing, and request that HMS implement a compatible closure.
c. Status quo, no fishing for any species except HMS species.

Restrict fishing at certain times within the closed areas as follows:

a. Prohibit fishing during the peak gag spawning season, February through March
b. Prohibit fishing during the entire gag spawning season, December through May
c. Status quo, prohibit fishing year-round.

Shallow-water grouper spawning seasons:

Species	Peak season	Total Season
Red grouper	April-May	December-July
Gag	February-March	December-May
Black grouper	unknown*	October, December-March
Yellowmouth grouper	March-May	January-December
Yellowfin grouper	unknown*	March, May-August
Scamp	unknown*	March-May
Red hind	unknown*	April, June-August
Rock hind	unknown*	January-June

*Little information is available on spawning seasons with an asterisk. The seasons given are best estimates from limited data, peak season is unknown.

5.0 INFORMATION COLLECTED SINCE THE CLOSED AREAS WERE IMPLEMENTED

Sustainable Seas Expedition

Scientific studies have been conducted as part of the NOAA Islands in the Stream Sustainable Seas Expedition. This project explored the Madison/Swanson site during June 2001, and reported their finding on the web at http://oceanexplorer.noaa.gov/explorations/islands01/log/jun20/jun20.html. The description of the area from the web site is:

Madison Swanson Marine Fishery Reserve
June 16-20, 2001

Felicia Coleman, Program Director
Institute for Fishery Resource Ecology
Florida State University

NOAA's National Marine Fisheries Service (NMFS) established the Madison Swanson Fishery Reserve in June 2000. This 115-sq-nm area will serve as an experimental site until June 2003, allowing scientists to evaluate the efficacy of "no-take zones" in the management of reef fish, particularly groupers of the family Serranidae. One study focuses on whether the closed area protects male gag (*Mycteroperca microlepis*), thus allowing them to recover from their current low population levels. According to the American Fisheries Society, gag are at risk of being overfished, and, perhaps, even at risk of extinction, should current fishing practices persist.

During the Sustainable Seas Expeditions, we concentrated efforts in this reserve because of existing knowledge about the location of spawning aggregation sites. These sites were identified during the peak spawning season for gag and scamp (*Mycteroperca phenax*) through the efforts of scientists from Florida State University and the NMFS laboratories in Panama City and Pascagoula, and commercial fishermen from North Florida.

Fishermen often participate in our scientific missions. Indeed, their wealth of knowledge about the natural history of the species they catch is woefully underappreciated. We have found a number of

individuals to be extremely effective collaborators, and sometimes even strong proponents of marine protected areas. Unfortunately, not all fishermen feel the same way. While the NOAA Ship Gordon Gunter cruised the reserve, so, too, did commercial vessels actively engaged in fishing quite near the spawning sites. The U.S. Coast Guard intercepted two of these vessels and found reef fish onboard.

We selected study sites for this mission from acoustic side-scan images produced by Kathryn Scanlon, a marine geologist with the U.S. Geological Survey in Woods Hole, MA. These maps proved essential for locating different geomorphological features attractive to reef fish. We pinpointed habitats that ranged from low-relief, drowned patch reefs to pinnacles ("The Mad Swan Cones") and relatively high- relief ridges ("Stu's Ridge"), making a total of eight dives. G.P. Schmahl, manager of the Flower Gardens National Marine Sanctuary, dove in an area capriciously dubbed "The Alien Spaceship Landing Strip" because of its oddly rectangular array of isolated rocky outcrops on the sea floor. The purpose of the dive was to locate freshwater seeps in the area. On a previous NMFS cruise, a low-salinity anomaly appeared in the records, apparently associated with this strip. We were unable to find the seeps, but came upon an equally interesting array of tilefish burrows. Tilefish excavate burrows in silty substrate in deep water. The burrows attract a number of different organisms as co-habitants, including galatheid and goneplacid crabs. In addition, the burrows provide structure in habitat that is more typically devoid of any features.

Visibility on these dives tended to be rather poor. The expedition traveled in the wake of Tropical Storm Allison, which had been sufficiently strong during the Flower Gardens sanctuary leg to make launching the DeepWorker submersible impossible. This didn't make the Flower Gardens' scientific team particularly happy, but it certainly benefited our leg, because it allowed G.P. Schmahl and Emma Hickerson, the science director, to participate on the West Florida shelf.

When the sub was not operating, Kathryn Scanlon conducted systematic sediment sampling to ground-truth her acoustic maps. Knowing the surficial geology of the sea floor provides information about the kinds of organisms inhabiting it and the strength of currents that typically sweep through the area. For instance, fish tend to burrow in silty clay, which will hold a higher angle when excavated than will pure sand, which collapses.

Site Characterizations

June 16-18, Drowned Patch Reef Aggregation Sites
(Depths around 260 ft.) The habitat in this area consists primarily of scattered, low (2-3 ft in height) and somewhat higher-relief (6-8 ft) rocky outcrops embedded in sand with a veneer of silty material. Much of the silt in the area is, perhaps, a result of the tropical storm. The area appears to have been actively fished, as evidenced by the presence of lost longline gear. Longlines can be miles long, set with multiple hooks along the length, and, in this case, fished on the bottom to catch bottom-associated reef fish. Lost gear continues to "fish" until the line itself decays, which may take years, given that the line is made out of plastic. Fish on the reefs include amberjack, scamp, snowy grouper, red snapper, and many small reef fish, known as rough-tongued bass, that serve as forage species for the larger predators. Sessile invertebrates on the rocks include encrusting sponges, sea fans, corkscrew sea whips, and scattered clusters of Oculina coral. Much of the rock had a crustose coralline algae cover. Those able to move around include arrow crabs, crinoids, hermit crabs, and basket stars. When the sub transited sand in a fairly featureless area, the reef fish disappeared and batfish came into view.

June 18, Stu's Ridge
(Depths ~200 ft.) Stu's Ridge is a relatively high-relief (~50 ft) ridge that runs through the northeastern part of the Madison Swanson Reserve, continuing to the northwest outside of the reserve.

June 19, Mad Swan Cones
(Depths ~230-250 ft.) The Mad Swan Cones consist of a series of pinnacles, each roughly 30 ft in height off the bottom. The most abundant fish in the area were small basses, including red barbier and rough-tongued bass. Reef butterflyfish and bank butterflyfish were less abundant, but consistently present, in the area. All of the reef fish of any economic importance, such as red snapper, gag, and scamp, were very small, as determined using laser metrics. It would be extremely worthwhile to return to this area in three yrs to note any changes in the average size of the fish. The assumption is that within the reserve, fish should increase both in number and in individual biomass. That is, the protection afforded by the reserve (if, in fact, fishers comply with regulations) should effect these sorts of changes.

June 20, Alien Spaceship Landing Strip
(Depth ~315 ft.) This area, so named because of the paired series of parallel, evenly spaced features over an area of several hundred yards, is primarily sand with an overlay of silt. The "lights" of the "landing strip" are, in fact, very small, low-profile rocky outcrops. Associated with the outcrops were small basses, such as rough-tongued bass and tattler, and short bigeyes. Over the sandy areas were squid, large hermit crabs, and batfish.

NMFS/SEFSC Research

NMFS in cooperation with the United States Geological Survey, the Minerals Management Service, the University of New Hampshire, and the National Ocean Survey has been conducting detailed mapping operations of the Madison/Swanson and Steamboat Lumps sites. Multi-beam mapping of the Steamboat Lumps site has been completed, along with the majority of the Madison/Swanson area and a control area in-between referred to as Twin Ridges. This mapping depicts the benthic topology of the area with up to two-meter resolution. Additional operations are planned (pending funding by the Council) to complete the mapping of Madison/Swanson and Twin Ridges A final report is planned for Spring 2002.

Research has been conducted at both the Madison/Swanson and Steamboat Lumps sites by Andrew David and Christopher Gledhill of NMFS during February and April, 2001, using panoramic video camera arrays, digital cameras, chevron traps, and an underwater remotely operated vehicle (ROV). At Madison Swanson, spawning aggregations of gag and/or scamp were confirmed at 11 sites and suspected at five others through video surveillance from 20 ROV dives. Species collected included gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red grouper (*Epinephelus morio*), snowy grouper (*Epinephelus niveatus*), speckled hind (*Epinephelus drummondhayi*), red snapper (*Lutjanus campechanus*), silk snapper (*Lutjanus vivanus*), red porgy (*Pagrus pagrus*), knobbed porgy (*Calamus nodosus*), gray triggerfish (*Balistes capriscus*), and greater amberjack *(Seriola dumerili*). Histological and otolith samples were taken from 59 fish for reproductive and ageing studies.

Steamboat Lumps

Research on Steamboat Lumps by Andrew David and Christopher Gledhill of NMFS during February and April, 2001[36], found that sandy substrates in the central portion of the reserve harbored honeycomb moray (*Gymnothorax saxicola*), and bandtail puffer *(Sphoeroides spengleri*). Sites sampled in the northeast region of the reserve, with habitat consisting of sandy substrates, fish burrows or rocky outcrops were dominated by honeycomb moray, bank sea bass (*Centropristis ocyurus*), red porgy, vermilion snapper (*Rhomboplites aurorubens*), scamp and red grouper (*Epinephelus morio*).

Florida State University Research

In May 2001, Dr. Chris Koenig gave a presentation to the Gulf Council summarizing his research to date into the Madison/Swanson and Steamboat Lumps sites, including his rationale, from a fisheries standpoint, of having such sites. A summary of his presentation follows:

> Dr. Koenig stated that the intent of setting up MPAs is to address fishery management concerns. He divided the habitat into source or sink habitats. In a source habitat optimum spawning will occur because adult or juvenile habitat is optimal. Survival and immigration exceeds mortality and emigration. Fishery impacts on these source habitats is potentially great, whereas fishery impacts on sink habitats is relatively minor.
>
> If an MPA is placed within a source habitat, fishery effort will be displaced to the sink habitat. Reproductive output will move from the source habitat into the sink habitat.
>
> However, if the MPA is placed within a sink habitat, it becomes counter-productive. Effort is be displaced from the sink into the source habitat, which influences that source. Emigration can go either way, depending upon fishing intensity and reproductive output. The net effect is decreased reproduction that is counter-productive to the goals of fishery management.
>
> The purpose of the above discussion is to emphasize the importance of placing MPAs in areas where they maximize production and to prevent unknowingly making decisions that minimize and lessen production. It is known that larger fish produce more eggs than small fish. Movement is important because if the fish move out of the MPA they are no longer protected. The success with respect to enhancing reproduction can be evaluated by checking aggregation sizes and number, as well as the demographics on the aggregations. If aggregation sizes are large and numbers of aggregations are many, and the demographics of those aggregations are at historic levels, then reproduction is assumed to be maximized.
>
> Emigration from the MPA is known as spillover. The extent that this is occurring is questionable. It is necessary to discover what unifying themes exist in spawning habitat characteristics and if there are predictable components of these sites.

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[36] Andrew David and Christopher Gledhill. 2002. Survey of Fish Assemblages and Habitat within Two Marine Protected Areas on the West Florida Shelf. Abstract, Florida Chapter, American Fisheries Society, 19th Annual Meeting, February 12-14, 2002, Brooksville, Florida.

The problem with gag grouper was that there seem to be very few males in the population. When historical levels are compared with the levels that were obtained in the early 1990s there is a statistically significant decline in the proportion of males. The same phenomenon has occurred in the South Atlantic. The question is, how can you get a lower sex ratio in a species that can compensate by producing more males from females. In the older literature, it was assumed that if there was a socially-mediated sex change that you could not possibly do this. Yet, this species has experienced a marked decline in the population of males. This question can be addressed by noting the mechanism by which the sex change occurs. This can either be from something internal, that is the fish changes sex when it reaches some specific age or size, or it might change sex when a certain social environment is encountered that indicates to the fish that there is a paucity of males in this spawning group and it is time for the dominant females to change sex. The most unlikely of these theories is the latter (social environment). It is more likely related to specific age or size of the species. There is a statistically significant association of those transitional fish occurring immediately after the aggregations take place. The first is the pre-spawning aggregation that occurs in early December, and the second is the major spawning aggregation, the peak of which occurs in February and March. This strongly suggests that there is a social component because these fish are dispersed at other times of the year. The possibility of assessing the sex ratio only occurs at the time that the males and females are together. This is the strongest indicator that a social component exists, but does not exclude the possibility that there might also be a critical size they must reach before changing sex. The question is, if there is a social sex change component, what caused the decline in the male population. The working hypothesis is that the males have declined because, outside of the spawning season, they remain around those deep-water sites that fishermen fish all year-around and are subsequently caught. Thus, when the next spawning season arrives there is once again a paucity of males. If this is the case, and if males do not move out of the reserves to be caught, there should be an increase in the number of males in the reserves fairly rapidly, perhaps in one or two years.

Immediate objectives for the MPAs research studies are acoustic mapping using side-scan sonar or multi-beam, and to locate spawning aggregations of gag grouper. Gag grouper and scamp aggregations are always in close proximity. Another objective is to track aggregation demographics over time, and to examine the sex ratios to determine what the sex ratio do, and what the size and the age structure do within the aggregations. It is possible that gag grouper males might remain within the spawning sites or in their vicinity throughout the year. To evaluate this possibility, hydrophones with a 1-year battery life were placed in the MPA sites to record the presence of an individual that they had tagged internally with a sonic device. The hydrophones can detect a presence for up to a half a mile from the hydrophone itself. The tags have a 4-year life. Therefore, they would be able to determine whether the males remained near these aggregation sites.

Another objective is to determine movements of all economically important species relative to the MPAs by tagging. The research team has developed a method of tagging without producing depth-related capture-release mortality. They acoustically mapped both of the MPAs, with Ms. Kathy Scanlon of the U.S. Geological Survey of Woods Hole doing most of the work. They located 15 aggregation sites for gag grouper. Six very good ones are within the MPAs and six very good ones are located outside these areas. They characterized the fish species and abundance associated with these sites. In June 2001 the researchers will be going out again and doing further characterizations of these habitats. The habitats seem to have very distinctive features, with an incline and then a ridge with a fairly steep drop off on the other side with large boulders. This seems to be the type of terrain gag grouper would choose for spawning sites. The researchers will be going on a Sustainable Seas expedition cruise next month to do some quantitative characterization. This is all set up for mapping the spawning habitat visually, and not using the acoustic method. This visualization was to examine

biological features of the bottom in terms of sessile organisms, such as sea fans, coral, etc., as well as fishes and other creatures that occupy the habitat.

There will be sonic tagging done this year, and red grouper sites in the Steamboat Lumps have been identified. The interesting thing about red grouper sites is that they are very distinctive on the side-scan sonar and the acoustic images. They show up as white spots; what red grouper do is clear off areas where there is a veneer of sand or sediment over hard rock. Many species of fish occupy this hard bottom; a lot of coral are found in these areas. For habitat purposes, they intend to map out geomorphological features and characterize the biological components of those features. In the Steamboat Lumps area Dr. Koenig believed that they had been able to get a proposed pipeline installed around the reserve rather than through it. This is be an advantage because when the pipes are placed they destroy about a one-mile swath of bottom from anchor cable sweeps. In the Madison/Swanson area, damage occurred in areas where gag grouper were known to spawn.

Dr. Koenig acknowledged the assistance given by commercial fishermen such as Mr. Clay Bailey, tremendous support provided by Mr. Bob Jones of the Southeastern Fisheries Association, and Mr. Steve Rash of Apalachicola (Water Street Seafood). Their help was invaluable to the success of this project. During this phase of the research, they saw no gag grouper males on these sites. Scamp was the most abundant species seen, also red snapper, and on the aggregation sites gag grouper were numerous. They saw speckled hind, Warsaw grouper, and snowy grouper, all of which are species about which little was known. The Warsaw grouper had exhibited a color change that might be associated with possible spawning. It could well be that other species spawned in these areas.

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7.0 PUBLIC REVIEW

Scoping meetings will be held to accept public input into whether there is a need to initiate an amendment to the Reef Fish FMP to continue the Madison/Swanson and Steamboat Lumps closed areas, and what the scope of alternatives should be if an amendment is initiated. The meetings will be held from 7:00 p.m. to 10:00 p.m. at the following locations and dates. (Locations and dates are tentative.)

June 19, 2002
National Marine Fisheries Service
Panama City Laboratory
3500 Delwood Beach Road
Panama City, Florida

June 20, 2002
Tampa Airport Hilton
2225 Lois Avenue
Tampa, Florida

RESPONSIBLE AGENCY

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- Steven Atran, Population Dynamics Statistician

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

The following are descriptions of habitat sites identified by Dr. Chris Koenig and Chris Gledhill on Figure 2. Most of these sites are far offshore and generally in 20 to 50 fathoms. Site locations are identified both by latitude/longitude boundaries and by USGS lease blocks and the discussion is that of Chris Gledhill and Chris Koenig. The size of each area in square nautical miles was calculated by Kathy Scanlon, U.S. Geological Survey.

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

Area A (62 sq. naut. mi), USGS lease blocks 853-857, 897-901;
boundaries: N= 30º 09'N, S= 30º 04'N, E=86º 43'W, W=86º 58'W;
Area B (75 sq. naut. mi), USGS lease blocks 939-942; 983-986, 15-18;
boundaries: N=30º 04'N, S=29º 57'N, E=86º 53'W, W=87º 05'W;
Area C (86 sq. naut. mi), USGS lease blocks 57, 58, 101, 102, 145, 146;
boundaries: N=29º 57'N, S=29º 48'N, E=87º 05'W, W=87º 16'W;
Area D (144 sq. naut. mi), USGS lease blocks 185-188, 229-232, 273-276, 317-320, 361-364.
boundaries: N=29º 48'N, S=29º 33'N, E=87º 11'W, W=87º 22'W.

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

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

2. "Woodward-Clyde" Pinnacles (42 sq. naut. mi)
Destin Dome USGS lease blocks 473, 474, 516, 517, 518, 562.
boundaries: NW= 29º 33'N, 86º 11'W NE= 29º 33'N, 86º 05' W
SW= 29º 25'N, 86º 11'W SE= 29º 25'N, 86º 05'W

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

3. "3-to-5s" area (76 sq. naut. mi)
Destin Dome USGS lease blocks 434, 478, 522, 566, Apalachicola USGS lease blocks 397, 398, 441, 442, 485, 486, 529, 530.
boundaries: NW= 29º 35'N, 85º 56'W NE= 29º 35'N, 85º 47'W
SW= 29º 25'N, 85º 56'W SE= 29º 25'N, 85º 47'W

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

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

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

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

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

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

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

6. Twin Ridges site (5 sq. naut. mi).
USGS lease block 979 bordering Apalachicola and Florida Middle Ground bathymetric maps.

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

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

7. Florida Middle Grounds. (340 sq. naut. mi).
Large area (irregular polygon) on the 20 fathom isobath that covers about 40 USGS lease blocks

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

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

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

Area A (61 sq. naut. mi), Florida Middle Grounds USGS lease blocks 147, 148, 149, 150,151, 191, 192, 193, 194, 195;
boundaries: NW= 28º 51'N, 85º12'W NE= 28º 51'N, 84º 57'W,
SE= 28º 46'N, 84º 57'W SW= 28º 46'W, 85º 12'W;
Area B (67 sq. naut. mi), Florida Middle Grounds USGS lease blocks 237, 238, 239, 240, 281, 282, 283, 284;
boundaries: NW= 28º 46'N, 85º06'W NE= 28º 46'N, 84º 54'W,
SE= 28º 40'N, 84º 54'W SW= 28º 40'W, 85º 06'W;
Area C (57 sq. naut. mi), Florida Middle Grounds USGS lease blocks 326, 327, 328, 329, 370, 371, 372, 373;
boundaries: NW= 28º 40'N, 85º03'W NE= 28º 40'N, 84º 51'W,
SE= 28º 34'N, 84º 51'W SW= 28º 34'W, 85º 03'W;
Area D (143 sq. naut. mi), Florida Middle Grounds USGS lease blocks 415, 416, 417, 418, 419, 459, 460, 461, 462, 463, 503, 504, 505, 506, 507, 547, 548, 549, 550, 551;
boundaries: NW= 28º 34'N, 85º01'W NE= 28º 34'N, 84º 45'W,
SE= 28º 24'N, 84º 45'W SW= 28º 24'W, 85º 01'W;
Area E (108 sq. naut. mi), Florida Middle Grounds USGS lease blocks 593, 594, 595, 596, 637, 638, 639, 640, 681, 682, 683, 684, 725, 726, 727, 728;
boundaries: NW= 28º 24'N, 84º54'W NE= 28º 24'N, 84º 42'W,
SE= 28º 14'N, 84º 42'W SW= 28º 14'W, 84º 54'W;

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

9. "Steamboat lumps". (104 sq. naut. mi.)
Florida Middle Grounds USGS lease blocks 771, 772, 816, 860, 861, 862, 906
boundaries: NW= 28 14'N, 84 48'W NE= 28 14'N, 84 37'W
SW= 28 03'N, 84 48'W SE= 28 03'N, 84 37'W

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

10. " The Elbo". (107 sq. naut. mi).
Elbo USGS lease blocks 36, 37, 80, 81, 124, 125, 168, 169, 212, 213, 256, 257, 300, 301;
boundaries NW= 27 57'N, 84 11'W NE= 27 57'N, 84 05'W
SW= 27 38'N, 84 11'W SE= 27 38'N, 84 05'W

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

11. "Christmas Ridge". (191 sq. naut. mi).
Charlotte Harbor USGS lease blocks 444, 445, 446, 488, 489, 490, 532, 533, 534, 576, 577, 578, 620, 621, 622, 664, 665, 666, 708, 709, 710, 752, 753, 754, 796, 797, 798;
boundaries: NW= 26º 31'N, 83º 51'W NE= 26º 31'N, 83º 41'W
SW= 26º 06'N, 83º 49'W SE= 26º 06'N, 83º 42'W

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

12. "Hambone Ridge/the Finger". (153 sq. naut. mi).
Pulley Ridge USGS lease blocks 445, 446, 447, 489, 490, 491, 533, 534, 535, 577, 578, 579, 621, 622, 623, 665, 666, 667, 709, 710, 711;
boundaries: NW= 25º 31'N, 83º 46'W NE= 25º 31'N, 83º 37'W
SW= 25º 12'N, 83º 46'W SE= 25º 12'N, 83º 37'W

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

13. " Northwest Peaks". (182 sq. naut. mi).
Pulley Ridge USGS lease blocks 617, 618, 619, 620, 661, 662, 663, 664, 705, 706, 707, 708, 749, 750, 751, 752, 793, 794, 795, 796, 837, 838, 839, 840, 881, 882, 883, 884.
boundaries: NW= 25º 20'N, 83º 57'W NE= 25º 20'N, 83º 46'W
SW= 25º 02'N, 83º 57'W SE= 25º 02'N, 83º 46'W

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

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

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

Discussion: This area is a rise between the 20 and 30 fathom isobaths southwest of the Dry Tortugas and it covers about one lease block of area This area was designated as a mutton snapper spawning grounds in Amendment 5 (supplement) of the Reef Fish FMP (1993), and no fishing was allowed in May and June. The area was subsequently encompassed by the Tortugas South marine reserve (60 sq. naut. miles) which was implemented in July 2001 by Reef Fish Amendment 19 (also known as the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves).

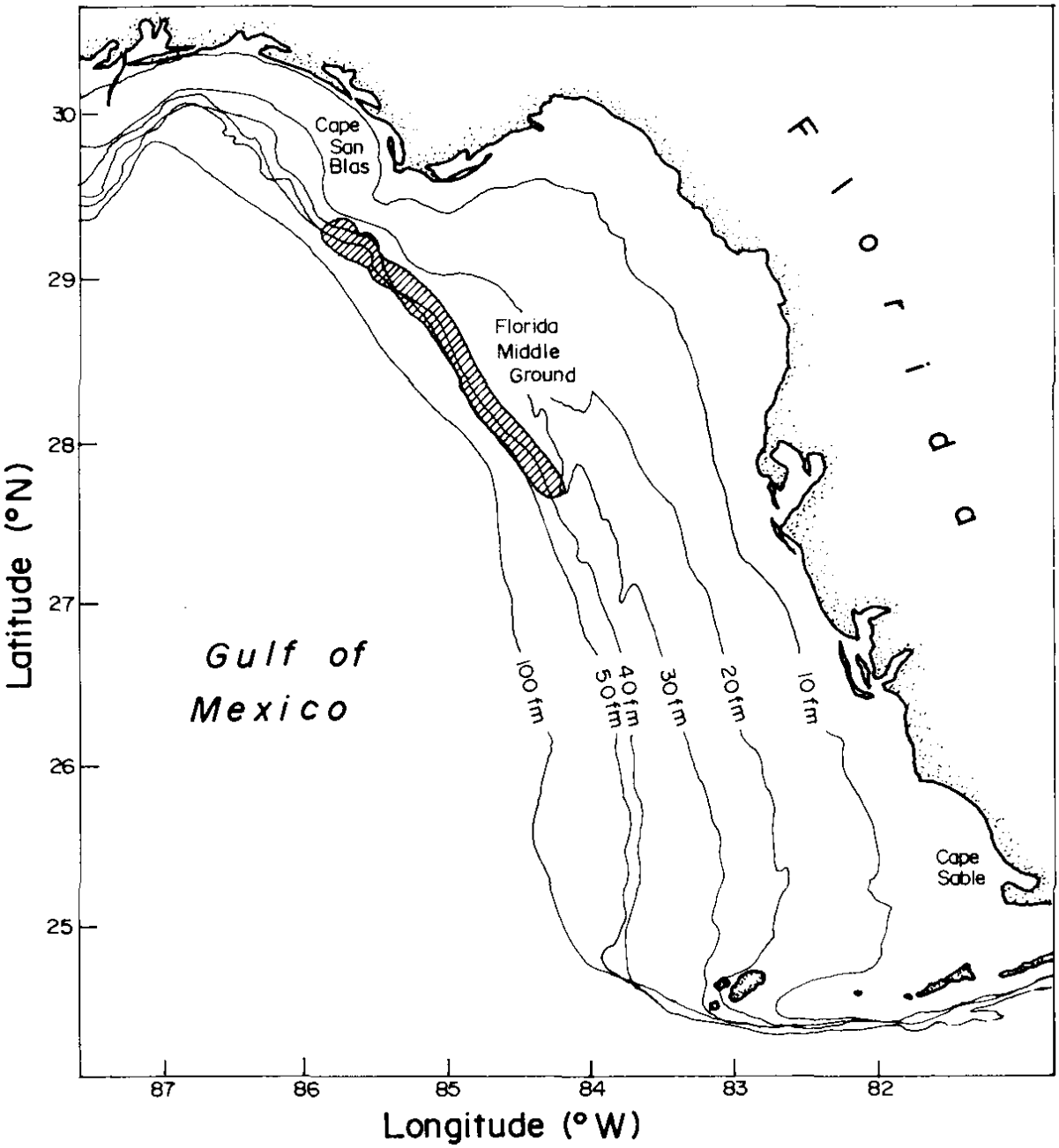

Figure 1. Dominant spawning grounds for gag off the Gulf coast of Florida (source: Koenig et al. 1996)

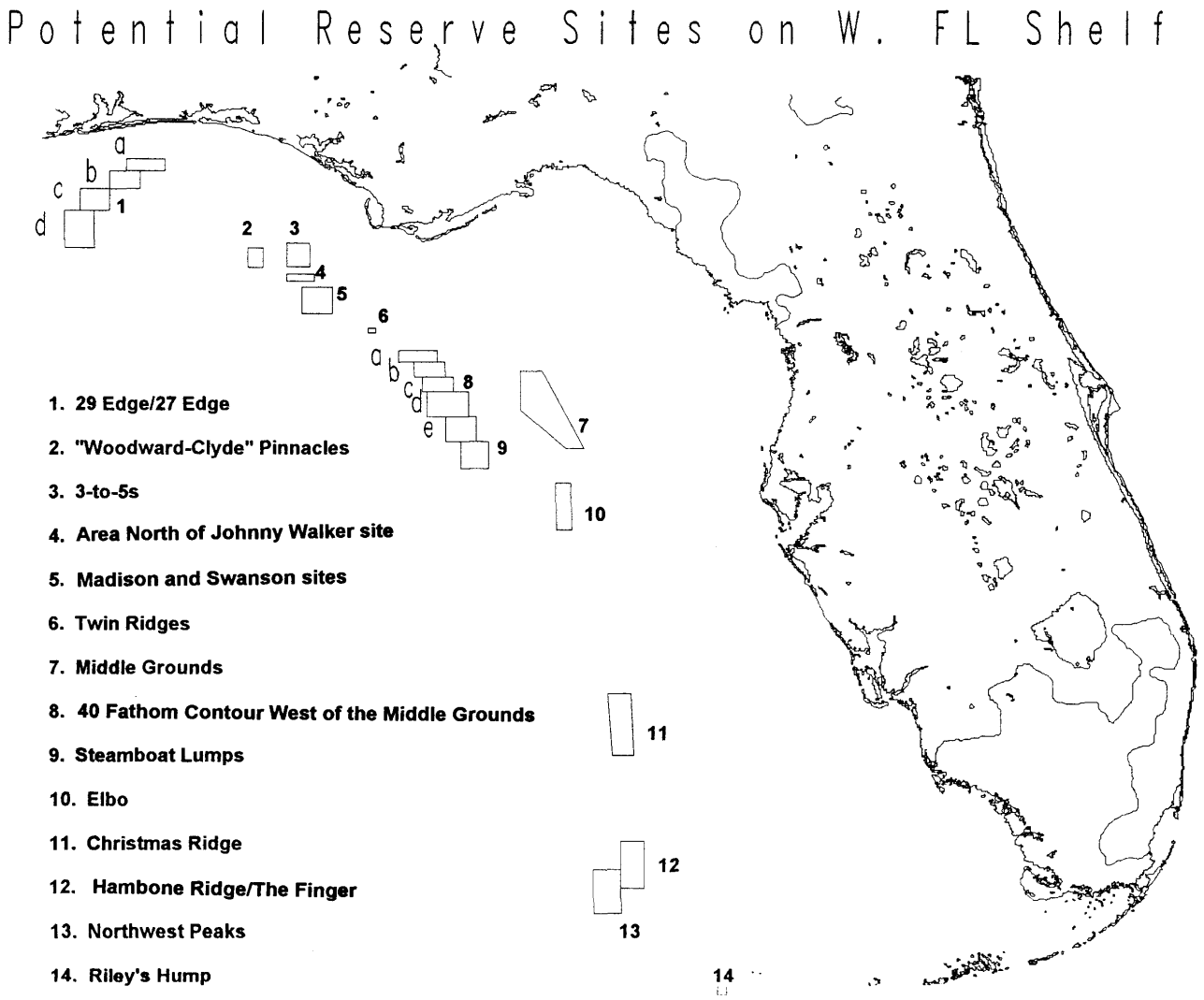

Figure 2. Potential reserve sites on west Florida shelf (source: Chris Koenig and Gary Fitzhugh)

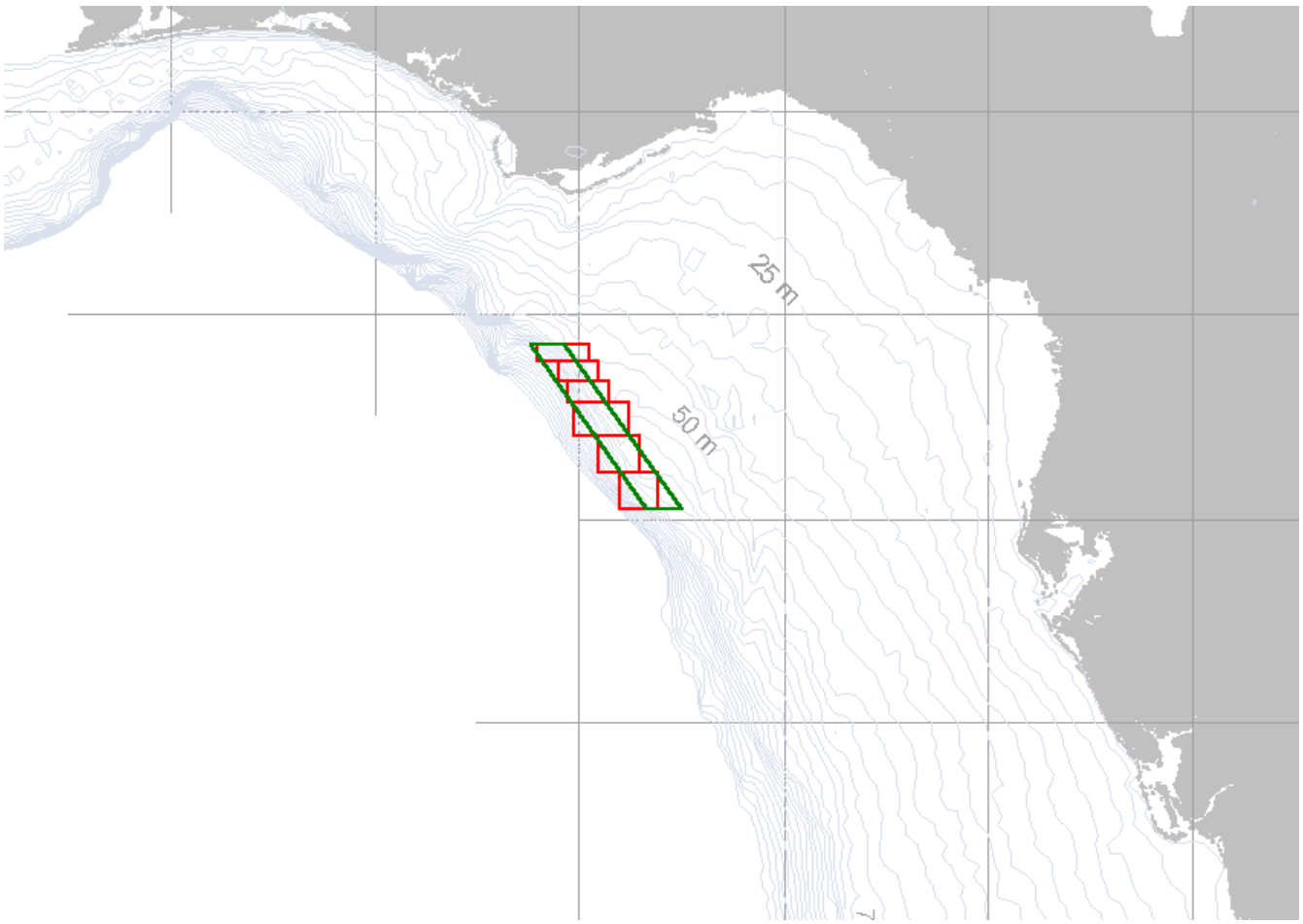

Figure 3. Original proposed gag area closure. The boxes represent Dr. Chris Koenig's sites 8(a-e) and 9. The oblong region is the simplified version of the proposed closed area.

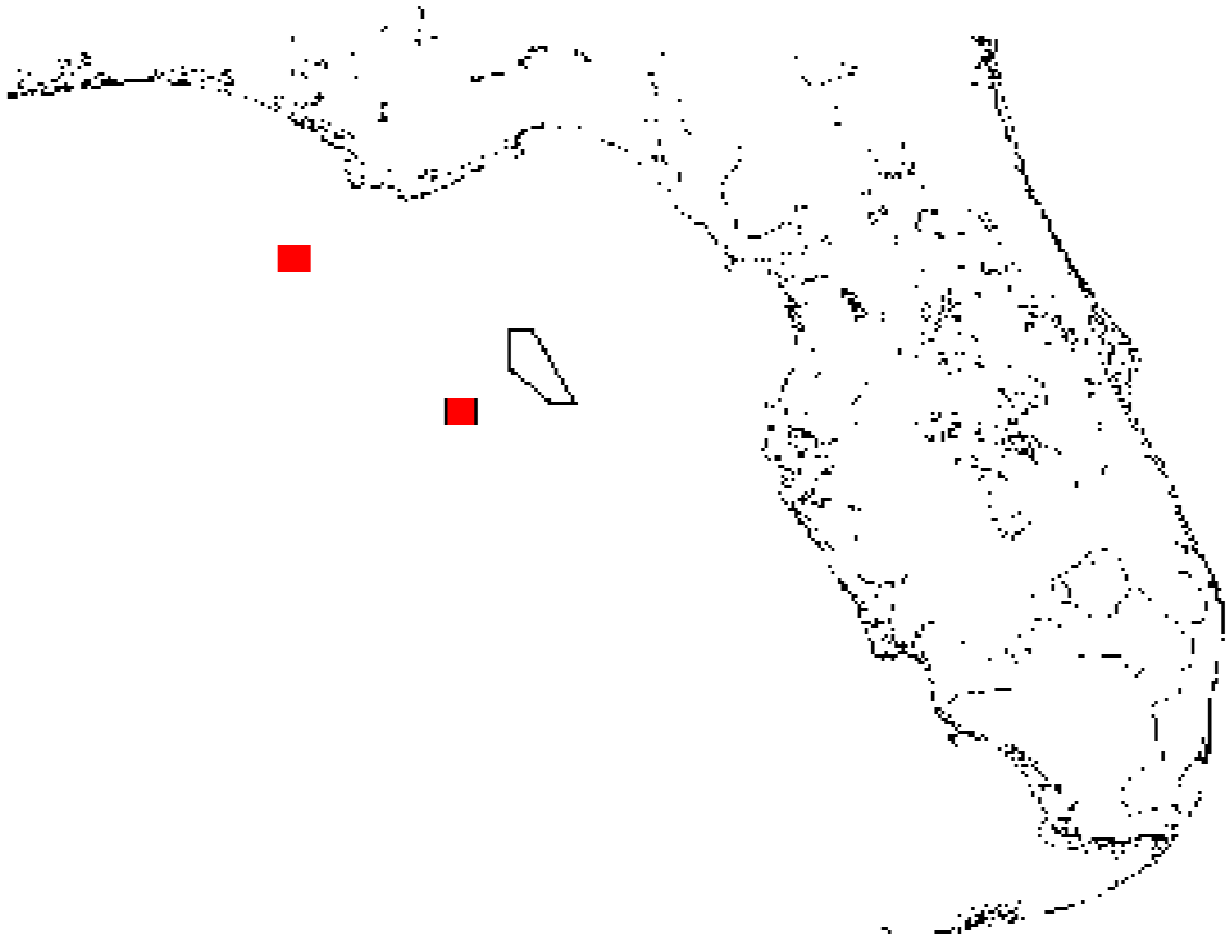

Figure 4. No-take zones created June 2002. Upper rectangle is Madison/Swanson site. Lower rectangle is Steamboat Lumps. Florida Middle Grounds HAPC is also shown for comparison.

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APPENDIX C- Scoping Comments Received

Scoping Meeting Summary
Madison/Swanson and Steamboat Lumps Closed Areas
Panama City, Florida
June 19, 2002

Present:
Jim Fensom
Steven Atran
Camilla Moyer
Chris Koenig
5 members of NMFS Panama City Laboratory staff
3 members of the public

The meeting began an hour later than announced to allow persons who were interested to also attend the NMFS scoping meeting on white marlin that was being held nearby. The three fishermen who showed up stated that they had received no notice of our meeting, and only learned of it when an announcement was made at the NMFS scoping meeting.

After Mr. Fensom opened the meeting, Mr. Atran gave a brief PowerPoint presentation describing the issues to be covered by the scoping process. Dr. Koenig then gave a presentation describing his ongoing research in the Madison/Swanson and Steamboat Lumps sites. At the conclusion of the presentation, Mr. Fensom asked for public comments.

Buster Niquet, longline commercial fisherman, stated that the closed areas do not affect longline fishermen, so he had no objection to keeping the areas closed. However, he felt that bandit gear fishermen would want the areas to be opened. He stated that, inside the closed area, in an area that he called 42 Gully but Dr. Koenig called Stu's Ridge, in 210 feet is where he always found the biggest aggregations of spawning gag. He felt that moving the longline boundary to 50 fathoms would result in the yellowedge grouper being fished out pretty quickly, and would result in additional effort on gags.

(Greg Abrams did not testify during the public comment period, but he made several comments during Dr. Koenig's presentation that appear to have been intended for the public record.)
Greg Abrams, Abrams Seafood, stated that he is willing to have his boats cooperate with the scientists, but the information that NMFS takes is used to put him out of business. He stated that the two closed reserves plus the Florida Middle Grounds constituted about 65% of the fishing grounds. He could live with that, but the Council proposal to move the longline boundary to 50 fathom would take 90% of the area, which will close the restaurant business tremendously. He that his vessels are catching more large gag west of the Mississippi (Cameron, Leeville, TX/LA border, Galveston) than he can remember catching. He said that a Mexican dealer who he does business with said that they were having record catches of grouper, but switched to octopus fishing because of the demand in Europe. He felt that the two marine reserves were working and should stay if they have been proven, but that there should be enforcement.

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Scoping Meeting Summary
Madison/Swanson and Steamboat Lumps Closed Areas
Tampa, Florida
June 20, 2002

Present:
Steven Atran
Trish Kennedy
Melinda McIlvaine
Chris Koenig
3 members of the public

The Council member who was to chair the meeting did not arrive, so the meeting was conducted by Council staff. Mr. Atran opened the meeting and gave a brief PowerPoint presentation describing the issues to be covered by the scoping process. Dr. Koenig then gave a presentation describing his ongoing research in the Madison/Swanson and Steamboat Lumps sites. At the conclusion of the presentation, Mr. Atran asked for public comments.

Anne Wakefield, Conservation Associate, Reefkeeper International, read a prepared statement (attached), which contained suggestions for alternatives and Reefkeeper's preferred alternatives.. The preferred alternatives of Reefkeeper International are:

Spatial Characteristics - Maintain the current size of Madison/Swanson and Steamboat Lumps reserves but implement a buffer zone around the reserves to decrease fishing pressure that may occur along the boundaries. These buffer zones would limit types of gear used (i.e. no bottom rollers, fish traps or powerhead-equipped spearguns) and impose more restrictive bag limits (i.e. set at * of the current fishery recreational limits).

Deadlines for Evaluating Reserve Effectiveness - Set a sunset clause of 6 years beyond 2004, for a total reserve test period of ten years. At the end of that time, the reserves would be evaluated for their effectiveness, based on measured increases in the proportion of males in the gag population. The extension of a new sunset clause will allow essential additional time for male gag numbers and the gag stocks to respond to the protection from the closed areas. Over this period more reliable and detailed long-term scientific studies providing a better assessment of the effects of the reserves can be obtained.

User Restriction Options - Prohibit all fishing year-round within the reserves, except for trolling for Highly Migratory Species (HMS). This will prevent gag male bycatch mortality that would result from the targeting of other groupers, and make enforcement possible.

Enforcement - Require all commercial and charter boats for hire fishing for reef fish in the Eastern Gulf to employ vessel monitoring devices (VMS). This will reduce most difficulties in enforcing reserve restrictions and help ensure the reserve's benefits are realized for the good of the entire fishing community.

Evaluation - Develop scientific research plans and goals as a part of the amendment plan, with research completion set two years in advance of the reserves' sunset date. This will ensure that the appropriate data is available for evaluating the effectiveness of the reserves.

Sal Versaggi, President of Versaggi Shrimp Co., was interested in the overall picture of essential fish habitat. He supports mapping of the bottom, and involving the commercial fishermen in the research. He felt that there might be a credibility problem. The closed areas were originally presented as a four-year program, to be evaluated after

the four years. However, we are now talking about an extension after just two years. He opposed the buffer zones suggested by the previous speaker.

Geoffrey Lane, Gulf and South Atlantic Fisheries Development Foundation, applauded Dr. Koenig's statement that he would be working with the commercial fishermen in his research. He felt that there was no need to extend the closures beyond some part of a time. He felt that the current science should be able to be completed within a year. He asked if work would be done on dispersal of transitional gags. Dr. Koenig responded that transitionals than 1% or less. To track them, he plans to tag large females (over 800 millimeters) which are the potential males.

REEFKEEPER INTERNATIONAL SCOPING COMMENTS & REQUESTS ON DRAFT REEF FISH AMENDMENT 21 TO CONTINUE THE MADISON/SWANSON & STEAMBOAT LUMPS RESERVES

By Anne Wakeford Conservation Associate ReefKeeper International
(For complete document see version sent on letterhead by Alex Stone)

Points read at June 20, 2002 Scoping Meeting

These Reserves Were Created to Protect Male Gags
More Time Will Be Needed to Evaluate These Reserves

The Following Management Options Should Be Considered

ReefKeeper International requests the evaluation of the following options for the continuation of the Madison/Swanson and Steamboat Lumps reserves. Due to the complexity of managing reserves the options have been broken into categories that address

(A) spatial characteristics,

(B) deadlines for evaluating reserve effectiveness,

(C) user restrictions,

(D) enforcement and

(E) evaluation planning.

A) Spatial Characteristics
Option A1 -- ReefKeeper's Preferred Option:
Maintain the current size of Madison/Swanson and Steamboat Lumps reserves but implement a buffer zone around the reserves to decrease fishing pressure that may occur along the boundaries. These buffer zones would limit types of gear used (i.e. no bottom rollers, fish traps or powerhead-equipped spearguns) and impose more restrictive bag limits (i.e. set at * of the current fishery recreational limits).

Option A2:
Maintain Madison/Swanson and Steamboat Lumps reserves at their present size. These reserves were selected because they were approximately the same size, represented high and low relief, are believed to be spawning grounds, and imposed the least economic impact on the fisheries. They were, therefore, chosen based on reasoned decision that remains sound. At a minimum, these reserves should be continued at their present size to evaluate their effectiveness.

Option A3:
Increase the size of Madison/Swanson and Steamboat Lumps reserves. The reserves encompass 20% of the dominant spawning grounds for gag. By displacing fishers from reserves it is likely that fishing pressure has increased along reserve borders. While fishing along the margins of the reserves, vessels may accidentally drift across the borders reducing the area actually protected. Ensuring that 20% of the spawning habitat is closed for study may require expanding the boundaries of the reserves.

B) Deadlines for Evaluating Reserve Effectiveness
Option B1 -- ReefKeeper's Preferred Option:

Set a sunset clause of 6 years beyond 2004, for a total reserve test period of ten years. At the end of that time, the reserves would be evaluated for their effectiveness, based on measured increases in the proportion of males in the gag population. The extension of a new sunset clause will allow essential additional time for male gag numbers and the gag stocks to respond to the protection from the closed areas. Over this period more reliable and detailed long-term scientific studies providing a better assessment of the effects of the reserves can be obtained.

Option B2:
Maintain the designated fishing restrictions indefinitely. This strategy follows the precautionary management approach by requiring that the reserves be proven ineffective or harmful before they could be discontinued.

Option B3:
Maintain the reserve restrictions in effect until gag fishery OY has been maintained for two or more years. National Standard 1 requires that management measures prevent overfishing and maintain the OY. Marine reserves provide a feasible way to allow gag stocks to rebuild to OY levels. Maintaining OY for successive years would demonstrate that the gag stock has reached a level capable of sustaining OY and that other restrictions upon the gag fishery -- such as minimum size or bag limits -- can be relaxed.

Option B4:
Continue the reserves until the proportion of male gag groupers within the reserves has returned to its historic 17% of the spawning aggregations. While allowing male gag numbers to rebound, this will provide the Gulf Council with a set point to determine if retaining reserve restrictions would provide continued or added benefit to the fishery (e.g. male percentage in excess of 17%) or if restrictions could be reduced without decreasing the 17% male proportion.

Option B5:
Continue the reserves until the the gag fishery has maintained BMSY for two successive years. Maintaining reserve restrictions until BMSY is obtained will help ensure that the fishery can support OY on a continuing basis.

C) User Restriction Options
Option C1 -- ReefKeeper's Preferred Option
Prohibit all fishing year-round within the reserves, except for trolling for Highly Migratory Species (HMS). This will prevent gag male bycatch mortality that would result from the targeting of other groupers, and make enforcement possible.

Option C2:
Year-round prohibition of all fishing within the reserves (including a prohibition on highly migratoryspecies). This option would provide the most reliable enforcement method.

Option C3:
Allow surface trawling for coastal migratory species (i.e. mackerel, wahoo, cobia, and dolphin) from July to December, which is outside the gag spawning season. This option will allow other fisheries which by their nature may not pose a direct threat to year-round resident bottom-dwelling male gags or their habitat. Allowing the fishery to operate only in non-spawning or aggregating periods will allow enforcement of the reserve restrictions during the entire spawning season. However, this option presents more challenges to enforcing gear restrictions during the July to December period.

D) Enforcement
Option D1 -- ReefKeeper's Preferred Option:
Require all commercial and charter boats for hire fishing for reef fish in the Eastern Gulf to employ vessel monitoring devices (VMS). This will reduce most difficulties in enforcing reserve restrictions and help ensure the reserve's benefits are realized for the good of the entire fishing community.

Option D2:
Require all commercial boats fishing for reef fish in the Eastern Gulf to employ vessel monitoring devices (VMS). This will reduce some difficulties in enforcing reserve restrictions and help ensure the reserve's benefits are realized for the good of the entire fishing community.

Option D3:
Require all boats fishing for reef fish in the Eastern Gulf to employ vessel monitoring devices (VMS). This will reduce almost all difficulties in enforcing reserve restrictions and help ensure the reserve's benefits are realized for the good of the entire fishing
community.

E) Evaluation

Option E1 -- ReefKeeper's Preferred Option
Develop scientific research plans and goals as a part of the amendment plan, with research completion set two years in advance of the reserves' sunset date. This will ensure that the appropriate data is available for evaluating the effectiveness of the reserves.

Thank You

Since 1992, ReefKeeper International has been working as a public interest organization with the Council and the National Marine Fisheries Service to ensure sustainable fisheries in the Gulf of Mexico. We look forward to working with the Council in developing an effective Reef Fish Amendment 21 to achieve rebuilding of male gag abundance through
continuation of the Madisson/Swanson and Steamboat Lumps marine reserves.

APPENDIX D- Research Reports Presented at May 2003 Gulf Council Meeting

The following are summaries of three presentations given at the May 2003 Gulf Council meeting by researchers studying the Madison/Swanson and Steamboat Lumps marine reserves.

FSU Marine Reserves Study - Felicia Coleman and Chris Koenig

Felicia Coleman and Chris Koenig presented a summary of their research in the Madison-Swanson marine reserve. Key research questions being addressed are:

- What are the key features of essential fish spawning habitat
- Do males remain in spawning habitat year round
- Does protecting spawning habitat help to recover males
- Does the absence of males leads to missed spawning opportunities for females

Answering the first question involves mapping a 3-dimensional structure and superimposing spawning habitat location based on research evidence based on commercial fishermen knowledge. For red grouper, key spawning habitat features are flat with veneer of sand over solution holes (=pits), pits with a high percentage of carbonate rock, and containing live-bottom crustose coralline algae, and sponges. The pits, above five feet across, were found to contain both greater numbers of fish and more species per area than the surrounding sand. For gag, key spawning habitat features are pinnacles with a high percentage of carbonate rock, the edge of drop offs, and live-bottom, primarily sea whips, sea fans.

To answer the second question, gag are caught with chevron traps, vented at depth, and brought slowly to the surface. Gonads were biopsied to determine sex and reproductive condition. Other information collected included genetic samples, body measurements and spines for aging. Gag and scamp were tagged, some with acoustic tags to track location during spawning season and early post-spawning.

To answer the third and fourth questions, CPUE and size frequency information collected for several species in the Madison-Swanson reserve and compared to a reference site outside the reserve. Preliminary results comparing 18 aggregation sites inside the reserve to 18 aggregation sites in the reference area found males present and females hydrated eggs in the reserve, compared with few males (N = 1) and no hydrated females in the reference site. In addition, CPUE of male gag was 8 times higher in the Madison-Swanson reserve than outside the site.

Ongoing research includes continuing to work with commercial fishermen, developing economic model of fishermen behavior in response to marine reserves, and combining economic with life history model to evaluate competing management options (including seasonal, areal closures, size limits etc.).

Special problems with the reserves include compliance with MPA boundaries, and the proposed phosphate dumping off the coast of Florida. Dr.; Koenig stated that violations in the reserve include both small recreational vessels and commercial grouper boats. Dr. Coleman noted that the proposed phosphate dumping area encompasses most of the Madison-Swanson site and he southwest corner of Steamboat Lumps. The dumping site was selected based on a 1973 report that stated that algae blooms did not occur beyond 40 miles from shore, and that the dumping area is beyond the influence of the Gulf of Mexico loop currents. However, satellite imagery indicates that this information is incorrect. Dr. Coleman suggested that the impact of phosphate dumping could be minimized by using spin-off eddies from the loop current or moving the dumping area beyond the continental shelf to the continental slope, and she asked the Council to say something on this issue.

NMFS Marine Reserve Study - Andrew David

Andy David, NMFS Southeast Fisheries Research Center, Panama City Laboratory, gave a presentation on NMFS research to evaluate the effectiveness of Madison-Swanson and Steamboat Lumps marine reserves and to compare them with a control site known as Twin Ridges being conducted by him and Christopher Gledhill. The main objectives of the study are:

- Establish baseline estimates of fish abundance, especially for species of groupers and snappers;
- Describe significant habitat features in the Madison-Swanson and Steamboat Lumps MPAs;
- Analyze the relationship between habitat and species assemblages;
- Track changes in fish abundance and distribution within the MPAs during the closure period.

A secondary objective was to locate spawning aggregations of gag and scamp. Sidescan sonar mosaics and multibeam bathymetry were used to stratify the study areas based on benthic topology and geology. Fish surveys were conducted with video cameras and chevron traps. An underwater remotely operated vehicle (ROV) was used to describe habitat and locate spawning aggregations. Samples reported on to date were conducted between February 2001 and May 2002. The analyses of 2003 survey results is currently underway and not included in this report.

In Madison-Swanson, sampling was conducted between February and May. Spawning aggregations of gag and scamp were confirmed along the Pinnacles. Substrate was dominated by sand-clay (40% - 95%), but rock (30%) and soft corals (14%) were found in greatest amounts along the Ridge at the 74 meter isobath, and at the Pinnacles and the Snake strata. A total of 55 fish taxa were observed in 2001, and 66 fish taxa in 2002. The most frequently observed taxa were scamp, blue angelfish, red grouper, short bigeye, gag, and groupers of the genus *Mycteroperca*. Frequency of occurrence and abundance was generally higher in 2002 than in 2001. Red snapper abundance, however, declined.

In Steamboat Lumps, sampling was conducted between April and July, after the spawning period for gag and scamp and no aggregations of either species were observed. Substrate was dominated by sand-clay (60% - 95%), but diverse composition was found along the Ridge, which had rock (4%) and soft coral (7%). A total of 53 fish taxa were observed in 2001, and 50 fish taxa in 2002. The most frequently observes taxa were red porgy, flatfish (Bothidae family), planehead filefish, southern puffer, sand perch, and bank seabass. Abundances were generally greater in 2002 than in 2001.

In the Twin ridges control area, sampling was conducted between February and May. There were 41 fish taxa were observed in 2001 and 37 taxa in 2002. Substrate composition was dominated by sand-clay (52%), shell-gravel (19%), and rock (14%). The most frequently observes taxa were Almaco jack, blue angelfish, scamp, greater amberjack, reef butterflyfish, and red porgy. Gag were not observes in 2001 but were seen in 50% of the sites in 2002. Most taxa were observed more frequently in 2002 than in 2001. However, observations of red snapper declined in 2002.

Fish lengths were measures using paired lasers affixed to the video cameras. In 2001, scamp were significantly larger in Steamboat Lumps (mean 439 mm FL) than in Madison-Swanson (mean 392 mm FL) or Twin Ridges (mean 360 mm FL). The largest vermilion snapper were observed at Twin Ridges (mean 348 mm FL). In 2002, red porgy (306 mm) were largest at Madison-Swanson, scamp (459 mm) were largest at Steamboat Lumps, and vermilion snapper (347 mm) and blue angelfish (285 mm) were largest at Twin Ridges. Scamp and vermilion snapper in Steamboat Lumps were the only species to have length measurements taken in both 2001 and 2002. In both cases mean length increased from 2001 to 2002.

Additional estimates of fish abundance were made with acoustic volume backscatter measurements. Mean volume backscatter of fish near the bottom in Madison-Swanson was highest along the Pinnacles, Ridge, and the northeast stratum. In Steamboat Lumps, mean volume backscatter was lower compared to Madison-Swanson, with higher mean volume estimates in isolated locations along the Ridge, Pits, northeast stratum, and central stratum.

Conclusions to date from this study are:

- Grouper and snapper associated with hard bottom features in both MPAs. In general, abundances were greater within Madison-Swanson than in Steamboat Lumps.
- Spawning aggregations of gag and/or scamp confirmed at several sites within Madison-Swanson during February-March in 2001 and 2002.
- Some changes in abundance estimates between years were noted, with a general trend of more reef fish seen in 2001 than in 2002. Within Madison-Swanson, the abundance of red grouper, gag, and scamp increased. Within Steamboat Lumps, an increase in abundance was noted for red grouper and scamp.

As a precautionary note, results from only two years of data should not be considered a trend. Gag are long-lived fish, and only 10% are male by age 7. Thus, many years of protecting males may be required before significant changes are seen at the population level.

One problem has been fishing within the reserves. Both commercial and recreational vessels were observed fishing within the reserve in 2001 an 2002. Once Coast Guard overflights were increased in the latter part of 2002, no commercial fishing vessels were sen in 2003, although a charter vessel was seen fishing in Madison-Swanson during March 2003. Since the amount of fishing activity in the reserves is unknown, it is difficult to evaluate the impact of the closures on fishery productivity.

Evaluation of Trolling in Marine Reserves - Andrew David

Andy David presented a progress report on susceptibility of reef fish to trolling within the northeast Gulf of Mexico marine protected areas. He noted that a final report would be presented at the July Council meeting. As part of a settlement to a legal challenge brought by CCA to the Council's request to NMFS HMS to close the Madison-Swanson and Steamboat Lumps reserves to HMS fishing, the research is to address the following questions[37]:

- Can recreational trolling gear access reef fish in habitats similar to those in the Madison-Swanson and Steamboat Lumps MPAs?
- If accessible, what is the effective off-bottom distance for catching grouper and snapper?
- Are there seasonal differences in the susceptibility of grouper and snapper to trolling?
- Can enforcement officials surveying the areas (MPAs) detect depth of trolling from surface observations?

To conduct the research, a charter boat from Panama City was hired and popular fishing literature was surveyed for techniques and gear currently employed to catch reef fish while trolling. Monthly trolling trips to the Madison-Swanson MPA during the gag grouper spawning season (December 2002 – March 2003), and federal enforcement officials were utilized to determine ability to discern trolling depth from an observation vessel. The first charter boat trip, in December 2002, was conducted for gear testing purposes, and three more trips to evaluate trolling were conducted in January, February and March 2003. A trip to evaluate ability to estimate depth of trolling was conducted in April 2003.

[37] The wording of the research questions used in the presentation differs slightly from the wording used in the research proposal that was part of the CCA legal challenge settlement. The questions in the research proposal were: (1) Can recreational fisherls trolling for coastal migratory pelagic species access the deep reef fishes at the shelf-edge depths (200-400 ft.) That Madison-Swanson and Steamboat Lumps reserves occur? (2) If downriggers can access reef fish species, what is the depth threshold or effective distance-off-bottom for catching snapper/grouper? (3) Are there seasonal differences in susceptibility of deep species to trolling? (4) Can enforcement officials surveying the areas detect depth of trolling by recreational vessels from surface observations?

During the four trips in which trolling was conducted, a total of 28 reef fish were caught; 17 gag, 6 greater amberjack, 2 speckled hind, 1 scamp, 1 warsaw grouper, and 1 red snapper. Overall CPUE from 148 trials totaling 949 minutes of trolling was 0.030 reef fish/minute of trolling. There was a higher catch rate using rod and reel (0.032 fish/minute) than using downriggers (0.021 reef fish/minute). Higher CPUE was recorded with monofilament line (0.034 reef fish/minute) than with wire line (0.027 reef fish/minute). By bait type, natural live bait had the highest catch rate (0.052 reef fish/minute). Natural dead bait and artificial bait with a natural bait teaser had 0.028 reef fish per minute. Using just artificial bait, no reef fish were caught, but one king mackerel was caught in 146 minutes of trolling.

To test ability to detect trolling and estimate depth of trolling, two USCG officers and a former NMFS Enforcement Special Agent in Charge were used as observers. A compact depth recorder was affixed near the terminal end of the fishing gear used to record true depth of fishing to within half a meter. The depth recorder was used only for the depth estimation trials, not for the fishing trials, due to its high cost ($1400) and the risk of it being lost on the bottom. An artificial bait with the hooks removed was used to simulate fishing since catching fish was not desired during the depth estimation trials. The "fishing" was done from one boat, and the enforcement observers were on a second boat. The mate on the fishing vessel targeted four depths for fishing; surface, 30 feet, 100 feet and 200 feet. Both the estimation of depth of fishing and the distance between the vessels at the time the estimate was made was recorded. In 96 trials, the correlation between the observer's estimate of depth of fishing and the actual depth was very inaccurate, with a correlation of 0.187. Observer's estimates tended to be too deep when the true depth of fishing was shallower, and too shallow when the true depth was deeper. The distance between vessels where the observers felt confident making their depth estimates averaged 26 meters. This distance was closer for monofilament line (23 meters) than for wire line (29 meters) because wire line is easier to see. Comparing the error percentage to the number of prior trials indicated that there was no learning curve involved, i.e., there was no improvement in the error rate as the trials progressed.

There were 8 trials conducted at random where the fisher was holding a pole but did not have the gear in the water. The purpose of these trials was to determine how close the vessels had to be for the observers to determine whether the person on the fishing vessel was actually fishing or just holding the pole. The overall mean distance for observers to determine if fishing was occurring was just under 30 meters (27 meters for monofilament line and 33 meters for wire line).

Given the inaccuracies in estimating depth of fishing from an observer boat near the observer vessel, it seems unlikely that depth of fishing can be estimated from USCG airplanes. In addition, Dr. David noted that, during the fishing trials, some gear would get hung up on the bottom and be lost, thus it is likely that this type of fishing has impacts on the bottom habitat.

Dr. David also noted that the fishing gear does not need to be on the bottom to catch reef fish. A world record gag that was caught of Destin a few years ago was caught with the gear about halfway to the bottom according to the captain of the vessel, and in some of the video camera drops during the preceding study, gag were observed swimming up to meet the cameras, as much as 80 feet off the bottom. Red snapper are also frequently observed up in the water column.

The conclusions of this study to date are:

- Reef fish are relatively easy to catch with recreational fishing gear while trolling in the Madison-Swanson MPA.
- A wide variety of reef fish are susceptible to trolling gear including gag, scamp, speckled hind, Warsaw grouper, red snapper and greater amberjack.
- Enforcement personnel have great difficulty determining depth of trolled lines from adjacent vessels.
- Under ideal conditions, observers need to be within 30m of target vessel to determine if fishing lines are in the water.

Dr. David concluded by informing the Council that he had two fishing trips scheduled to Madison-Swanson in June during the grouper non-spawning season to check on the seasonality of the results, ans a final written report will be submitted to the Gulf Council and CCA prior to the July Council meeting in Naples, FL.

APPENDIX E- Research Report Presented at July 2003 Gulf Council Meeting

Susceptibility of Reef Fish to Fishing in NE Gulf of Mexico Marine Protected Areas

Presented to the Gulf of Mexico Fishery Management Council
14 July 2003

Andrew David - Principal Investigator
NOAA Fisheries
Southeast Fishery Science Center
3500 Delwood Beach Road
Panama City, FL 32408
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Summary
NOAA Fisheries researchers employed a variety of gear types and techniques to assess the susceptibility of reef fish to fishing at depths found in the NE Gulf of Mexico closed areas. Various lures and baits were fished at depths between the surface and the bottom at speeds between 1.5 and 15.0 knots for a total of 68 hours and 36 minutes. Forty-seven fish were caught representing 10 species: 43 of these fish were reef fish, 31 of the reef fish were grouper, and 26 of the grouper were gag grouper. Catch per unit effort (CPUE) for the overall project was 0.011 fish per minute. Differentiated by spawning season (and speed), CPUE was 0.010 fish per minute during grouper spawning season (0.000 for high speed fishing and 0.031 for low speed fishing), and 0.014 outside grouper spawning season (0.002 for high speed and 0.037 for low speed). Twenty different types of lures and baits were employed, using monofilament or wire line-stocked fishing reels, with or without downriggers, and with weights on the fishing lines between 0 and 48 ounces. Fishing operations were conducted during and outside of the gag grouper spawning season. Reef fish are most susceptible to live baits fished below 4 kts on monofilament lines without downriggers outside the spawning season (CPUE = 0.090), and least susceptible to artificial baits fished on the surface at 15 kts (CPUE = 0.000). High speed fishing results in the line and lure being on or near the surface and the catch of one king mackerel and one wahoo on an artificial lure outside the grouper spawning season. Video observations have revealed gag grouper in the study area are found up to 28.22 m (92.58 ft) off the bottom, although fiscal limitations prevented the use of depth recorders on the lures and baits used during the fishing operations to determine depth of hooking for the fish collected. Fisheries enforcement personnel on board an observer vessel were asked to estimate the depth of lures fished by an adjacent fishing vessel. These observers produced estimates which varied from the actual depths by -252.11 ± 613.88 % (mean ± standard deviation) and with a range between 97.25 and -3233.30 %. Enforcement personnel observing simulated fishing operations were able to determine the presence or absence of fishing lines in the water at a distance of 29.83 ± 15.17 m (mean ± standard deviation, 97.87 ± 49.77 ft).

Background
In July 1999, the Gulf of Mexico Fishery Management Council established two areas closed to fishing of all species with the primary purpose of protecting spawning aggregations of gag grouper. These two reserves, Madison-Swanson and Steamboat Lumps, are located on the west Florida shelf approximately 50 and 100 miles SSE of Panama City, Florida. Monitoring of economically important fish assemblages within these “closed” areas is critical to assess the use of marine reserves in the Gulf of

Mexico as a fishery management tool.

NOAA Fisheries agreed to conduct research to address the closure to fishing in the Madison-Swanson and Steamboat Lumps Marine Protected Areas. NOAA Fisheries agreed to address the following questions and objectives through the subsequently described methods (quoted verbatim in italics from the Joint Stipulation):

> ***Questions:*** *(1) Can recreational fishers trolling for coastal migratory pelagic species access the deep reef fishes at the shelf-edge depths (200-400 ft.) that Madison-Swanson and Steamboat Lumps reserves occur? (2) If downriggers can access reef species, what is the depth threshold or effective distance-off-bottom for catching snapper/grouper? (3) Are there seasonal differences in susceptibility of deep species to trolling? (4) Can enforcement officials surveying the areas detect depth of trolling by recreational vessels from surface observations?*
>
> ***Objectives:*** *(1.) Run trolling gear (including downriggers) equipped with a depth profiler so that the actual depth of the bait can be determined under specific conditions of vessel speed and type of downrigger. (2.) Run bait at a series of depths (from 200 to 400 ft. deep) over known gag and scamp aggregation sites, outside of the M-S reserve, to determine if those species can be readily caught (Note that this objective will be contingent upon the depths achieved in objective 1. and would be conducted both during and outside of the spawning period). (3.) Determine if the depth of trolling is detectable from the surface for enforcement purposes.*
>
> ***Methods:***
>
> *1. Several styles of trolling gears (including those with downriggers) will be used in combination with compact depth profilers to determine the conditions necessary (i.e., vessel speed, line out, etc.) to achieve certain depths.*
>
> *2. Several types of baits will be used over known grouper aggregation sites both within and outside of the spawning period, to see if these species can be caught while trolling with downrigger fishing gear. We will choose aggregation sites within the range of depths that occur within the Madison-Swanson and Steamboat Lumps reserves.*
>
> *3. Photographs will be taken from a small boat running parallel to the fishing vessel (like a small Zodiac inflatable) of the trolling line and fishing vessel while running the gear at several depths. Depths observed will be: surface, 30 ft down, 100 ft down, 200 ft down, and 400 ft down.*
>
> *4. In addition to the photos of the surface gear while various depths are being run, we will have enforcement personnel (coast guard, marine patrol, NMFS enforcement) with us in separate boats observing the surface gear while various depths are being run in a single blind experiment. That is, they are to estimate the depth of trolling with only their surface observations to go on (i.e., they will be required to remain at a distance until the trolling depth is achieved, then approach the trolling vessel and estimate the depth of trolling based on their observation.) Additionally, they will be required to estimate how close they need to be to determine, (1) that the vessel is trolling, and (2) what kind of gear is being trolled, and (3) the depth of trolling, if possible.*

We strove to follow the prescribed methods as closely as possible. A survey of NOAA Fisheries personnel involved in tagging several thousand coastal pelagic fish indicated electric reels with monofilament and wire line would be most productive in catching fish. Downriggers were suggested to achieve the 200 - 400 ft depths called for in the settlement agreement. Popular fishing literature provided insights into lures and bait types. A local charter boat and crew were hired to serve as the platform for fishing operations. Seven trips were made on the charter vessel to cover the objectives of fishing during and outside the spawning season and determining fisheries enforcement personnel's ability to detect fishing and determine fishing depth.

All of the low speed fishing (1.5 - 4 kt) activities took place within the boundaries of the Madison-Swanson Marine Protected Area. This area was chosen for three reasons: a) the main point of the current project was to assess the impact of fishing on reef fish within the MPA, b) the vast majority of grouper spawning aggregation sites known to us were in the MPA, and c) any reef fish collected could be used in an ongoing project involving reef fish abundance, distribution, age, and growth. High speed fishing (12 - 15 kt) took place across the continental shelf between Panama City and the Madison-Swanson MPA. Depth estimation trials were conducted closer to Panama City in water depths equivalent to those in the fishing area. Results and specific methodologies are presented seriatim below for the three aspects of this project: a) reef fish susceptibility to fishing, b) reef fish off bottom distance, and c) ability of enforcement personnel to ascertain occurrence of fishing operations and depths.

REEF FISH FISHING

Fishing operations were conducted on a 40 ft Hatteras chartered in Panama City Beach, FL. The vessel's master, Captain Jim Guinn, is very experienced in many aspects of recreational fishing in the northern Gulf of Mexico, including activities targeting highly migratory, coastal pelagic, and reef species. Seven trips were made on the charter vessel; one for gear testing, three for fishing during the gag grouper spawning season, two for fishing outside the gag grouper spawning season, and one for observation and depth estimation by fisheries enforcement personnel. Tackle employed included 6/0 fishing reels filled with 80 lb test monofilament or 250 lb test stainless steel wire line and equipped with 24 v electric motors. Terminal tackle consisted of 20 different lures, baits, and combinations thereof which fit into four categories: artificial, artificial with natural, dead natural, and live natural. Six baits fit the artificial category: black/silver plug, red/white plug, gold plug, pink/black skirted duster, cobia jig, and silver spoon. The artificial with natural bait category contained cobia jigs tipped with cut mackerel, herring, or amberjack. Five natural dead baits were used: cut mackerel, cut amberjack, ballyhoo, whole mackerel, and hardtail. The live natural bait category included six items: pigfish, pinfish, croaker, bank sea bass, red porgy, and hardtail. Egg sinkers were employed to get lures and baits to the specified 200 - 400 ft depths, and these weights ranged between 10 and 48 ounces. Recreational-style downriggers were also used with downrigger balls between 10 and 12 pounds. All fishing trials were conducted in the Madison-Swanson Marine Protected Area over areas of known grouper spawning aggregation sites. The initiation and termination times of each trial were recorded

along with bait type, line type, weight on line, weight of downrigger ball (if used), catch, vessel speed, water depth, date, latitude, and longitude.

Fishing results are presented by category in the following hierarchy (the results are also presented in tabular form in Appendix 1):

Total fishing effort
- Fishing during gag spawning season
  - High speed fishing during gag spawning season
  - Low speed fishing during gag spawning season
    - Low speed fishing during gag spawning season by bait type
    - Low speed fishing during gag spawning season by line type
    - Low speed fishing during gag spawning season with/without downrigger
- Fishing outside gag spawning season
  - High speed fishing outside gag spawning season
  - Low speed fishing outside gag spawning season
    - Low speed fishing outside gag spawning season by bait type
    - Low speed fishing outside gag spawning season by line type
    - Low speed fishing outside gag spawning season with/without downrigger

Each category lists:
- Total fishing time
- Total number of trials
- Duration of fishing trials (mean ± standard deviation), range of duration
- Weight used on line: mean ± standard deviation, range of weight
- Catch (by type and species)
- CPUE (catch per unit effort, by type)

Total fishing effort

4116 minutes of fishing
230 trials
Duration of each fishing trial: 17.90 ± 42.07 minutes (mean ± standard deviation)
Range of duration of fishing trials: 2 - 211 minutes
Weight used on line: 29.80 ± 16.56 oz, range: 0.00 - 48.00 oz
47 fish caught:
- 43 reef fish
  - 26 gag grouper (*Mycteroperca microlepis*)
  - 10 greater amberjack (*Seriola dumerili*)
  - 2 speckled hind (*Epinephelus drummondhayi*)
  - 2 red snapper (*Lutjanus campechanus*)
  - 2 warsaw grouper (*Epinephelus nigritus*)
  - 1 scamp (*Mycteroperca phenax*)
- 3 coastal pelagics
  - 2 king mackerel (*Scomberomorus cavalla*)
  - 1 wahoo (*Acanthocybium solanderi*)
- 1 large coastal shark

1 silky shark (*Carcharinus falciformis*)

CPUE (catch per unit effort):

Total: 0.011 fish per minute
Reef fish: 0.010 fish per minute
Coastal pelagics: 0.001 fish per minute
Large coastal sharks: <0.001 fish per minute

Fishing during gag grouper spawning season

2868 minutes of fishing
160 trials
Duration of each fishing trial: 17.93 ± 41.51 minutes, range: 2 - 200 minutes
Weight used on line: 31.95 ± 18.60 oz, range: 0.00 - 48.00 oz
29 fish caught: 28 reef fish
17 gag grouper
6 greater amberjack
2 speckled hind
1 red snapper
1 warsaw grouper
1 scamp
1 coastal pelagic
1 king mackerel

CPUE: Total: 0.010 fish per minute
Reef fish: 0.010 fish per minute
Coastal pelagics: <0.001 fish per minute

High speed fishing during gag grouper spawning season (12 - 15 kts)

1919 minutes of fishing
12 trials
Duration of each fishing trial: 159.92 ± 30.42 minutes, range: 95 - 200 minutes
0 fish caught
CPUE: Total: 0 fish per minute

All high speed fishing during gag grouper spawning season used artificial lures on monofilament line without downriggers or weights on the line.

Low speed fishing during gag grouper spawning season (1.5 - 4 kts)

949 minutes of fishing
148 trials
Duration of each fishing trial: 6.41 ± 3.92 minutes, range: 2 - 25 minutes
Weight used on line: 34.54 ± 16.85 oz, range: 0.00 - 48.00 oz
29 fish caught: 28 reef fish
17 gag grouper
6 greater amberjack
2 speckled hind
1 red snapper
1 warsaw grouper
1 scamp
1 coastal pelagics
1 king mackerel
CPUE: Total: 0.031 fish per minute
Reef fish: 0.030 fish per minute
Coastal pelagics: 0.001 fish per minute

Low speed fishing during gag grouper spawning season by bait type

Artificial lure

146 minutes of fishing
10 trials
Duration of each fishing trial: 14.60 ± 6.70 minutes, range: 6 - 25 minutes
Weight used on line: 4.80 ± 10.12 oz, range: 0.00 - 24.00 oz
1 fish caught: 1 coastal pelagic
1 king mackerel
CPUE: Total: 0.007 fish per minute
Coastal pelagics: 0.007 fish per minute

Artificial lure with cut bait

253 minutes of fishing
41 trials
Duration of each fishing trial: 6.17 ± 2.93 minutes, range: 2 - 19 minutes
Weight used on line: 46.83 ± 7.50 oz, range: 0.00 - 48.00 oz
7 fish caught: 7 reef fish
5 gag grouper
2 greater amberjack
CPUE: Total: 0.028 fish per minute
Reef fish: 0.028 fish per minute

Dead natural bait
318 minutes of fishing
55 trials
Duration of each fishing trial: 5.78 ± 3.33 minutes, range: 2 - 17 minutes
Weight used on line: 40.15 ± 16.04 oz, range: 0.00 - 48.00 oz
9 fish caught: 9 reef fish
4 gag grouper
1 greater amberjack
2 speckled hind
1 red snapper
1 warsaw grouper
CPUE: Total: 0.028 fish per minute
Reef fish: 0.028 fish per minute

Live natural bait
232 minutes of fishing
42 trials
Duration of each fishing trial: 5.52 ± 2.14 minutes, range: 3 - 11 minutes
Weight used on line: 22.29 ± 6.26 oz, range: 0.00 - 24.00 oz
12 fish caught: 12 reef fish
8 gag grouper
3 greater amberjack
1 scamp
CPUE: Total: 0.052 fish per minute
Reef fish: 0.052 fish per minute

Low speed fishing during gag grouper spawning season by line type
Wire line
656 minutes of fishing
107 trials
Duration of each fishing trial: 6.13 ± 3.56 minutes, range: 2 - 25 minutes
Weight used on line: 38.80 ± 15.34 oz, range: 0.00 - 48.00 oz
19 fish caught: 18 reef fish
10 gag grouper
4 greater amberjack
2 speckled hind
1 red snapper
1 warsaw grouper
1 coastal pelagic
1 king mackerel
CPUE: Total: 0.029 fish per minute
Reef fish: 0.027 fish per minute
Coastal pelagics: 0.002 fish per minute

Monofilament line
293 minutes of fishing
41 trials
Duration of each fishing trial: 7.15 ± 4.71 minutes, range: 3 - 25 minutes
Weight used on line: 23.42 ± 15.64 oz, range: 0.00 - 48.00 oz
10 fish caught: 10 reef fish
7 gag grouper
2 greater amberjack
1 scamp
CPUE: Total: 0.034 fish per minute
Reef fish: 0.034 fish per minute

Low speed fishing during gag grouper spawning season with/without downrigger
With downrigger
191 minutes of fishing
16 trials
Duration of each fishing trial: 11.94 ± 5.50 minutes, range: 5 - 25 minutes
Weight used on downrigger: 11.88 ± 0.50 lbs, range: 10.00 - 12.00 lbs, no weight on line
4 fish caught: 4 reef fish
3 greater amberjack
1 red snapper
CPUE: Total: 0.021 fish per minute
Reef fish: 0.021 fish per minute

Without downrigger
758 minutes of fishing
132 trials
Duration of each fishing trial: 5.74 ± 3.11 minutes, range: 2 - 25 minutes
Weight used on line: 38.73 ± 12.46 oz, range: 0.00 - 48.00 oz
25 fish caught: 24 reef fish
17 gag grouper
3 greater amberjack
2 speckled hind
1 warsaw grouper
1 scamp
1 coastal pelagic
1 king mackerel
CPUE: Total: 0.033 fish per minute
Reef fish: 0.032 fish per minute
Coastal pelagics: 0.001 fish per minute

Fishing outside gag grouper spawning season

1248 minutes of fishing
70 trials
Duration of each fishing trial: 17.83 ± 43.62 minutes, range: 2 - 211 minutes
Weight used on line: 14.66 ± 9.12 oz, range: 0.00 - 24.00 oz
18 fish caught: 15 reef fish
9 gag grouper
4 greater amberjack
1 red snapper
1 warsaw grouper
2 coastal pelagics
1 king mackerel
1 wahoo
1 large coastal shark
1 silky shark
CPUE: Total: 0.014 fish per minute
Reef fish: 0.012 fish per minute
Coastal pelagics: 0.002 fish per minute
Large coastal sharks: 0.001 fish per minute

High speed fishing outside gag grouper spawning season (12 - 15 kts)

812 minutes of fishing
6 trials
Duration of each fishing trial: 135.33 ± 88.27 minutes, range: 7 - 211 minutes
2 fish caught: 2 coastal pelagics
1 king mackerel
1 wahoo
CPUE: Total: 0.002 fish per minute
Coastal pelagics: 0.002 fish per minute

All high speed fishing outside gag grouper spawning season used artificial lures on monofilament line without downriggers or weights on the line.

Low speed fishing outside gag grouper spawning season (1.5 - 4 kts)

436 minutes of fishing
64 trials
Duration of each fishing trial: 6.81 ± 5.23 minutes, range: 2 - 35 minutes
Weight used on line: 16.03 ± 8.28 oz, range: 0.00 - 24.00 oz
16 fish caught: 15 reef fish
9 gag grouper
4 greater amberjack
1 red snapper
1 warsaw grouper
1 large coastal shark
1 silky shark
CPUE: Total: 0.037 fish per minute
Reef fish: 0.034 fish per minute
Large coastal sharks: 0.002 fish per minute

Low speed fishing outside gag grouper spawning season by bait type

Artificial lure

67 minutes of fishing
7 trials
Duration of each fishing trial: 9.57 ± 3.31 minutes, range: 6 - 14 minutes
Weight used on line: 10.29 ± 12.83 oz, range: 0.00 - 24.00 oz
0 fish caught
CPUE: Total: 0 fish per minute

Artificial lure with cut bait

57 minutes of fishing
6 trials
Duration of each fishing trial: 9.50 ± 5.96 minutes, range: 5 - 19 minutes
Weight used on line: 19.00 ± 5.90 oz, range: 10 .00 - 24.00 oz
0 fish caught
CPUE: Total: 0 fish per minute

Dead natural bait

145 minutes of fishing
16 trials
Duration of each fishing trial: 9.06 ± 8.36 minutes, range: 2 - 35 minutes
Weight used on line: 18.00 ± 9.47 oz, range: 0.00 - 24.00 oz
1 fish caught: 1 large coastal shark
1 silky shark
CPUE: Total: 0.007 fish per minute
Large coastal sharks: 0.007 fish per minute

Live natural bait

167 minutes of fishing
35 trials
Duration of each fishing trial: 4.77 ± 1.77 minutes, range: 2 - 10 minutes
Weight used on line: 15.77 ± 6.58 oz, range: 0.00 - 24.00 oz
15 fish caught: 15 reef fish
9 gag grouper
4 greater amberjack
1 red snapper
1warsaw grouper
CPUE: Total: 0.090 fish per minute
Reef fish: 0.090 fish per minute

Low speed fishing outside gag grouper spawning season by line type

Wire line

184 minutes of fishing
23 trials
Duration of each fishing trial: 8.00 ± 7.03 minutes, range: 3 - 35 minutes
Weight used on line: 24.00 ± 0.00 oz
3 fish caught: 2 reef fish
1 gag grouper
1 greater amberjack
1 large coastal shark
1 silky shark
CPUE: Total: 0.016 fish per minute
Reef fish: 0.011 fish per minute
Large coastal sharks: 0.005 fish per minute

Monofilament line

252 minutes of fishing
41 trials
Duration of each fishing trial: 6.15 ± 3.82 minutes, range: 2 - 19 minutes
Weight used on line: 11.56 ± 7.15 oz, range: 0.00 - 16.00 oz
13 fish caught: 13 reef fish
8 gag grouper
3 greater amberjack
1 red snapper
1 warsaw grouper
CPUE: Total: 0.052 fish per minute
Reef fish: 0.052 fish per minute

Low speed fishing outside gag grouper spawning season with/without downrigger

With downrigger

73 minutes of fishing
8 trials
Duration of each fishing trial: 9.13 ± 4.58 minutes, range: 2 - 16 minutes
Weight used on downrigger: 10.00 ± 0.00 lb, no weight on line
0 fish caught
CPUE: Total: 0 fish per minute

Without downrigger

363 minutes of fishing
56 trials
Duration of each fishing trial: 6.48 ± 5.27 minutes, range: 2 - 35 minutes
Weight used on line: 18.32 ± 5.99 oz, range: 0.00 - 24.00 oz
16 fish caught: 15 reef fish
9 gag grouper
4 greater amberjack
1 red snapper
1 warsaw grouper
1 large coastal shark
1 silky shark
CPUE: Total: 0.044 fish per minute
Reef fish: 0.041 fish per minute
Large coastal sharks: 0.003 fish per minute

Summary

A wide variety of species were caught fishing in the Madison-Swanson Marine Protected Area. Coastal pelagic, large coastal shark, and reef species were susceptible to the gear and methods employed. However, highly migratory species, the only group permitted to be fished for in the current regulations, were not. Reef fish were caught outside of the spawning season at a rate of 0.012 fish per minute (catch per unit effort - CPUE), while CPUE during the spawning season was 0.010. More reef were caught slow fishing (1.5 - 4 kts) than fast fishing (12 - 15 kts). Slow fishing had a reef fish CPUE of 0.034 outside the spawning season and 0.030 during the spawning season. Among bait types, live baits had the highest CPUE values, 0.052 / 0.090 (during / outside spawning season) and artificial lures had the lowest (CPUE = 0.000 / 0.000). Monofilament line had higher CPUE than wire line, monofilament = 0.034 / 0.052 (during / outside spawning season), wire = 0.027 / 0.011. Lines without downriggers had higher CPUE than lines on downriggers, with 0.032 / 0.041 for during / outside spawning season trials without downriggers and 0.021 / 0.000 for trials with downriggers. Coastal pelagics were uncommon in the catch, one king mackerel was caught slow fishing an artificial lure on wire line without a downrigger during the spawning season and one king mackerel and one wahoo were caught high speed fishing artificial lures on monofilament line without downriggers outside the spawning season. One large coastal shark was caught on a dead bait slow fished on wire line without a downrigger outside the grouper spawning season.

REEF FISH OFF-BOTTOM DISTANCE

Data exist on the off-bottom distance of reef fish within the Madison-Swanson MPA. A separate project on reef fish abundance and distribution in the MPA utilizes digital video camera arrays to identify, count, and measure fish. Between 20 February and 25 March 2003, 57 sites were surveyed within the Madison-Swanson MPA with the digital video camera arrays. Forty-five of these sites contained habitat suitable for grouper, and the tapes from 6 of these sites revealed gag grouper at considerable distances off the bottom. Table 1 below lists the station numbers and water depths as well as the depths and heights off bottom of gag grouper identified on these video tapes.

Station	Water depth (ft)	Depth of gag (ft)	Height of gag off bottom (ft)
6	245.4	152.8	92.6
68	297.9	209.3	88.6
35	290.4	202.6	87.8
30	231.0	171.2	59.8
36	300.0	245.5	54.5
32	242.4	195.0	47.4
37	298.8	273.8	25.0

Table 1. Gag grouper off-bottom distances within Madison Swanson MPA.

FISHERY ENFORCEMENT OBSERVATIONS

Three fishery enforcement agents were deployed on one vessel and estimated the depth of a lure fished behind a second charter fishing vessel. Estimated depth and range at which the depth estimate was made were recorded independently by the three fishery enforcement officials. Actual fishing depths were determined by an autonomous depth recorder attached to the terminal tackle on the fishing gear. Forty trials were conducted, twenty each with a wire line reel and a monofilament line reel. Target deployment depths were: surface, 30 ft down, 100 ft down, and 200 ft down. Sixteen of the twenty trials with each line type had line deployed into the water. Four trials within each line type were made with no line in the water to determine range at which enforcement personnel could detect the presence of line in the water. Deployment depths were randomized and all target depths were selected an equal number of times. Vessel speed during the depth estimation trials was 2 - 4 kts. Fishing lines were deployed by the mate on the charter fishing vessel. Weight attached to terminal tackle included 3, 16, 32 and 64 oz egg sinkers and no weights. Distances between observer and fishing vessels when depth

estimations were made were determined with a laser rangefinder. Trials were conducted approximately 36 nmi southeast of Panama City, FL in water depth of 220 ft. Environmental conditions during trials were excellent: sunny, east wind at 4-8 kts, seas of 1-2 ft, and unlimited visibility. Results for the depth estimation trials are described with Pearson product moment correlation coefficients and significance levels. These values may range between + 1.000 and - 1.000. If depth estimates tended to increase as actual depths decreased, the correlation coefficients are negative, while positive correlation coefficients result when the actual and estimated depths changed in the same direction. Results are presented for all trials combined, all trials by observer, wire line trials combined, wire line trials by observer, monofilament trials combined, and monofilament trials by observer. Fishing detection results are presented as mean distances ± standard deviations, and range of distances. These data are presented below in the same hierarchical design as the fishing depth estimates, and in tabular form in Appendices 2 and 3. Figures 1 and 2 graphically display the results of the depth estimation trials. Figure 1 illustrates the divergence from the actual depth of each observer estimate, while Figure 2 demonstrates the inability of the observers to improve the accuracy of their depth estimates with increasing experience.

LEGEND for analytical results:
CG 1 - US Coast Guard, Commanding Officer, Gulf Regional Fisheries Training Center
CG 2 - US Coast Guard, Executive Petty Officer, Gulf Regional Fisheries Training Center
NMFS - National Marine Fisheries Service, Special Agent, Enforcement Division

Depth Estimation

All Trials Combined
All observers combined
Pearson correlation of Actual Depth and Observer Estimates = 0.187, P-value = 0.068, n = 96
Estimation distance: 26.34 ± 12.20 m (mean ± standard deviation), range 14.00 - 70.00 m

CG 1
Pearson correlation of Actual Depth and CG 1 Estimate = - 0.041, P-value = 0.824, n = 32
Estimation distance: 30.25 ± 11.42 m, range 14.00 - 65.00 m

CG 2
Pearson correlation of Actual Depth and CG 2 Estimate = 0.417, P-value = 0.018, n = 32
Estimation distance: 26.06 ± 13.33 m, range 14.00 - 70.00 m

NMFS
Pearson correlation of Actual Depth and NMFS Estimate = 0.197, P-Value = 0.279, n = 32
Estimation distance: 22.72 ± 10.90 m, range 14.00 - 51.00 m

Wire Line Trails
All observers combined
Pearson correlation of Actual Depth and Observer Estimates = 0.341, P-Value = 0.018, n = 48
Estimation distance: 28.90 ± 15.07 m, range 14.00 - 70.00 m

CG 1
Pearson correlation of Actual Depth and CG 1 Estimate = 0.031, P-Value = 0.908, n = 16
Estimation distance: 32.13 ± 15.21 m, range 14.00 - 65.00 m

CG 2
Pearson correlation of Actual Depth and CG 2 Estimate = 0.651, P-Value = 0.006, n = 16
Estimation distance: 26.75 ± 16.91 m, range 14.00 - 70.00 m

NMFS
Pearson correlation of Actual Depth and NMFS Estimate = 0.364, P-Value = 0.165, n = 16
Estimation distance: 27.81 ± 13.30 m, range 14.00 - 51.00 m

Monofilament Line Trials
All observers combined
Pearson correlation of Actual Depth and Observer Estimates = - 0.324, P-Value = 0.025, n = 48
Estimation distance: 23.79 ± 7.78 m, range 14.00 - 44.00 m

CG 1
Pearson correlation of Actual Depth and CG 1 Estimate = - 0.299, P-Value = 0.261, n = 16
Estimation distance: 28.38 ± 5.57 m, range 19.00 - 40.00 m

CG 2
Pearson correlation of Actual Depth and CG 2 Estimate = - 0.412, P-Value = 0.113, n = 16
Estimation distance: 25.38 ± 8.96 m, range 14.00 - 44.00 m

NMFS
Pearson correlation of Actual Depth and NMFS Estimate = - 0.426 P-Value = 0.100, n = 16
Estimation distance: 17.63 ± 3.63 m, range 14.00 - 28.00 m

Range of Fishing Detection

Combined Bare Pole Trials
All observers combined
Maximum range of detection of fishing line in water: 29.83 ± 15.27 m, range: 14.00 - 57.00 m, n = 24

CG 1
Maximum range of detection of fishing line in water: 34.13 ± 14.96 m, range: 14.00 - 57.00 m, n = 8

CG 2
Maximum range of detection of fishing line in water: 25.38 ± 12.95 m, range: 14.00 - 54.00 m, n = 8

NMFS
Maximum range of detection of fishing line in water: 30.00 ± 17.92 m, range: 14.00 - 54.00 m, n = 8

Bare Pole Trials with Wire Line Reel
All observers combined
Maximum range of detection of fishing line in water: 32.58 ± 17.51 m, range: 14.00 - 54.00 m, n = 12

CG 1
Maximum range of detection of fishing line in water: 28.25± 16.46 m, range: 14.00 - 43.00 m, n = 4

CG 2
Maximum range of detection of fishing line in water: 27.50 ± 17.99 m, range: 14.00 - 54.00 m, n = 4

NMFS
Maximum range of detection of fishing line in water: 42.00 ± 18.76 m, range: 14.00 - 54.00 m, n = 4

Bare Pole Trials with Monofilament Line Reel
All observers combined
Maximum range of detection of fishing line in water: 27.08 ± 12.58 m, range: 14.00 - 57.00 m, n = 12

CG 1
Maximum range of detection of fishing line in water: 40.00 ± 12.62 m, range: 29.00 - 57.00 m, n = 4

CG 2
Maximum range of detection of fishing line in water: 23.25 ± 7.46 m, range: 14.00 - 32.00 m, n = 4

NMFS
Maximum range of detection of fishing line in water: 18.00 ± 3.65 m, range: 14.00 - 22.00 m, n = 4

Summary
Fishery enforcement personnel had considerable difficulty estimating depth of fishing lines. The correlation coefficient between estimated and actual depths for the three observers over both line types was 0.187. The highest correlation, 0.651, was found with the second U. S. Coast Guard observer during the wire line trials. The lowest correlation was - 0.426 for the NMFS observer during the monofilament line trials, indicating this observer believed the fishing depth decreased when it actually

increased, and vice versa. The mean range (± standard deviation) of the three observers for determination that no lines were deployed from the fishing rods was 29.83 ± 15.27 m. The absence of line in the water during the wire line trials was detected at greater distances, 32.58 ± 17.51 m, than monofilament lines, 27.08 ± 12.58 m. The greatest distance of determination of no line in the water was 57.00 m and the least was 14.00 m. Two of the observers provided written comments at the conclusion of the trials.

Comments of Agents:

"Can detect steel (wire) line in water at about 50-60 m. It is not possible to accurately judge trolling depth without knowing variables of speed, drag coefficient, and amount of line out." - NMFS Enforcement

"Could not determine (depths of trials below surface), educated guess on angle of line into water." - CO, USCG Gulf Fisheries Training Center

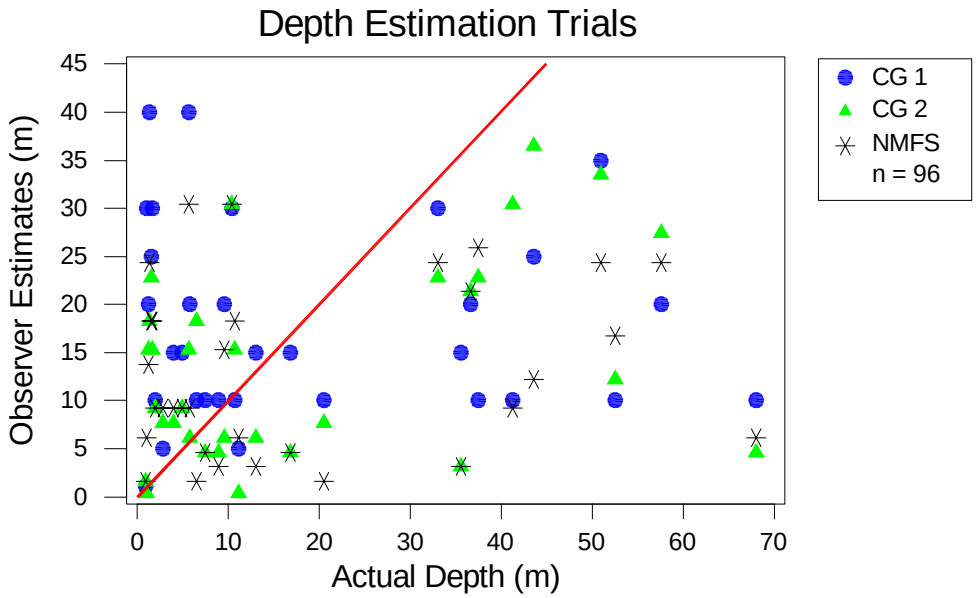

Figure 5 Depth estimation trials of observer depth estimation on actual depth. Points above the diagonal line are overestimates of actual depth, while those below the line are underestimates.

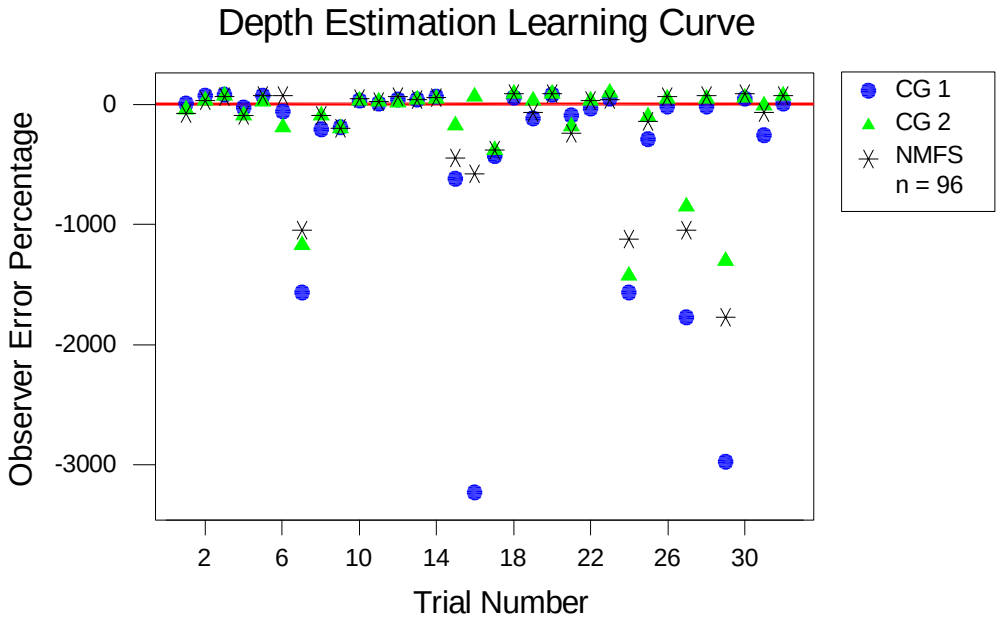

Figure 6 Observer error percentage on trial number. The closer a point is to the horizontal line, the more accurate the depth estimate. If observers were able to improve estimation accuracy with practice, the points should converge on the red line from the left side of the plot to the right.

Appendix 1. Fishing catch and effort by season, speed, bait, line, and downrigger type.

	Season	Speed	Gear or bait type	Time fished, min	Trials	Duration of trials, min	Range of duration, min	Weight on line, oz.	Range of weight on line, oz	Total catch (CPUE)	Reef fish catch (CPUE)	Coastal pelagic catch (CPUE	Large coastal shark catch (CPUE)
Total				4116	230	17.90 ± 42.07	2 - 211	29.80 ± 16.56	0 - 48	47 (0.011)	43 (0.010)	3 (0.001)	1 (<0.001)
	Spawning Season			2868	160	17.93 ± 41.51	2 -200	31.95 ± 18.60	0 - 48	29 (0.010)	28 (0.010)	1 (<0.001)	0 (0)
		High		1919	12	159.92 ± 30.42	95 - 200	0	0	0 (0)	0 (0)	0 (0)	0 (0)
		Low		949	148	6.41 ± 3.92	2 - 25	34.54 ± 16.85	0 - 48	29 (0.031)	28 (0.030)	1 (0.001)	0 (0)
			Artificial	146	10	14.60 ± 6.70	6 - 25	4.80 ± 10.12	0 - 24	1 (0.007)	0 (0)	1 (0.007)	0 (0)
			Art. + Nat.	253	41	6.17 ± 2.93	2 - 19	46.83 ± 7.50	0 - 48	7 (0.028)	7 (0.028)	0 (0)	0 (0)
			Natural (Dead)	318	55	5.78 ± 3.33	2 - 17	40.15 ± 16.04	0 - 48	9 (0.028)	9 (0.028)	0 (0)	0 (0)
			Natural (Live)	232	42	5.52 ± 2.14	3 - 11	22.29 ± 6.26	0 - 24	12 (0.052)	12 (0.052)	0 (0.	0 (0)

	Season	Speed	Gear or bait type	Time fished, min	Trials	Duration of trials, min	Range of duration, min	Weight on line, oz.	Range of weight on line, oz	Total catch (CPUE)	Reef fish catch (CPUE)	Coastal pelagic catch (CPUE	Large coastal shark catch (CPUE)
			Mono	293	41	7.15 ± 4.71	3 - 25	23.42 ± 15.64	0 - 48	10 (0.034)	10 (0.034)	0 (0)	0 (0)
			Wire	656	107	6.13 ± 3.56	2 - 25	38.80 ± 15.34	0 - 48	19 (0.029)	18 (0.027)	1 (0.002)	0 (0)
			Downrigger *	191	16	11.94 ± 5.50	5 - 25	0	0	4 (0.021)	4 (0.021)	0 (0)	0 (0)
			No downrigger	758	132	5.74 ± 3.11	2 - 25	38.73 ± 12.46	0 - 48	25 (0.033)	24 (0.032)	1 (0.001)	0 (0)
	Non-Spawning Season			1248	70	17.83 ± 43.62	2 - 211	14.66 ± 9.12	0 - 24	18 (0.014)	15 (0.012)	2 (0.002)	1 (0.001)
		High		812	6	135.33 ± 88.27	7 - 211	0	0	2 (0.002)	0 (0)	2 (0.002)	0 (0)
		Low		436	64	6.81 ± 5.23	2 - 35	16.03 ± 8.28	0 - 24	16 (0.037)	15 (0.034)	0 (0)	1 (0.002)
			Artificial	67	7	9.57 ± 3.31	6 - 14	10.29 ± 12.83	0 - 24	0 (0)	0 (0)	0 (0)	0 (0)
			Art. + Nat.	57	6	9.50 ± 5.96	5 - 19	19.00 ± 5.90	10 - 24	0 (0)	0 (0)	0 (0)	0 (0)

Season	Species	Gear or bait type	Time fished, min	Trials	Duration of trials, min	Range of duration, min	Weight on line, oz.	Range of weight on line, oz	Total catch (CPUE)	Reef fish catch (CPUE)	Coastal pelagic catch (CPUE	Large coastal shark catch (CPUE)
		Natural (Dead)	145	16	9.06 ± 8.36	2 - 35	18.00 ± 9.47	0 - 24	1 (0.007)	0 (0)	0 (0)	1 (0.007)
		Natural (Live)	167	35	4.77 ± 1.77	2 - 10	15.77 ± 6.58	0 - 24	15 (0.090)	15 (0.090)	0 (0)	0 (0)
		Mono	252	41	6.15 ± 3.82	2 - 19	11.56 ± 7.15	0 - 16	13 (0.052)	13 (0.052)	0 (0)	0 (0)
		Wire	184	23	8.00 ± 7.03	3 - 35	24.00 ± 0	0	3 (0.016)	2 (0.011)	0 (0)	1 (0.005)
		Downrigger **	73	8	9.13 ± 4.58	2 - 16	0	0	0 (0)	0 (0)	0 (0)	0 (0)
		No downrigger	363	56	6.48 ± 5.27	2 - 35	18.32 ± 5.99	0 - 24	16 (0.044)	15 (0.041)	0 (0)	1 (0.003)

* Downrigger weights for spawning season trials had mean of 11.88 ± 0.50 lbs, range 10.00 - 12.00 lbs
** Downrigger weights for non-spawning season trials had mean of 10.00 ± 0 lbs

Appendix 2. Pearson product moment correlation coefficients, significance values, and sample size values for fishing depth estimation trials.

	USCG 1	USCG 2	NMFS	All observers
All trials	Corr = -0.041 p = 0.824, n = 32	Corr = 0.417 p = 0.018, n = 32	Corr = 0.197 p = 0.279, n = 32	Corr = 0.187 p = 0.068, n = 96
Wire line	Corr = 0.031 p = 0.908, n = 16	Corr = 0.651 p = 0.006, n = 16	Corr = 0.364 p = 0.165, n = 16	Corr = 0.341 p = 0.018, n = 48
Monofilament line	Corr = -0.299 p = 0.261, n = 16	Corr = -0.412 p = 0.113, n = 16	Corr = -0.426 p = 0.100, n = 16	Corr = -0.324 p = 0.025, n = 48

Appendix 3. Range of fishing detection trials. Values are mean ± standard deviation in meters.

	USCG 1	USCG 2	NMFS	All observers
All trials	34.13 ± 14.96 n = 8	25.38 ± 12.95 n = 8	30.00 ± 17.92 n = 8	29.83 ± 15.17 n = 24
Wire line	28.25 ± 16.46 n = 4	27.50 ± 17.99 n = 4	42.00 ± 18.76 n = 4	32.58 ± 17.51 n = 12
Monofilament line	40.00 ± 12.62 n = 4	23.25 ± 7.46 n = 4	18.00 ± 3.65 n = 4	34.13 ± 14.96 n = 12

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