

11/23/93

DRAFT
AMENDMENT 2
TO THE
FISHERY MANAGEMENT PLAN
FOR
CORAL AND CORAL REEFS
OF THE GULF OF MEXICO
AND
SOUTH ATLANTIC
INCLUDING A DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
REGULATORY IMPACT REVIEW
AND
INITIAL REGULATORY FLEXIBILITY ANALYSIS

NOVEMBER 1993

GULF OF MEXICO FISHERY MANAGEMENT COUNCIL
LINCOLN CENTER, SUITE 331
5401 WEST KENNEDY BOULEVARD
TAMPA, FLORIDA 33609-2488
813-228-2815

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL
SOUTHPARK BUILDING, SUITE 306
1 SOUTHPARK CIRCLE
CHARLESTON, SOUTH CAROLINA 29407-4699

This is a publication of the Gulf of Mexico and South Atlantic Fishery Management Councils pursuant to National Oceanic and Atmospheric Administration Award Nos. NA47FC0005 and NA47FC0006.



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LINCOLN CENTER, SUITE 331
5401 WEST KENNEDY BOULEVARD
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813-228-2815

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COVER SHEET

RESPONSIBLE AGENCIES:

Gulf of Mexico Fishery Management Council
Lincoln Center, Suite 331
5401 West Kennedy Boulevard
Tampa, Florida 33609-2468

South Atlantic Fishery Management Council
Southpark Building, Suite 306
1 Southpark Circle
Charleston, South Carolina 29407-4699

National Marine Fisheries Service
9450 Koger Boulevard
St. Petersburg, Florida 33702

TITLE OF PROPOSED ACTION:

Draft Amendment 2 to the Fishery
Management Plan for Coral and
Coral Reefs of the Gulf of Mexico
and South Atlantic

TYPE OF DOCUMENT:

Draft Supplemental Environmental Impact Statement (DSEIS)

CONTACT FOR FURTHER INFORMATION:

Terrance Leary
Gulf of Mexico Fishery Management Council
Lincoln Center, Suite 331
5401 West Kennedy Boulevard
Tampa, FL 33609
813-228-2815

Roger Pugliese
South Atlantic Fishery Management Council
Southpark Building, Suite 306
One Southpark Circle
Charleston, SC 29407-4699
803-571-4366

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ABSTRACT:

The Gulf of Mexico and South Atlantic Councils (Councils) are considering an amendment to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and the South Atlantic (FMP) that could add "live rock" to the fishery management unit. Live rock means certain living marine organisms or an assemblage thereof attached to a hard substrate (including dead coral or rock). In addition to corals, these organisms include anemones, sponges, tube worms, molluscs, crustaceans, echinoderms, bryozoans, sea squirts, and algae.

Management could include harvest limitations or prohibition to prevent fishery habitat loss, permitting of harvesters, and a provision for aquaculture of live rock.

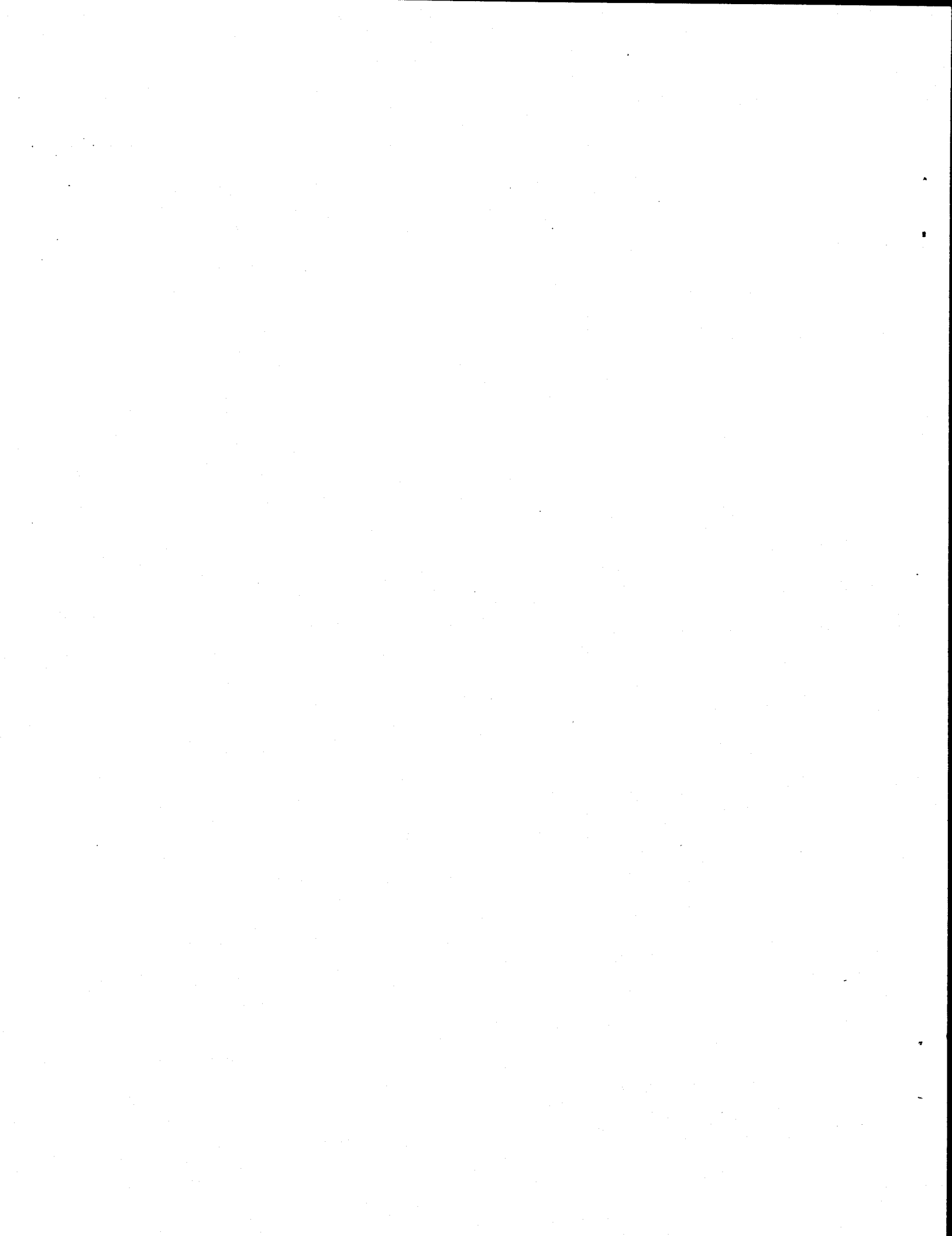


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Abbreviations and Acronyms Used in this Document

CFMC	Caribbean Fishery Management Council
DSEIS	Supplemental Environmental Impact Statement
EEZ	Exclusive Economic Zone
FDEP (= FDNR)	Florida Department of Environmental Protection (successor to Florida Department of Natural Resources)
FMFC	Florida Marine Fisheries Commission
FMP	Fishery Management Plan
FMRI	Florida Marine Research Institute
GMFMC	Gulf of Mexico Fishery Management Council
NMFS	National Marine Fisheries Service
OY	Optimum Yield
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFMC	South Atlantic Fishery Management Council
SPL	(Florida) Saltwater Products License

1.0 INTRODUCTION

Description of the Fishery

With the recent development of technology to maintain marine aquaria, a market developed for calcareous material to decorate the tanks and to maintain the proper water chemistry. This material, composed of calcium carbonate and the attached marine life occurs naturally off the Florida coast and consists of coral reef rubble and limestone. Coral reefs and hard corals are protected by federal and Florida regulations.

Live rock was marketed in the 1970s, but the fishery expanded greatly in the 1980s and early 1990s to meet the demand from the development of public and private marine aquaria.

Technical advances in saltwater aquarium filtration systems during the mid-1980s led to the feasibility of so-called "mini-reef" systems dominated by invertebrates. These organisms and nitrogen-fixing bacteria serve as a form of filtration to reduce toxins and filter out excess organics as they feed (Blackburn, 1988). Demand for ornamental fish began to include "live rock," consisting generally of calcareous substrates encrusted with a variety of living marine organisms.

Live rock is now being air shipped throughout the United States and to Canada and England. The marine aquarium hobby at first concentrated on fishes because neither the equipment nor the knowledge allowed the keeping of other organisms. Gradually, as knowledge and equipment improved, more and more invertebrates were kept successfully. In recent years, the development of "Living Reef" aquarium systems that were able to maintain stable ecologies in closed-system aquariums has enabled aquarists to set up and maintain tiny bits of reef ecology in their homes (Feddern, pers. comm.). Florida live rock landings in 1992 reached 390 tons (FDEP).

Robert Stewart, Jr. (pers. comm.), reports that live rock "carries" the marine aquarium trade industry of Florida and estimates that without the sale of live rock, his company would lose 50-75 percent of their gross revenue, since the live rock is very important in stimulating the sales of related marine life products.

Most of the live rock collectors are in the marine life fishery, which also harvests tropicals for the aquarium trade. Live rock is harvested by divers who selectively pick-up small pieces from the bottom. Harvesters maintain that they do not remove large quantities from a single site, but range over wide areas of hard bottoms choosing aesthetically pleasing pieces that would beautify aquaria. One square mile of hard bottom is estimated to contain about 600,000 tons of live rock in the top one foot of surface. The Fishery Management Plan for Reef Fish Resources in the Gulf of Mexico estimates there to be 19,691 square miles of live bottom within 55 fathoms in the Gulf (GMFMC, 1991).

Purpose and Need

In 1989, the Florida Department of Natural Resources (FDNR) (now Department of Environmental Protection) determined that live rock harvest (i.e., the collection of rocks with marine organisms attached for use in home aquariums) was detrimental to the Florida Reef Tract and other hard bottom habitat areas (Wheaton, 1989). Accordingly, Florida prohibited live rock landings from state waters in May, 1989; however, effort shifted to the EEZ off Florida (Florida Marine Fisheries Commission (FMFC, 1991).

Although the councils discussed the live rock issue, no action was taken because the Florida Marine Fisheries Commission had decided to begin rulemaking regarding live rock landings from the EEZ off Florida (FMFC, 1991). During the course of its rulemaking, the FMFC noted that approximately 35 individuals were reporting landings of about 300 tons (1991) of live rock from waters adjacent to the Florida Reef Tract, Florida's east coast reefs, and the west central coast (FMFC, 1992). (Reported landings in 1992 totaled about 400 tons [Florida Marine Research Institute (FMRI, 1993)]. (See Figures 1A, 1B and 6).

Beginning in March 1991, FMFC held five public hearings and two workshops throughout the state regarding the impacts of live rock harvests on coral conservation, habitat preservation, and the effects of harvest restrictions on the marine aquarium industry.

During its rulemaking the FMFC noted that the only current net production of the carbonate substrate underlying live rock occurs on living coral reefs; and, in Florida, these areas are either in equilibrium or eroding. FDNR personnel testified that more than 90 percent of the live rock examined at the request of enforcement agents contained visible colonies of prohibited corals. The FMFC concluded that live rock removal (1) can violate state and Federal laws that prohibit the taking of corals. (2) reduces the surface area and topographic complexity of Florida's coral reefs and other live bottom areas, and (3) removes entire micro-communities along with targeted aquarium species.

The Councils, along with other state and Federal agencies, also received a petition in June of 1991 from Project ReefKeeper requesting rulemaking action to prohibit the taking and landing of live rock within their areas of jurisdiction. The purpose of the request was to protect coral reefs and their associated marine life (Stone, 1991). The Councils and NMFS advised Project ReefKeeper that they were deferring action to obtain additional data.

In June 1992, the Florida Governor and Cabinet approved the FMFC rule to phase-out live rock landings over a 3-year period, ending on June 30, 1995. The phase-out period was designed to allow development of live rock aquaculture which would be exempt from the harvest ban. The phase-out was to be accomplished by a 25 percent annual reduction in landings (based on the 1991 reported landings) accompanied by a 500 pound daily vessel limit. The quotas set were 225 tons for 1993, 150 tons in 1994, 75 tons in 1995. A July 1 - June 30 season was established, and the 1993 quota was filled by February 12, 1993.

On March 31, 1993, a U.S. District Court Judge issued a preliminary injunction to prevent enforcement of the state's quota or vessel landing limits relating to possession or landing of live rock taken in the EEZ. Florida live rock fishermen argued that the Magnuson Act supersedes state landing laws and that the Councils had made "an affirmative and conscious decision" not to prohibit the taking of live rock in the EEZ. The councils had deferred action because the implementation of a phase-out of live rock landings by the state of Florida addressed what appeared to be a localized management issue. Subsequently, they became concerned that the removal of live rock from the EEZ was now unregulated, and there now is interest in harvest from North Carolina through Alabama. In April, 1993 the SAFMC approved a motion to include live rock in the Coral Fishery Management Plan and reactivate the South Atlantic Coral Advisory Panel. In May, 1993 the Gulf Council, on being advised of live rock landings in Alabama and on the request of that state and Florida, initiated development of options for live rock management. In June, 1993 the SAFMC held a public scoping meeting in Duck Key, Florida to solicit input from the harvesters and the general public on the management of live rock. In addition, the Councils recommended that a control date be published to accomplish two things; first, it would put all active harvesters and people interested in beginning harvest on notice that the Councils are developing regulations to manage live rock in the EEZ, and secondly, that the Councils would consider all options from total prohibition to a limited entry system.

Live rock landings and other fishery statistics for states other than Florida are not available; however, live rock landings are believed to occur in Alabama, and possibly South and North Carolina. In addition, in SAFMC deliberation on live rock, it was noted that a request had been made to the Georgia Department of Natural Resources for information on the distribution of live rock or hard bottom off Georgia with the intent of identifying possible harvest locations. NMFS recently received a request for licensing information for a new business planning to land live rock in North Carolina (R.Schmied, pers. comm.). Live rock harvest is currently allowed in the Florida Keys National Marine Sanctuary, but may be restricted to specific areas by a developing plan. Subsequently both councils have decided to consider options regarding live rock and to establish a control date for entry into the fishery.

ISSUES TO BE CONSIDERED
HABITAT LOSS - What are the direct and indirect effects of live rock harvests on substrate availability and reef fish productivity?
AQUARIUM SALES - How will restrictions on live rock harvests affect the aquarium trade?
ECOSYSTEM MANAGEMENT - How can we ensure the viability of the entire coral reef ecosystem?
AESTHETIC VALUES - How does the continued collection of live rock affect non-consumptive users/divers.
CONSISTENT REGULATIONS - What is the most consistent management regime for live rock harvests in the EEZ, state waters, and the National Marine Sanctuary.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. NO ACTION

Discussion:

Before the mid-1980s, marine aquarium hobbyists concentrated on tropical fish rather than invertebrates. In recent years, however, experienced hobbyists have been able to establish "Living Reef" aquarium systems using live rock and its associated invertebrates (Feddern, pers. comm.). By the late 1980s, the Florida Marine Patrol estimated that about 3 tons of live rock left Miami International Airport daily (Wheaton, 1989; FMFC, 1991). In April 1990, Florida began a licensing and reporting system for live rock landings from the EEZ. In the first year, landings increased 68 percent, but this could have been an artifact of the new reporting system. Between 1991 and 1992, reported landings in Florida increase by one-third (FMRI, 1993). Florida landings of live rock in 1991 were composed of 41 percent rubble rock, 35 percent algae rock, and 9 percent serpulid rock with sea mat, false coral, and gorgonian rock comprising the remainder. Live rock is now being air shipped from Florida throughout the United States and to Canada and England (Feddern, pers. comm.).

Ecological: Expert testimony to the FMFC (FMFC, 1991, 1992), to the South Atlantic Council (June 1993) and Wheaton (1989) indicates that live rock harvests represent a consumptive use of an essentially non-renewable resource. In addition, live rock removals are concentrated in only a few areas, primarily off South Florida (Figures 2, 3, and 4). About 40 percent of the 1992 landings were recorded along a 40 mile stretch of reef in the Florida Keys (Tavernier to Duck Key) (FMRI,

1993) (Figure 4). Thus, adverse impacts can be expected on hard bottom habitat from a continuation of live rock harvests at reported levels. The FMFC estimated that the 1991 harvest resulted in the loss of at least .39 acre of hard bottom surface (4 inches deep). By 1992, harvest levels had increased from a reported 300 tons to about 400 tons. In the period January through July of 1993, with no harvest allowed in March, 250 tons were landed (FMRI, 1993). Monthly landings have continually increased in 1993 over 1990 (Figure 6).

The SAFMC's Habitat and Environmental Protection Advisory Panel developed the following position statement: "It is the opinion of the majority of scientists familiar with the ecology of live rock habitats that continued harvest of "wild rock" is resulting in a net loss of this important resource, ..." In addition, they referred to live rock as "... habitat of at least high value and, to a larger extent, critical value for a number of managed species including spiny lobster, reef fishes including the snapper/grouper complex and state managed species such as "tropical species" for the aquarium trade."

Socioeconomic: Florida estimated that the ex-vessel value of the FY 95 live rock harvest in the EEZ off Florida would be about \$3.5 million, assuming no state or Federal restrictions and a 30 percent annual increase in landings (FMFC, 1992).

B. DEFINITIONS FOR THE MANAGEMENT UNIT

The management unit already consists of the coral and coral reefs of the EEZ within the jurisdiction of the Councils. The species already included in the management unit area:

- a. Corals: the corals of the Class HYDROZOA (stinging and hydrocorals) and the Class ANTHOZOA (sea fans, whips, precious corals, sea pens, and stony corals).
- b. Coral Reefs: The hard bottoms, deep-water banks, patch reefs, and outer bank reefs.



(1) Addition of Live Rock to the Coral FMP's Management Unit

G&SA*

Additions to the management unit:

- c. Live Rock: Certain living marine organisms or an assemblage thereof attached to a hard substrate (including dead coral or rock). Such Living Marine Organisms associated with Hard Bottoms, Banks, Reefs, and Live Rock may include:

- Sea Anemones (Phylum CNIDARIA: Class ANTHOZOA:
Order ACTINARIA)
- Sponges (Phylum PORIFERA)
- Tube Worms (Phylum ANNELIDA)
 - Fan worms
 - Feather duster worms
 - Christmas tree worms



G - Indicates preferred option of the Gulf of Mexico Fishery Management Council

SA - Indicates preferred option of the South Atlantic Fishery Management Council

Crustaceans (Phylum ARTHROPODA: Class CRUSTACEA)

Molluscs (Phylum MOLLUSCA)

Snails

Nudibranchs

Bivalves: scallops, oysters, clams, mussels

Cleaner shrimp

Decorator and hermit crabs

Echinoderms (Phylum ECHINODERMATA)

Starfish

Brittlestars and feather stars

Crinoids

Sea Urchins

Byozoans (Phylum BRYOZOA)

Sea Squirts (Phylum CHORDATA)

Marine Algae

Mermaid's fan and cups (Udotea spp.)

Coralline algae

Green feather, green grape algae (Caulerpa spp.)

Watercress (Halimeda spp.)

Discussion:

In order to be included in the management unit live rock must be defined. The Councils are authorized to develop management plans for fisheries (composed of stocks of finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds). This definition aptly describes the product and conforms to those animals and marine life forms subject to management under the Magnuson Act.



(2) Redefinition of Allowable Octocorals

G & SA

"Allowable octocorals" could be redefined as follows:

Allowable octocorals means erect, non-encrusting species of the subclass Octocorallia, except the prohibited sea fans *Gorgonia flabellum* and *G. ventalina*, including only the substrate covered by the holdfast.

Discussion:

Any restrictions on live rock harvests will affect harvest of octocorals allowed under the FMP since most octocorals taken for the marine aquarium trade are removed with attached substrate. A redefinition of "allowable octocorals" would help clarify that only individual colonies, and not whole rocks, may be taken under the octocoral quota. Harvest of encrusting octocorals (i.e., primarily Briareum and Erythropodium spp. or "gorgonian live rock") involves removal of the entire substrate.

C. MANAGE LIVE ROCK HARVESTS

The impacts of managing live rock harvests will depend upon the specific type of restrictions chosen. Restriction alternatives include:

- C.1. Limit Harvest
 - a. Establish an annual quota for live rock harvest
 - b. Limit access/effort for live rock
- C.2. Prohibit Harvest
 - a. Prohibit harvest of live rock
 - b. Phase out harvest of live rock
 - c. Provide for aquaculture of live rock
- C.3 Provide for different management in the jurisdictional areas of the two councils

Any restrictions on the harvest of live rock will entail consideration of scientific and educational uses, the addition of live rock to the management unit, a possible re-definition of allowable octocorals, and the timing of restrictions as a mitigating measure.

C.1. Limit Harvest

C.1.a. Establish a live rock quota and permit system.

Section 12.3.1 may be revised to provide an annual quota for live rock. An additional management measure may be added to include a permit and reporting system for live rock harvest, similar to allowable octocorals. Other than recent production statistics from Florida there are few data on which to base a quota.

Discussion:

Ecological: Florida live rock collectors argue that there is net production of live rock on the Florida Reef Tract. In testimony on the State's rulemaking, marine life fishermen noted that pieces of coral reefs naturally break off during storms - forming the rubble zones or coral rubble - and that this live rock was surplus to the needs of the ecosystem and available for harvest. They recommended no quotas but wished to limit future entry into the fishery. Trip limits have been suggested by some.

About 85 percent of the 1991 live rock harvest was rubble, algae, or serpulid rock (FDER). It is used as a base in saltwater aquariums to improve filtration. The filtration capabilities of coral rubble depend on the presence of a complex assemblage of micro-organisms, bacteria, larval forms of coral, and other macro-invertebrates. Live rock, however, is probably at least as useful in the reef ecosystem as it is in marine aquaria, i.e., as substrate essential for colonization of sessile organisms including prohibited coral (FMFC, 1991).

Some commercial live rock is encrusted with "showy" macro-organisms to form a "mini-reef". Based on estimated growth rates for coral reefs, these mini-reefs probably grow extremely slowly, if at all (FMFC, 1991; CFMC in draft).

Socioeconomic: The wholesale (exvessel) value of live rock varies by location and with encrusting organisms. Bare rubble rock may be priced as low as \$0.50 per pound while "Christmas tree rock" brings \$3.00 per pound (R. Londeree, pers. comm.).

C.1.b. Limit Access/Effort in the Live Rock Fishery

Implement a moratorium on new entrants in the harvest of live rock and limit the harvest to X pounds per daily trip.

Discussion:

Ecological: Florida live rock collectors recommended no quotas but wished to limit future entry into the fishery (Januzzi, 1991). Trip limits have also been recommended by some fishermen during Council discussions.

Studies have shown that the coral rubble communities are extremely rich in species diversity, provide refuge for species that are not found in other habitats, and contribute a substantial amount of the total coral reef biomass (Meesters et al. 1991). Only about 30 percent of the 1991 live rock harvest was so-called "rubble rock" used as a base in saltwater aquariums to improve filtration (FMFC, 1992). Based on estimated growth rates for coral reefs (maximum sustainable growth of about 10 mm/yr [Buddemeier and Smith, 1988]), these "mini-reefs" grow extremely slowly. Serpulled rock, composed of calcareous worm tubes, accretes more rapidly. It comprised about 33 percent of live rock production on Florida's West Coast in 1991.

Florida's live rock harvest in 1992 was about 800,000 pounds as compared with 370,000 for 11.5 months of 1991. With increasing sophistication of marine aquarium facilities there is a potential for increasing the number of participants in the fishery and harvest of live rock.

Socioeconomic: Currently about 35 individuals or about 18 percent of those engaged in the marine aquarium or "marine life" fishery in Florida are involved at least part-time in the collection of live rock. The FMRI reports the exvessel value of the 1992 live rock harvest at about \$628,000. Limiting entry and effort rather than prohibitions on harvesting of live rock could allow this industry to continue at some prescribed level of harvest.

C.2. Prohibit Harvest



C.2.a. Prohibit Harvest of Live Rock

SA

Amend the FMP to prohibit the take or possession of live rock from the EEZ. This is the preferred option of the South Atlantic Fishery Management Council.

Discussion:

Ecological: The current Coral FMP prohibits the damaging, harming, killing, or possession of prohibited coral or of coral reefs. Thus, the taking of live rock from these sources is currently prohibited. The importance of live rock to the reef ecosystem is threefold. First, the sessile invertebrate communities that comprise live rock are a significant food base for fisheries of commercial and recreational importance. Second, the physical and topographical complexity of the hard substrate and attached living communities provides critical shelter and habitat to a wide range of organisms. Limestone ledges and outcroppings and serpulid rocks which occur in the eastern Gulf of Mexico also provide habitat for invertebrate reef dwelling organisms as well as reef fish assemblages. Indeed, many studies show a positive correlation between increased habitat complexity and increased fish abundance and diversity (e.g., Carpenter et al., 1981; Roberts and Ormond, 1987; Hixon and Beets, 1993).

Third, rock and dead coral surfaces are vital substrates for the settlement of larval phases of benthic organisms. Suitability of substrate is one of the major factors controlling the distribution of many species (Kinzie, 1971; Wheaton, 1989). There is little known of the generation rates of live rock complexes. In terms of some hard substrate, replacement is

likely to be in the order of geological time and harvest is expected to result in net loss of this substrate.

In addition, Amendment 1 to the Snapper/Grouper FMP in the South Atlantic (SAFMC, 1988) prohibits trawling a live bottom to protect essential fishery habitat from disturbance. The SAFMC considered disturbance of essential reef fish habitat unacceptable considering the limited distribution of limestone ledges and outcropping which constitute the majority of hard bottom in the South Atlantic north of Cape Canaveral, Florida (Figure 5).

Wheaton, in a presentation to the South Atlantic Council's Habitat Committee, stated that the rubble zone of a reef tract promotes the highest carbonate production from coral and algae which sustains the living coral reef. she noted that 75 percent of the rubble live rock has come from Area 748, a 40-mile section of the Florida reef tract (Figures 3 and 4).

Harvest of "wild" live rock could be replaced with live rock from aquaculture in state waters. Experiments on the cultivation of live rock in Tampa Bay, Florida, indicate that marketable live rock can be produced within 6 months (Ehringer and Webb, 1992). A more desirable product would take longer to produce, perhaps a year or longer (Shella Barger, pers. comm.). One 5-acre lease site has been approved off Tarpon Springs and the Florida Governor and Cabinet is scheduled to consider a second lease site in September 1993. FDEP plans to survey a third site in October. The Florida Department of Environmental Protection is developing rulemaking which provides for a general permit for live rock aquaculture which should be implemented in July of 1994, prior to the approval and possible effective date of regulations presented in this amendment (V. Wetherell, pers. comm.). Prohibition of harvest upon implementation of this amendment would correspond closely with the original phase-out implemented by Florida. In addition, total landings from the now unregulated fishery will exceed what the total landings would have been under previous state regulations.

Billy Causey, Florida Keys National Marine Sanctuary (Sanctuary) Manager, testified at a SAFMC Habitat Committee meeting in June, 1993 that the aquaculture of live rock could be done in the "special use zones" which have been proposed in the Draft Sanctuary Plan. Special use zones, as described in a Sanctuary draft management alternatives document (NOAA, 1993) can be used to, "establish areas that confine or restrict high-impact activities ... and to reduce user conflicts." FDEP personnel are meeting with Sanctuary personnel in October of 1993 to discuss the coordination of aquaculture sitings in the Sanctuary (Wheaton, pers. comm.).

Socioeconomic: There will be costs associated with permitting and licensing systems to establish and monitor open-system aquaculture operations. A continuation of a supply of aquacultured product, however, could benefit the marine aquarium industry as a whole, including fish collectors, fish wholesalers and retailers, equipment suppliers, and the live rock producers. Although most marine aquarium species are taken from the wild, about 90 percent of the freshwater fish available in the ornamental trade are captive-bred (Andrews, 1990). If prohibitions are placed on wild harvests, the marine aquarium industry could transfer to aquaculture provided the legal means to do so are implemented in state or federal waters. A further delay of up to one year after placement of the cultch material may be expected to allow for attachment and growth of marine organisms.

C.2.b. Phase-out Live Rock Harvest

Allow a harvest or decreasing annual quotas of live rock harvest for a prescribed period to allow eventual replacement from aquaculture.



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The Gulf Council proposes as its preferred option to allow three more years of unlimited live rock harvest after implementation of the amendment. After three years live rock could be harvested from or possessed in the EEZ only under permit for aquaculture or scientific collection.

This alternative would allow time for live rock fishermen to convert to aquaculture. There is proposed to be such a system in Florida; however, no such operation has been completely permitted. An applicant may spend a year obtaining a permit once a system is developed and another year in culturing the introduced cultch (seed rock) material.

There are a number of other phase-out schedules that may be considered, including longer or shorter time periods and the use of daily vessel limits.

Florida prohibited live rock harvest from state waters in 1989, but decided to allow a gradual phase-out of landings from the EEZ to minimize economic impacts on fishermen and to allow the development of live rock aquaculture in state waters (FMFC 1992). Florida's phase-out schedule: Harvest of live rock in the EEZ is not to exceed 225 tons during the 1993 season, 150 tons during the 1994 season and 75 tons during the 1995 season. Following the close of the 1995 season, OY for live rock in the EEZ is to be zero (0) except as may be authorized for scientific and educational purposes or aquaculture permit. This phase-out schedule was overturned by a federal court in March 1993, however.

Discussion:

Ecological: A phasing out of live rock harvest from the EEZ would allow three more years of harvest but would eventually eliminate any adverse impact caused by the removal of hard bottom material.

Socioeconomic: Presumably, aquaculture operations could eventually replace the harvest of naturally occurring live rock while contributing to a reef type of habitat. Deposition of material would be similar to construction of an artificial reef. In addition, stony corals and other prohibited corals will settle on the aquaculture substrate, and their harvest and sale will need to be addressed specifically.

No aquaculture venture has yet obtained all necessary permits for operation in Florida or federal waters; though several collectors are currently attempting to do so (R. Londeree, pers. comm.). The Florida Department of Environmental Protection expects to develop a rule-making for allowing live rock aquaculture in July 1994 (V. Wetherall, per. comm.). The Minerals Management Service has no history of leasing bottom areas for such purposes in federal waters; though some arrangement may be possible (C. Oynes, pers. comm.). Sufficient phase-out time, perhaps several years after permitting procedures are resolved, would be required to prevent a disruption of the live rock fishery and market.



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C.2.c. Provide for Aquaculture of Live Rock in the EEZ

Discussion:

The organisms in the management unit for live rock will readily attach to and grow on suitable material introduced into the marine environment given the appropriate conditions.

Shipwrecks, offshore platforms, rock jetties, bottles, and artificial reefs all bear evidence of accretion of various organisms. The Coral FMP, for example, specifically exempts the "harvest" of coral in the removal of marine equipment such as that used in offshore petroleum extraction. The Gulf Council proposes to provide allowance of aquaculture of live rock in the EEZ.

The rate of the encrustation of the material by desirable live rock organisms depends on local environment. Some seed rock may be saleable as live rock in as short a period as six months while development of more showy pieces may require several years. In order to identify the cultured rock it may be necessary to require use of non-indigenous material or some type of mark or tag to separate the aquaculture rock from "wild" live rock.

A number of potential aquaculturalists are interested in Federal lease sites for open-system live rock aquaculture. The Mobile District of the Army Corps of Engineers has indicated a willingness to authorize placement and removal of cultch material for live rock culture within the general permit area for artificial reef construction off Alabama. Authorization would be on an individual basis upon application. However, the applicant would not have exclusive property rights over the seeded live rock.

Socioeconomic: A provision to allow production and sale of cultured live rock if the harvest of wild live rock is prohibited would at least partially replace the loss to fishermen and others in the business. Exvessel sales of rock in 1992 were estimated to be \$628,000 in Florida. If maintenance of marine aquaria are dependent on such materials, then its production would affect the entire industry.

C.3. Provide for Different Management in the Jurisdictional Areas of the Two Councils

Discussion:

The two Councils have selected different preferred options for discussion at public review. The issues may be very different in the two areas. Most of the Florida reef tract where much live rock is produced lies within the jurisdiction of the South Atlantic Council. Most live rock in the Gulf comes from live bottom areas on the Florida shelf where there are fewer live coral reefs. The Councils could opt for different approaches to management because of the difference in bottom types and their need for protection.

C.4. Permits for Live Rock Harvest



G

- C.4.a. Require a federal permit in the absence of a state permit for harvest and possession of "wild" live rock from the EEZ during the phase-out period.**

Discussion:

The use of a permit would identify participants if effort limitation or a moratorium is selected as the preferred option.

The use of a permit could also facilitate statistical reporting. Florida already requires a marine life permit for landing live rock from the EEZ, therefore only persons landing live rock in other states would be affected.



C.4.b Require a permit for the possession or harvest of live rock from aquaculture operations.

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Live rock from a federally-authorized aquaculture operation may be possessed aboard a vessel in the EEZ or landed from the EEZ under a harvest permit issued by a federal entity. The presence of prohibited coral on the live rock is authorized under the permit.

While the Councils and NMFS do not have the authority to lease federal water bottoms for aquaculture, other federal agencies (Corps of Engineers, Minerals Management Service, and Florida Keys National Marine Sanctuary) may have some regulatory responsibility in that respect. A permit would allow harvest and possession of otherwise prohibited material.

Discussion:

Ecological: The transfer of live rock harvest from naturally occurring rock to aquaculture operations would preserve and enhance hard bottom habitat. A permit requirement would limit harvest to persons with authorized aquaculture operations. Although there is currently no known provision for leasing federal water bottom for aquaculture, some mechanism may be used through a Corps of Engineers' permit to place and remove cultch material. Individuals could obtain authorization to deposit the cultch material (seed rock) without exclusive harvest rights afforded by a lease. In such cases the existence of an aquaculture permit for live rock harvest would be useful in separating aquaculturalists from illegal harvesters.

The exemption for possession of prohibited corals on cultured live rock becomes appropriate due to the probability that corals will settle and grow on the cultch material.

The introduction of rock or other cultch material in aquaculture operations would serve to expand hard bottom areas similar to the construction of artificial reefs on otherwise barren bottoms.

Socioeconomic: If the marine aquarium industry is dependent on a source of live rock to stabilize water chemistry in aquaria, the livelihood of a number of people in associated sales and services would be adversely affected by a termination of supply. Included would be fish collectors, fish wholesalers and retailers, equipment suppliers, as well as the live rock producers.



C.4.c. Require a federal permit for harvest of prohibited corals and prohibited live rock from the EEZ for scientific, educational, and restoration purposes.

G&SA

Discussion:

The Coral FMP currently provides for issuance of a federal permit to take prohibited corals for scientific and educational purposes. If live rock is added to the management unit and its harvest is restricted or prohibited, allowance should be made to add it to the scientific collecting permit.

D. OPTIMUM YIELD (OY) FOR LIVE ROCK



D.1. OY for live rock is to be zero except for that which may be allowed by permit.

SA

There is to be no allowable harvest under this OY except that which is provided under scientific, educational, or restoration collecting permit or aquaculture permit. The amended FMP currently defines overfishing as an annual level of harvest that exceeds OY.

Discussion:

Ecological: This alternative would provide the maximum protection to the hard bottom habitat. It is compatible with Alternative C.2, prohibition of harvest.

Socioeconomic: There would be no further loss to fisheries from habitat removal due to harvest of live rock. Harvestors and dealers of live rock and those in the aquarium trade would lose access to the natural resource unless and until an alternative source is provided through aquaculture or from imported material.

D.2. OY for live rock to be unlimited for three years after which it is to be zero except for that which may be allowed by permit.

This alternative is compatible with Alternative C.2.b, which would provide for a three-year phase-out period. After that, harvest would be allowed only under permit for scientific collection or aquaculture.

Discussion:

Ecological: Live rock harvest would continue, probably at or near current level. The material would be removed from rubble areas and hard bottom areas, and to that extent would degrade the hard bottom habitat.

Socioeconomic: This option would provide a three-year grace period to allow harvestors, dealers, and users to develop an alternative source of supply.

3.0 AFFECTED ENVIRONMENT

Florida's "marine life" or aquarium fishery involves at least 300 species of tropical ornamental fish and invertebrates. In recent years, declining catch-per-unit-effort has led to industry sponsored proposals for limited entry. Florida's Department of Environmental Protection (FDEP) has issued marine life endorsements on 198 saltwater product licenses (SPLs); about 60 percent are full-time fishermen. About two-thirds reside in Monroe County and almost 90 percent are from South Florida [Januzzi, 1991; Florida Marine Fisheries Commission (FMFC), 1992].

Wheaton (1989) defined "live rock" as a broad term used by the marine life collection industry to describe several types of substrate colonized by marine organisms and described four main types collected in somewhat specific habitats:

1. Rubble Rock - Also called base rock, "possesses very little life" but is desirable for the "borers" living in the rock and as a substrate "base" in aquaria. Rubble rock is collected from mounds in shallow water in back-reef locations.
2. Algae Rock - Also called plant rock, is colonized chiefly by algae, secondarily by feather duster worms and other invertebrates. Algae rock is collected from rubble areas in the back reef and from inshore areas on both the Atlantic and Gulf sides of the Keys.
3. False Coral - Also called anemone rock, is covered with anemones in the genera Ricordea and Rhodactis, which are accompanied by encrusting gorgonians, chicken liver sponges, other invertebrates, and algae. Although collected mostly from patch reef areas, false coral occurs in other reef habitats.
4. Sea Mat - Also called gravel rock, is colonized almost exclusively by anemone-like organisms, usually of the genus Zoanthus, and is principally collected from dredged rock jetties.

Wheaton continues that her sources (dealers and collectors) maintain that the majority of the rock itself is dead coral, and its collection is primarily to obtain the associated organisms. Similar types of live rocks are also harvested from Gulf waters (personal observation/ communication). However, the underlying substrate in the Gulf is chiefly limestone outcropping with carbonate sediments rather than dead coral. Live rock can therefore be defined as a substrate with a composition that varies from dead/eroded coral, to a conglomerate of cemented calcium carbonate sediments, to non-organic rock of various shapes and dimensions with attached and/or associated biota, forming micro-communities. The substrate may exist as reef framework, outcroppings of hard bottom, or unconsolidated rubble.

In 1989, FDEP determined that live rock harvests constituted prohibited mining of state submerged lands, and landings from state waters were prohibited, but fishing operations shifted to the EEZ and intensified due to increasing demand (FMFC, 1991). By the late 1980s, the Florida Marine Patrol estimated that about 3 tons of live rock left Miami International Airport daily (FMFC, 1991; Wheaton, 1989). About 31 percent (61) of Florida's SPLs with a marine life endorsement (198) report live rock landings from the EEZ off Florida (FMFC, 1992). According to Norris and Wheaton (1991), during the last 9 months in 1990 (the first required reporting period), a total of 133 tons of live rock were reported landed in Florida. During the same 9 month period in 1991, over 226 tons were reported (a 68 percent increase). Total reported landings in Florida were about 300 tons in 1991 (FMFC, 1992). Landings and other fishery statistics for other states are not available; although live rock landings are believed to occur in Texas and Alabama. NMFS recently received a request for licensing information for a new business planning to land live rock in North Carolina (R. Schmied, pers. comm.).

Description of the Resource

A. Invertebrates Associated with Reefs and Live Rock:

The assemblage that makes up live rock comprises a community of organisms that have recruited at different times, grown at different rates and pursued different life history strategies (Wheaton 1989), supported by a hard substrate, often composed of dead coral. In general, little is known of the biology of the individual organisms and even less of the communities they form. Some are sessile (do not move) for all of their adult life, some are sedentary and move slowly or rarely, and others range extensively over the live rock and reef habitats. These organisms are members of a variety of species of the Phyla Porifera (sponges), Cnideria (anemones and gorgonians), Annelida

(polychaete worms), Mollusca (bivalves, snails and octopus), Arthropoda (shrimp, lobsters, and crabs), Bryozoa, Echinodermata (starfish, brittlestars, urchins), and Chordata (tunicates or sea squirts).

Following is a brief summary of the general characteristics of each of these groups.

1. Porifera - Sponges (Phylum PORIFERA) are typically attached to hard substrate. They are all sessile and exhibit little detectable movement. They display great variability in size and shape. Growth rates and body shape are highly dependent on space availability, the inclination of the substrate, and current velocity. They are taken commercially for curios, as bath sponges, and for use in marine aquaria. Certain species are thought to provide critical habitat for juvenile spiny lobster (Butler et al. 1992).

2. Cnidaria - Corals and sea anemones (Phylum CNIDARIA) include stony corals, octocorals, gorgonians, and anemones. Coral biology and life history is discussed in the FMP and Amendment 1. Anemones include a wide variety of organisms that may be solitary or colonial. The polyps vary greatly in morphology and colonial structure. Species are often brightly colored and are usually attached to rocks. Solitary anemones are considered sessile but can change location by slow gliding. Colonies of anemones are comprised of numerous polyps, each 1-2 cm in diameter and interconnected as a mat, which may form large encrusting masses on rocks. The Caribbean or pink-tipped anemone, which spawns off Key West in late spring, provides shelter for a variety of juvenile and adult fish and crustaceans (Jennison 1981). No information is available on its age and growth characteristics.

3. Annelida - Segmented tube worms (Phylum ANNELIDA: Polychaeta) including fan worms, feather duster worms and Christmas tree worms, live in tubes of varying degrees of complexity attached to hard substrate and filter-feed with their "fans." Because they firmly adhere to the substrate, in many cases it is necessary to remove the underlying rock to collect segmented worms.

4. Mollusca - The molluscs (Phylum MOLLUSCA: Gastropoda; Bivalvia; Cephalopoda) are a very diverse group including snails, nudibranchs, clams, oysters, and octopus. The gastropods (snails and nudibranchs, or sea slugs) are the largest class of molluscs and have adapted to a wide range of habitats including live rock. Snails usually have a spiral shell and an operculum (shell cover), while the shell is reduced in nudibranchs which have no operculum. Molluscs can be herbivorous, scrapping algae from rocks, or predaceous, like the horse conch.

Nudibranchs are often highly colored and may occur on the surface of living or dead coral. Many gastropods reach adult size and maturity in 6 months to 2 years, but slow growth continues and many species do not reach maximum size for many years. Bivalve molluscs (clams and oysters) are laterally compressed and possess a shell with two valves, hinged dorsally, that completely enclose the body. In general, bivalves grow most rapidly during their early years. Ages of 20 to 30 years are now known to be common in some bivalves. Flame scallops are commonly collected for marine aquariums. The flame scallop measures up to 8 cm and occurs in narrow rock crevices, occasionally in groups. Octopus also occur on coral reefs and live rock and feed at night on other invertebrates.

5. Arthropoda - The shrimp, crab, and lobster (Phylum ARTHROPODA: Crustacea decapoda) species are some of the most important reef-associated invertebrates. They are characterized by their segmented bodies, chitinous exoskeleton, and compound eyes. The shrimp species harvested for aquariums are characteristically highly colored and are often associated with anemone species, from which they may derive protection from predators. Some species help clean fish and may play

an important role in reef fish health. Some crab species occur on coral branches and feed on polyps by night. Decorator crabs attach bits of sponges and algae to their bodies, presumably for camouflage. The arrow crab most commonly occurs on sponges and near sea anemones. Little is known of the natural abundance, growth, longevity, or replacement rates of the decapod crustacea found on live rock and reefs.

6. Echinodermata - The starfish, brittlestars, feather stars and sea urchins are all members of the phylum ECHINODERMATA. They possess an internal skeleton of calcareous plates and, despite an underlying bilateral symmetry, often appear circular or exhibit 5-rayed symmetry. Brittlestars have long arms and can move actively over the reef, while the basket star, attached to gorgonian or tall coral heads, is relatively sessile. Some sea urchins are valuable research organisms, occur in rocky habitats, and are probably slow-growing.

7. Bryozoa and Chordata - Other Phyla, principally the BRYOZOA (ectoprocts or 'moss' animals) and CHORDATA (ascidians or sea squirts) may be the animals primarily responsible for the water-filtering characteristics of live rock. Bryozoans colonies can form a thin encrusting layer over rock or they may be erect and branching. As adults, sea squirts usually live attached, singly or in colonies, to hard substrate or to the bases such as gorgonian stalks, and vary greatly in size and coloration.

B. Ecological Relationships

The frequency of commensalism (relationship between two organisms in which one species benefits and the other species, the host, is neither benefited nor harmed) in the coral reef environment is one of the most important contributing factors to high species diversity (Bruce 1974). Hanlon and Hixon (1986) recorded over 30 small West Indian reef fish within the tentacles of a single anemone. Several reef and shrimp species, living in close association with anemones, are believed to play an important role in reef health by their "cleaning" activities. Limbaugh (1961) recorded one cleaning station that was visited by 300 fish over a 6 hour period. Following removal of cleaner species from 2 reefs, he noted a marked decline in fish in the area over the following few weeks and, among those remaining, an increase in infections and parasites.

Other interspecific associations have been documented for other fish, cnidarians, molluscs, crustaceans, echinoderms and bryozoans (Wheaton 1989). For example, sponges are inhabited by a wide variety of animals, including crustaceans, polychaetes, and fish. Several reef fish feed on sponges as does the endangered hawksbill sea turtle, *Eretmochelys imbricata*. Zoanthus, a colonial anemone, is a food source of major importance for at least 16 species of fish in 7 families (Randall 1967). In Randall's study, polychaetes were among the most important food items of 62 West Indian reef fish species in 24 families, and were surpassed as preferred foods only by crustaceans. Ophiuroids (brittlestars) were food for 33 fish species and 16 species fed on benthic tunicates. Octocorals have been noted to provide important habitat for fish and invertebrates and may be especially critical for lobster in the 20-40 mm size range (Wheaton pers. obs.).

4.0 REGULATORY IMPACT REVIEW AND INITIAL REGULATORY FLEXIBILITY ANALYSIS

Introduction

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

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

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

This RIR analyzes the probable impacts on fishery participants of the proposed plan amendment to the Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic (FMP).

Problems and Objectives

The general problems and objectives are found in the FMP, as amended. The purpose and need for the present plan amendment are found in Section 1.0 of the amendment document. Essentially the current plan amendment addresses the issue of including "live rock" in the management unit, regulating their harvest in the EEZ, and requiring permits for their harvest and possession.

Methodology and Framework for Analysis

The fundamental issue in this plan amendment is the management of "live rock" as part of the FMP. The basic approach adopted in this RIR is an assessment of management measures from the standpoint of determining the resulting changes in costs and benefits to society. The net effects are stated in terms of producer surplus to the harvest sector, net profits to the intermediate sector, and consumer surplus to the final users of the resource.

The harvest sector refers to the commercial harvesters of live rock and the intermediate sector, to dealers of live rock. Final users of the resource are taken to refer to the individuals that derive benefits from the resource in either consumptive or non-consumptive manner. This last group consists of individual buyers of live rock from commercial dealers or harvesters, harvesters of live rock for use in personal aquaria, extractors of live rock for research purposes, and non-extracting users of live rock such as divers.

In addition to changes in the surpluses mentioned above from managing live rock, there are also changes in producer and consumer surpluses of indirect users of the resource, such as those involved in other fisheries and tourist activities, that will be effected through a change in the management of live rock. Moreover, other so-called non-use values, such as existence value, bequest value and option value, will be affected by a change in the management of live rock. Finally, there are public and private costs associated with the process of changing and enforcing regulations on live rock.

Ideally, all these changes in costs and benefits need to be accounted for in assessing the net economic benefit from management of live rock. The RIR attempts to determine these changes to the extent possible, albeit in a very qualitative manner.

In addition to discussions on net economic benefits, some consideration is given on such other issues as community employment and income opportunity, acceptability of the regulatory measures, and present and historical participation in the fishery.

Impacts of Proposed Actions and Alternatives

A. NO ACTION

Global retail sales of in the ornamental fish hobby has been estimated at about \$4 billion, and about \$1.6 billion of that amount are spent in the U.S. (Derr, 1992; Andrews, 1990). Reportedly, the fastest growing component of the marine life or aquarium trade is minireefs or live reef aquarium systems, the cost of which could range from a thousand to several tens of thousands of dollars (Derr, 1992). The backbone for this type of aquarium is live rock and its associated invertebrates. Consumer demand then for such type of aquariums underlie the derived demand for live rock. Empirical estimates of such demand are not currently available, and in fact there is little known about the demand for live rock. It can be said, however, that as long as such consumer demand for minireefs continues to grow over time, derived demand for live rock or its substitutes will correspondingly grow. The likelihood of such growth in demand depends partly on whether minireefs are a mere fad or a structural shift in demand for aquariums. While as a fad minireef demand would decline in the near future, as a structural shift such demand would be sustained over time. In the latter case, income and population growth would become significant factors. Looking only at the income factor, one can possibly argue that if a growing demand for minireefs is observable at current times when the economy is at its ebb, a stronger demand can be expected when the economy starts to recover. Given such prospects for demand, the derived demand for live rock and its substitutes may be expected to keep apace.

Supply of accessories for aquarium trade come from many countries, including the U.S. While domestic production of ornamental fish comprises only a small percentage of the entire U.S. supply, it does reportedly account for a good percentage of live rock supply in the U.S. As mentioned elsewhere in the amendment document, a portion of domestic production is also shipped to Canada and England.

While live rock landings are reported to have occurred in Alabama and possibly in the Carolinas, only records of landings in Florida are available. The live rock industry in Florida is one major source of live rock supply in the aquarium trade. Since Florida included in trip ticket reporting the harvest of live rock harvest around March 1990, reported landings over the period 1990-1993 have shown a steady increase. This is highly reflective of supply of live rock matching the demand for the product.

Among the states in the jurisdiction of the SAFMC and GMFMC, only Florida has explicit regulations on the harvest of live rock. Although there are several species comprising live rock, Florida instituted a management plan for live rock as one unit. This management mainly consists of a regulation that would phase out the harvest of live rock over a three-year period ending June 30, 1995 by providing gradually reduced harvest quota with trip limits. As mentioned in several instances in the amendment document, such rules could not be enforced on live rock harvested in the EEZ.

Based on the foregoing discussions, a no action alternative would practically mean a continuation of a matching of live rock harvest with an increasing demand. The presence of the mentioned Florida rules means that, in principle, fishermen would likely fish in state waters during the open season and in the EEZ during the season when state fishery is closed. This condition would undoubtedly increase harvest cost, but the reopening of the season (at least in the EEZ) after March 31, 1993 has revealed that increases in harvest costs are far outweighed by revenue gains from the sale of live rock. Of course, fishermen would have the option of fishing in state waters during closed season but they have to match revenues with the probability of a higher cost in the

event they are caught violating state rules, although there is some reason to believe such probability to be relatively low.

A no action alternative essentially means that the producer surplus to the harvest sector, net profits to the dealers, and consumer surplus would be maintained at a level that matches any growth in demand. The level of these benefits cannot be estimated due to lack of information. It may only be stated that about 35 individuals or about 18 percent of those engaged in marine aquarium are involved at least part-time in the collection of live rock. Various types of live rock command different exvessel prices, for example, bare rubble rock could be sold at \$0.50 per pound while "Christmas tree rock" could get as much as \$3.00 per pound. FMRI reports the exvessel value of the 1992 live rock harvest at about \$628,000. However, if demand continues to improve, more individuals in Florida and other states would be involved in the fishery, likely resulting in increased harvest and larger revenues. Noting the relatively lower cost of harvesting live rock, producer surplus may be expected to increase as well.

While benefits of the no action alternative accrue to the live rock industry and its associated industries, certain potential costs would be borne by other sectors and by society as a whole. These cost items are associated with forfeiting benefits from non-harvest of live rock. These benefits are in turn associated with the value of live rock either by itself or as contributing factor to the survival of other marine organisms that may have commercial, recreational or other uses.

Like any natural resource, live rock commands what has been termed non-use values, specifically existence value, bequest value, and option value. Existence value refers to the satisfaction individuals derive from knowledge that a natural resource exists and will continue to exist in the future even though they may never use or see the resource. Bequest value is the benefit associated with endowing a natural resource to future generations. Option value refers to the benefit individuals obtain from retaining the option to use the resource in the future by conserving it now. These values are undoubtedly difficult to measure, but measurement has been done in few instances. For example, Pearce (1990) estimated the existence value for the Amazonia rainforest to be at least US\$3.2 billion and Hundloe (1987) estimated the existence and option values of the Australian Great Barrier Reef of about AUS\$45 million per year. It only needs mentioning here that certain degree of the mentioned three values would be forfeited by the harvest of live rock.

Elsewhere in the amendment document are outlined some of the important contributions of live rock of various kinds to the survival and growth of some marine species that have commercial or recreational value and in the particular case of rubble rocks to the promotion of high carbonate production from coral and algae which sustains the living coral reef. The economic issue related to the effects of live rock on other marine species is one of productivity. This issue involves the valuation of the change in the productive capacity of an area relative to the affected marine species where live rock is harvested. The actual estimation of such value requires an enormous amount of data especially that some of the organisms sustained by the food and protection afforded by live rock would command larger than minimal commercial or recreational value only when they reach certain size. The "other uses" referred above relate to the scientific, educational, and pharmaceutical values of those species, including organisms attached to the hard substrate, whose survival partly depend on the presence of live rock.

In the case of live rock's contributions to the living reef, the economic issue involves valuation of such contribution to the overall non-extractive value of reefs such as those derived from tourism and non-extractive research and education activities. While some methodologies exist to estimate such values, data are simply non-existent to undertake the exercise. There are, nonetheless, existing estimates on the value of reefs some of which were conducted in assessing the value of damage to reefs. In connection with the damage assessment of the Mavro ship grounding, the

value of bottom habitat was estimated at about \$11 per square foot (FMFC, 1991; GMFMC, 1992). This valuation was based on the dockside value of rubble rock with encrusting organisms. In another instance using tourism expenditures, Mattson and DeFoor (1985) estimated the value of coral reefs in seven sites located in the John Pennekamp Coral Reef State Park and Key Largo National Marine Sanctuary to be \$15.75 per square meter annually based on direct revenues and \$85 per square meter annually based on gross revenues (i.e., inclusive of indirect expenditures). They also estimated the lifetime value of coral reefs in these seven areas to be at least \$1.6 billion. Using a different technique, Finch, Julius, and Lopez (1992) estimated at \$1.5 million the value of 1,610 square meters of coral reefs in the Florida Keys damaged due to vessel grounding.

While the above estimates for coral reefs are not directly applicable to the issue of valuing live rock as an integral part of coral reef, they do point to the possibility of estimating such values. In the present case, it has been reported that 75 percent of rubble live rock comes from a known area of the Florida reef tract, the so-called Area 748 which is a 40-mile section of the Florida reef tract. Thus, if valuation of live rock and its contribution to the living reef were attempted, this area would be the prime candidate for study. Spurgeon (1992) spelled out the various components of valuing coral reefs in terms of financial and social benefits associated with reefs. These benefits can be assigned monetary values or a range of monetary values where estimation proves difficult. The two major estimating techniques are travel cost method (TCM) and contingent valuation method (CVM). Valuation under TCM utilizes such information as the number of people visiting a reef site and their corresponding travel costs. One major assumption of this method is that the number of people visiting a site is inversely related to the distance travelled. Under CVM, valuation is undertaken generally by asking people how much they would be willing to pay for certain reef products assuming they could not be obtained elsewhere. The basic idea in CVM estimation is to construct a hypothetical market for reef products and to elicit information from people on the amount they are willing to pay, or be compensated, for any increase or decrease in such products. Both techniques have been employed in the Gulf but only with regard to determining the recreational value of fishing for certain marine species (Green, 1989; Leeworthy, 1990; Milon, 1988, 1993; Milon et al., 1993). Currently, a study is under way to estimate the economic value of reefs in Florida (Adams, per. comm., 1993).

In sum, the no action alternative may be expected to sustain the benefits derivable from the harvest of live rock, but the attendant costs of an increasing harvest of live rock, although not quantifiable at the present time, appear to be less than negligible.

B. DEFINITION FOR THE MANAGEMENT UNIT

B.1. Inclusion of live rock in the management unit and provision of explicit definition thereof.

B.2. Redefinition of allowable octocorals

Both the Gulf and South Atlantic Councils prefer B.1 while only the Gulf Council expresses preference on B.2. While B.1 provides for an explicit definition of live rock and associated organisms, B.2 redefines octocorals that are allowed to be harvested as one excluding the hard substrate on which certain octocorals grow. Thus even if octocorals may be harvested, they have to be separated from the any hard substrate on which they may be found.

The inclusion of live rock in the management unit means that explicit management regulations may be enacted affecting live rock taken in the EEZ. In part, the need to explicitly manage the harvest of live rock in the EEZ is prompted by the existence of state regulations on the fishery. More importantly, however, earlier discussions on the potential effects of a no action alternative points

to the need of managing the live rock fishery for purposes of recognizing and estimating the costs and benefits associated with the harvest of live rock. While the no action alternative may seem to afford the live rock industry a more competitive environment, the harvest of live rock results in positive or negative economic externalities that justify government intervention. These externalities have been discussed earlier in terms of costs to society from forfeiting benefits from consumptive and non-consumptive use of live rock and other affected marine species.

C. MANAGEMENT OF LIVE ROCK HARVESTS

C.1. Limit harvest

- a. Establish an annual quota for live rock
- b. Limit access/effort for live rock

C.2. Prohibit Harvest

- a. Prohibit harvest of live rock
- b. Phase out harvest of live rock
- c. Provide for aquaculture of live rock

C.3. Provide for different management in the jurisdictional areas of the two Councils

The basic difference between C.1 and C.2 is that the former allows an almost sustained harvest of live rock while the latter closes the fishery either immediately or over a period of time with an option for aquaculture harvest of live rock. The current preference of the Councils is C.2 over C.1, although the two Councils differ in selecting a preferred option under C.2. The Gulf Council prefers the phasing out of live rock harvest to be supplanted later with aquaculture production while the South Atlantic Council prefers to immediately ban the harvest of live rock in the EEZ. If the Councils cannot reach a consensus, C.3 presents a possibility of adopting differing regulations affecting the harvest of live rock in the Councils' respective jurisdictional waters. Further discussion of this last option is not pursued here.

The economic issue in the choice between a limit on harvest and a prohibition on harvest of live rock is one of trade-off between net benefits derived from consumptive use and net benefits derived from non-consumptive use of live rock. Net benefits from consumptive use are broadly taken to be the resulting change in producer surplus from the harvest of live rock while net benefits from non-consumptive use refer to the increase in values derived from non-harvest of live rock. This latter set of values refers to those values mentioned earlier in the discussion of the no action alternative. Incidentally, the no action alternative is another option appropriately involved in the trade-off of net benefits between consumptive and non-consumptive use. The no action alternative would give the largest allocation of live rock for consumptive use while the harvest prohibition would give the least of such allocation for consumptive use. The option to limit harvest would stand in between the two extreme options. The main indicator involved in assessing the resulting effects of such trade-off is the resulting overall net benefits to society.

The mentioned trade-off in net benefits may be appropriately approached within the context of allocating the live rock resource among competing uses, i.e., consumptive and non-consumptive in the present case. For an optimal allocation, the necessary condition stipulates that marginal net benefits are equalized among the various resource uses. Information is obviously too scarce to

determine what level of allocation of live rock between consumptive and non-consumptive uses satisfies this condition. This lack of information is compounded by the problem of estimating non-consumptive values for live rock. Under this situation, the ensuing discussion merely points out the likely changes in overall net benefits to society from a given allocation.

As alluded to earlier, the no action alternative presents a good opportunity for the generation of relatively high producer surplus in consumptive use but at the same time the same alternative provides the highest likelihood of a relatively low benefit from non-consumptive use. The economic disexternalities on users of other marine species and reefs enhanced by the presence of live rock may not be quantifiable but could be deemed to increase as harvest of live rock increases over time. The prohibition on harvest of live rock would also present a situation where net loss is suffered by consumptive users (harvesters) of live rock and a high likelihood for a relatively high net benefit from non-consumptive use. While the net loss to harvesters may be estimated, the resulting net benefit for non-consumptive use may not be known, so that the resulting overall net benefit cannot be determined. In the case of limiting harvest, both consumptive and non-consumptive net benefits would be realized. In many economic decisions involving purely market values, most oftentimes the allocation that results in highest net benefits is one that allows many competing users to remain in business. The difficulty of directly applying this on live rock is that for a large portion of the benefits derivable from live rock there is no market mechanism that can be tapped to quantify especially the non-consumptive benefits. As mentioned earlier, however, there are modeling techniques that can be employed to estimate those benefits, but one has yet to be applied to live rocks in the Gulf and South Atlantic EEZ. The likely possibility that live rock is a non-renewable resource only intensifies the problem of quantifying such benefits. At any rate, there is probably a relatively higher benefit to society afforded by an allocation that does not eliminate any of the competing users of the resource. However, such allocation may be achieved either by simply limiting harvest of wild live rock or by banning such harvest but providing for aquaculture production. A comparison of the effects of these two alternatives is presented below.

Under C.1, the two options are not mutually exclusive. In fact, a limited access system that is structured so that fishermen are allocated fixed harvests, an overall quota may be necessary although such quota may be variable between fishing seasons or within a particular fishing season. An overall quota presupposes to some extent the provision of an allowable catch. Where an allowable catch can be provided like in some usual commercial fisheries, provision of an overall quota without corresponding restriction on effort would ultimately render the fishery inefficient with resulting reduction in producer surplus. Under this scenario, the adoption of a limited access management may correct the situation of declining producer surplus.

Under C.2, options (a) and (b) would have similar long-term impact which is a reduction in producer surplus to the consumptive users, but their short-term effects differ. The phase-out approach presents a gradual reduction and less overall reduction in short-term producer surplus than the immediate ban. In addition, the phase-out approach offers a transition phase from harvest of wild rocks to aquaculture.

As mentioned earlier, an allocation that allows both consumptive and non-consumptive users to remain in the fishery may be deemed to generate a relatively higher net benefit than an allocation that excludes one group of users or the other. Here the issue shifts to the effects of forcing the consumptive users to switch from harvest of wild live rock to aquaculture. Assume for discussion purposes that there are no costly legal obstacles to pursuing aquaculture production. The current absence of aquaculture production may be taken to imply that this type of production is more costly than harvest of wild live rock or that demand is still not large enough to render aquaculture production profitable. In either case, the switch from wild harvest to aquaculture would entail a reduction in producer surplus or a forgoing of larger profits especially in the face of an increasing

demand. However, such reduction in producer surplus or forgoing of larger profits have to be modified by the presumed absence of negative externalities on other fisheries or in non-consumptive use of the live rock resource. In this situation, the switch to aquaculture may not result in significant reduction in overall producer surplus, but it will most likely result in the distribution of producer surplus from those currently in the fishery who may not be able to afford the investment required for aquaculture to those who can afford and do invest in aquaculture production.

C.4. Permits for Live Rock Harvest

- C.4.a. Require a federal permit in the absence of a state permit for harvest and possession of "wild" live rock from the EEZ during the phase-out period.**
- C.4.b. Require a federal permit for the possession or harvest of live rock from aquaculture operations.**
- C.4.c. Require a federal permit for harvest of prohibited corals and prohibited live rock from the EEZ for scientific, educational, and restoration purposes.**

Depending on which type of harvest restriction is adopted, any of the three options may be appropriate. The basic advantage of requiring permit is the identification of fishery participants and the subsequent effective monitoring and enforcement of rules governing live rock. The corresponding cost may be deemed minimal considering that the direct cost outlay for securing permits may not exceed the administrative cost of issuing permits. There is, of course, the possibility of some transaction costs that may be incurred in case some form of access limitation is adopted for the fishery. But such costs would be appropriately considered attendant to that other regulation that may be adopted and not necessarily from any of the permitting options considered here.

D. OPTIMUM YIELD (OY) FOR LIVE ROCK

- D.1. OY for live rock is to be zero except for that which may be allowed by permit.**
- D.2. OY for live rock is to be unlimited for three years after which it is to be zero except for that which may be allowed by permit.**

The inclusion of live rock in the management unit generally requires the provision for definition of overfishing. The current FMP, as amended, already contains a definition of overfishing which is tied to the definition of OY. Specifically, the FMP, as amended, stipulates that overfishing is an annual harvest that exceeds OY. Either definition of OY may be appropriate depending on the type of restriction adopted for harvest of live rock.

Government Costs of Regulation

Federal government costs of this action were associated with meetings, travel, calculation of ABCs, preparation of various documents and reviewing all documents. Other sources of additional costs include extraordinary research specifically done for the purpose of this particular action, additional statistics costs, costs associated with the issuance of permits and additional enforcement costs resulting from the action.

- Prepare and implement action
- Research
- Statistics
- Public cost associated with permits
- NMFS cost associated with permits
- Enforcement

The cost items above have been identified as the likely cost to be incurred in preparing and implementing this plan amendment. No cost figures are yet available since this amendment is still under consideration by both Councils.

Summary and Expected Net Impact of Proposed Action

The proposed regulatory action constitutes changes in management for of live rock harvests in the EEZ under the jurisdiction on both the Gulf Council and South Atlantic Council. The emphasis of the summary is on the expected economic impact of the various options.

The no action alternative could result in a sustained profitability of the live rock harvest sector, but there are attendant costs that could increase along with any increases in the harvest of live rock. Such cost increases may be prevented by the various options to include live rock under the FMP and to provide certain restrictions in the harvest thereof. It has been concluded that an allocation allowing both consumptive and non-consumptive users of the live rock resource to remain in the fishery may be accompanied by a relatively higher net benefit to society than any of the other proposed allocation including the no action alternative.

The permit requirement is deemed necessary to identify the industry participants and to monitor and enforce any rules adopted for the fishery. A definition of OY is deemed appropriate if live rock is to be included in the management unit. The appropriate definition of OY depends on the type of restrictions imposed on the harvest of live rock.

Determination of a Major Rule

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: a) an annual effect on the economy of \$100 million or more; b) a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or c) significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

The entire Florida commercial harvest sector of the live rock fishery is valued at about \$628,000 exvessel which is significantly less than \$100 million. Even if the fishery in other states were accounted for, it is very unlikely that the total value would exceed \$100 million. The proposed

actions in this plan amendment apply to live rock harvests in the EEZ under the jurisdiction of the Gulf Council and South Atlantic Council. Given the size of the fishery and the segment of the fishery directly affected by the proposed regulation, it is concluded that any revenue or cost impacts on the fishery would be significantly less than \$100 million annually.

In the event that an outright prohibition or severe restriction on the harvest of live rock is adopted, a major cost increase (in terms of forgone profits) to the industry will ensue. As long as the reduction in domestic production is offset by other supply sources of live rock, prices to consumers are expected to not increase significantly. The possibility of outright ban or severe restriction in the harvest of live rock may be expected to have a significant adverse effect on employment, productivity, and investment; likewise such ban or severe restriction would render the domestic industry less competitive in the international market, specifically in Canada and England.

Based on the foregoing, it is concluded that this regulation if enacted would constitute a "significant regulatory action" under some of the mentioned criteria.

Initial Regulatory Flexibility Analysis

Introduction

The purpose of the Regulatory Flexibility Act is to relieve small businesses, small organizations, and small governmental entities from burdensome regulations and record keeping requirements. The category of small entities likely to be affected by the proposed regulatory amendment is that of commercial businesses currently engaged in the harvest of live rock. The impacts of the proposed action on these entities have been discussed above. The following discussion of impacts focuses specifically on the consequences of the proposed action on the mentioned business entities. An Initial Regulatory Flexibility Analysis (IRFA) is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." Although an IRFA focuses more on adverse effects, determination of beneficial significant effects is also an integral component of the analysis. In addition to analyses conducted for the Regulatory Impact Review (RIR), the IRFA provides an estimate of the number of small businesses affected, a description of the small businesses affected, and a discussion of the nature and size of the impacts.

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

In general, a "substantial number" of small entities is more than 20 percent of those small entities engaged in the fishery (NMFS, 1992). It has been estimated that there are about 38 individuals who are at least on a part-time basis engaged in the harvest of live rock. The Small Business Administration (SBA) defines a small business in the commercial fishing activity as a firm with receipts of up to \$2.0 million annually. Since the proposed action will affect practically all participants of the live rock harvest sector, the "substantial number" criterion will be met in general.

Economic impacts on small business entities are considered to be "significant" if the proposed action would result in any of the following: a) reduction in annual gross revenues by more than 5 percent; b) increase in total costs of production by more than 5 percent as a result of an increase in compliance costs; c) compliance costs as a percent of sales for small entities are at least 10 percent higher than compliance costs as a percent of sales for large entities; d) capital costs of compliance represent a significant portion of capital available to small entities, considering internal

cash flow and external financing capabilities; or e) as a rule of thumb, 2 percent of small business entities being forced to cease business operations (NMFS, 1992).

In the event that a ban or severe restriction on the harvest of live rock is adopted for this plan amendment, revenues to the affected individuals may be expected to be reduced by more than 5 percent. A switch from harvest of wild live rock to aquaculture in compliance with the proposed action may be deemed to result in a significant increase in the operating and capital costs to fishermen as a result of complying with the regulations. Considering that all participants in the commercial live rock harvest fishery may be deemed small business entities, the issue of big versus small business operations is not relevant in determining distributional/regional effects of regulations, and it thus also rules out disproportionate effects on capital costs of compliance. A number of current participants of the live rock harvest industry may be forced to cease business or switch to other operations if the more severe restrictions are adopted for the fishery. This number, however, is not known.

It can be inferred from the foregoing discussion that the proposed regulation can be expected to result in a significant economic impact on a substantial number of small entities in the commercial live rock harvest sector. On this account, an IRFA has been prepared. The following comprises the remaining portions of the IRFA.

Explanation of Why the Action is Being Considered

Refer to the section on Problems and Objectives in the RIR and to Section I of the amendment document.

Objectives and Legal Basis for the Rule

Refer to the section on Problems and Objectives in the RIR and to Sections I and II of the amendment document. The Magnuson Fishery Conservation and Management Act of 1976 provides the legal basis for the rule.

Demographic Analysis

Refer to the Coral Fishery Management Plan, as amended.

Cost Analysis

Refer to the Government Cost and Summary sections of the RIR.

Competitive Effects Analysis

The industry is composed entirely of small businesses (harvesters and charter boats operations). Since no large businesses are involved, there are no disproportional small versus large business effects.

Identification of Overlapping Regulations

The proposed action does not create overlapping regulations with any state regulations or other federal laws. Some of the proposed options may even render federal and state (Florida) rules compatible.

Conclusion

The proposed regulation is concluded to have a significant economic impact on a substantial number of small entities. In this regard, the foregoing information and pertinent portions of the RIR are deemed to satisfy the analysis required under the RFA.

5.0 ENVIRONMENTAL CONSEQUENCES

Habitat Loss: Hard bottoms and reef rubble from which live rock is removed contributes to the habitat for reef dwelling organisms which include reef fish and ornamental fishes and invertebrates. There is concern that the removal of this material degrades the value of the habitat due to the slow rate of regeneration of the material. There is an estimated 19,691 square miles of live bottom in the Gulf of Mexico.

Aquarium Sales: Harvest of live rock at a level of about 500 tons per year is said by producers to be the backbone of the marine aquarium trade because it allows appropriate habitat for captive tropical fishes and invertebrates. Harvest of naturally occurring rock could be replaced by material from aquaculture operations.

Ecosystem Management: An acceleration and continuation of removal of live rock can degrade the quality of fishery habitat, particularly if the activity is concentrated in high use areas.

Aesthetic Values: Removal of coral or damaging coral reefs is already prohibited by federal and Florida regulations. However, the removal of showy material in areas frequented by divers would contribute to aesthetic degradation.

Consistent Regulations: Only the state of Florida currently regulates harvest of live rock. Florida prohibits removal in its waters since 1989 and proposed a phase-out over a 3-year period of landings from the EEZ.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

EFFECTS OF LIVE ROCK ALTERNATIVES ON THE ISSUES

LIVE ROCK ALTERNATIVES							
		LIMIT HARVEST		PROHIBIT HARVEST			
ISSUES	No Action	Establish an Annual Quota	Limit Access/Effort	Prohibit all Harvests	Phase Out Harvest Except Aquaculture	Provide for Aquaculture	Permit Requirement
Habitat Loss	Losses increase	Losses could stabilize	Losses could stabilize	No net loss	Short term loss; long term possible gain	Gain from seed material	No effect
Aquarium Sales	Profits stable or increase	Profits stable	Redistribute and possible reductions	Adverse effects	Aquaculture could replace wild production without interruption	Temporary Loss	No effect
Ecosystem Management	Reef and hard bottom systems unprotected	Some level of loss to reef systems and hard bottoms	Non-renewable losses	Benefits other species	Short term loss; long term potential benefit	Some Benefit	Enforcement and protection enhanced
Aesthetic Values	Negative effects	Negative effects	Negative effects	Positive effects	Short term negative; long term positive	Positive Effect	No effect
Consistent Regulations	Not consistent with Florida regulations	Not consistent with Florida approach	Not consistent with state approach	Consistent with state approach	Consistent with Florida approach after closure of wild harvest	Consistent with Florida approach	Consistent with Florida approach

Conclusion

Habitat of the Stocks - Since corals are sessile animals the FMP section on Description of the Stocks (5.0) and the FMP section on Description of the Habitat (6.0) adequately describe the habitat of the stocks (105 pages in aggregate), including condition of the stocks as well as man-induced and natural impacts to the habitat. Amendment 1 modified the FMP by including the following updated revised subsections: 6.4 Habitat Information Needs; 6.5 Habitat Protection Programs; and 6.6 Habitat Recommendations. These revisions are in Appendix A.

Physical Environment - The proposed actions in this amendment will have no adverse impact on the physical environment.

Fishery Resource - The proposed actions are intended to maintain the coral, coral reefs, and live rock and to prevent them from becoming overfished.

Human Environment - Some marine life fishermen would be affected by restrictions intended to conserve live rock. Long-term benefits are expected to exceed short-term loss.

Effect on Wetlands - The proposed amendment will have no effect on any flood plains, wetlands, trails, or rivers.

Mitigating Measures Related to the Proposed Action - Introduction of aquaculture would enhance the hard bottom habitat and tend to mitigate earlier loss from harvest of the natural live rock. Aquaculture would also reduce the economic loss to live rock harvesters who are displaced from harvest of naturally occurring material and who elect to revert to aquaculture.

Unavoidable Adverse Effects - None: no change is proposed.

Relation Between Local, Short-Term Users of the Resource and Enhancement of Long-Term Productivity - (To be added)

Irreversible or Irretrievable Commitment of Resources - None.

6.0 TIME AND LOCATION OF PUBLIC HEARINGS

January 5	Savannah, Georgia (7:00 p.m. - 10:00 p.m.) Holiday Inn Mid-town 7100 Abercorn Street	January 13	Wrightsville Beach, North Carolina (7:00 p.m. - 10:00 p.m.) Holiday Inn Wrightsville Beach 1706 North Lumina Avenue
January 6	Duck Key, Florida (7:00 p.m. - 10:00 p.m.) Hawk's Cay Resort Mile Marker 61 (10 miles north of Marathon)	January 19	Clearwater Beach, Florida (8:30 a.m.) Gulf of Mexico Fishery Management Council meeting Clearwater Beach Hilton Resort 715 S. Gulfview Boulevard
January 11	Pensacola, Florida (7:00 p.m. - 10:00 p.m.) Pensacola Civic Center 201 East Gregory Street	(Week of February 7)	St. Augustine, Florida South Atlantic Fishery Management Council Meeting Ponce De Leon Hotel

Written comments on this draft must be received by the responsible agencies by January 15, 1994.

Responsible Agencies

Gulf of Mexico Fishery Management Council
Lincoln Center, Suite 331
5401 West Kennedy Boulevard
Tampa, Florida 33609
813-228-2815

South Atlantic Fishery Management Council
Southpark Building, Suite 306
One Southpark Circle
Charleston, South Carolina 29407-4699
803-571-4366

National Marine Fisheries Service, Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, Florida 33702
813-893-3141

7.0 LIST OF PREPARERS

Georgia Cranmore, Ecologist, National Marine Fisheries Service, Southeast Regional Office
Antonio Lamberte, Economist, Gulf of Mexico Fishery Management Council
Terrance Leary, Biologist, Gulf of Mexico Fishery Management Council
Roger Pugliese, Biologist, South Atlantic Fishery Management Council

8.0 LIST OF AGENCIES AND ORGANIZATIONS CONSULTED:

Gulf of Mexico Fishery Management Council
- Coral Advisory Panel
- Law Enforcement Advisory Panel
- Scientific and Statistical Committee

South Atlantic Fishery Management Council
- Coral Advisory Panel
- Habitat Protection Advisory Panel
- Scientific and Statistical Committee

National Oceanic and Atmospheric Administration (NOAA)
- Office of General Counsel (SER)
- Florida Keys National Marine Sanctuary

National Marine Fisheries Service (SER)
- Southeast Regional Office
- Southeast Fisheries Center

Florida Marine Life Association
Florida Marine Aquarium Society
Project Reefkeeper
Reef Relief
Florida Live Rock Alliance
Coral Reef Coalition
Nature Conservancy
Florida Keys Audubon Society
The Nature Conservancy

9.0 OTHER APPLICABLE LAW

Impacts on Other Fisheries - Unregulated removal of live rock could reduce the available hard bottom habitat for reef fish and invertebrates and subject coral reefs to damage from collectors. Regulated harvest would reduce this adverse impact. Aquaculture by introduction of cultch material has the potential of increasing the hard bottom habitat for reefal species.

Data Needs - Data needs and responsibilities are listed in Appendix A.

Vessel Safety - The proposed actions do not impose requirements for use of unsafe (or other) gear nor do they direct fishing effort to periods of adverse weather conditions.

Paperwork Reduction Act - (depends on permit options)

Coastal Zone Management Consistency - The Assistant Administrator has determined that this proposed action will be implemented in a manner that is consistent to the maximum extent practicable with the approved coastal zone management program of the affected states in the management area. This determination has been admitted for review by the states under Section 307 of the Coastal Zone Management Act.

Federalism - This proposed action does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under E.O. 12612.

Effect on Endangered Species and Marine Mammals - The proposed amendment will have no effect on endangered species and marine mammals. A Section 7 consultation was held for Amendment 1 with a "no jeopardy opinion" being rendered. The proposed actions do not alter provisions of the FMP that would affect these animals. An additional Section 7 consultation on Amendment 2 is in progress.

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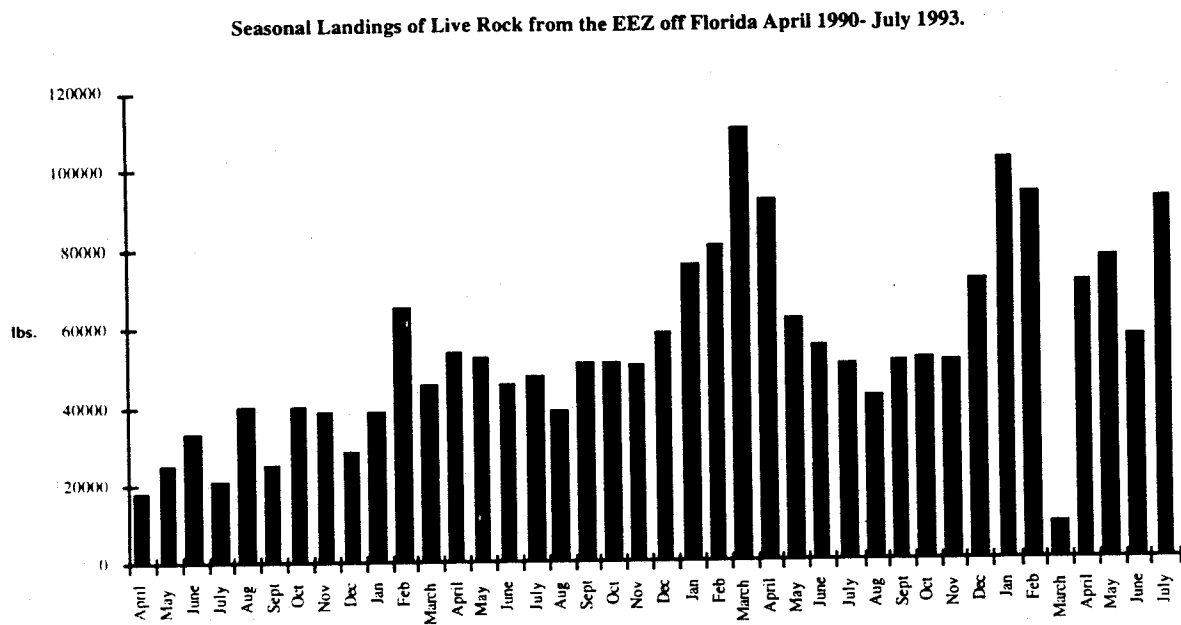
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FIGURE 1A



Seasonal Landings by Month of Live Rock from the EEZ off Florida, (FDEP).

FIGURE 1B

SEASONAL LANDINGS OF LIVE ROCK
FROM THE EEZ OFF FLORIDA
(FROM FDER)

Live Rock Landings, 1991 - Feb., 1993

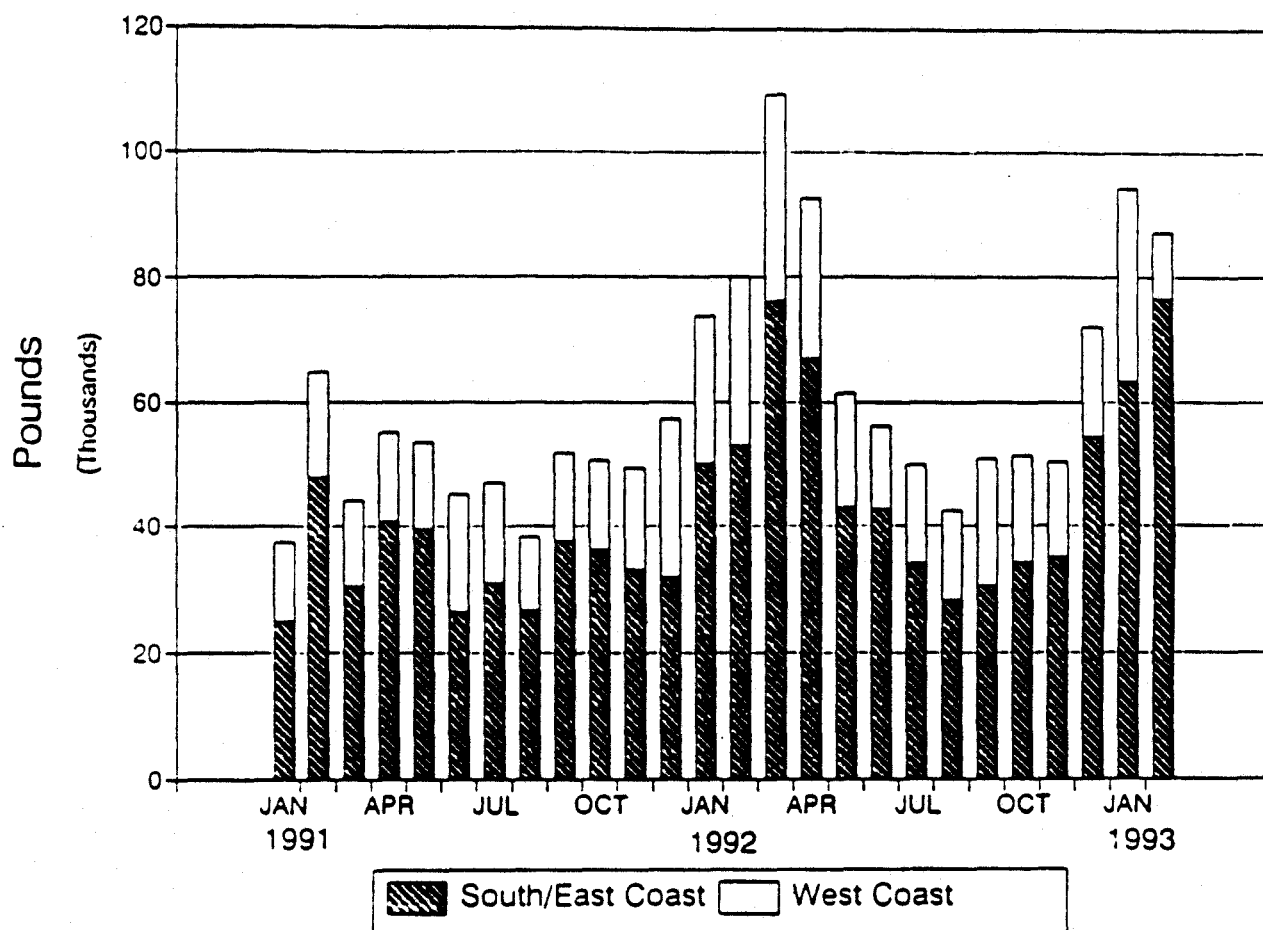
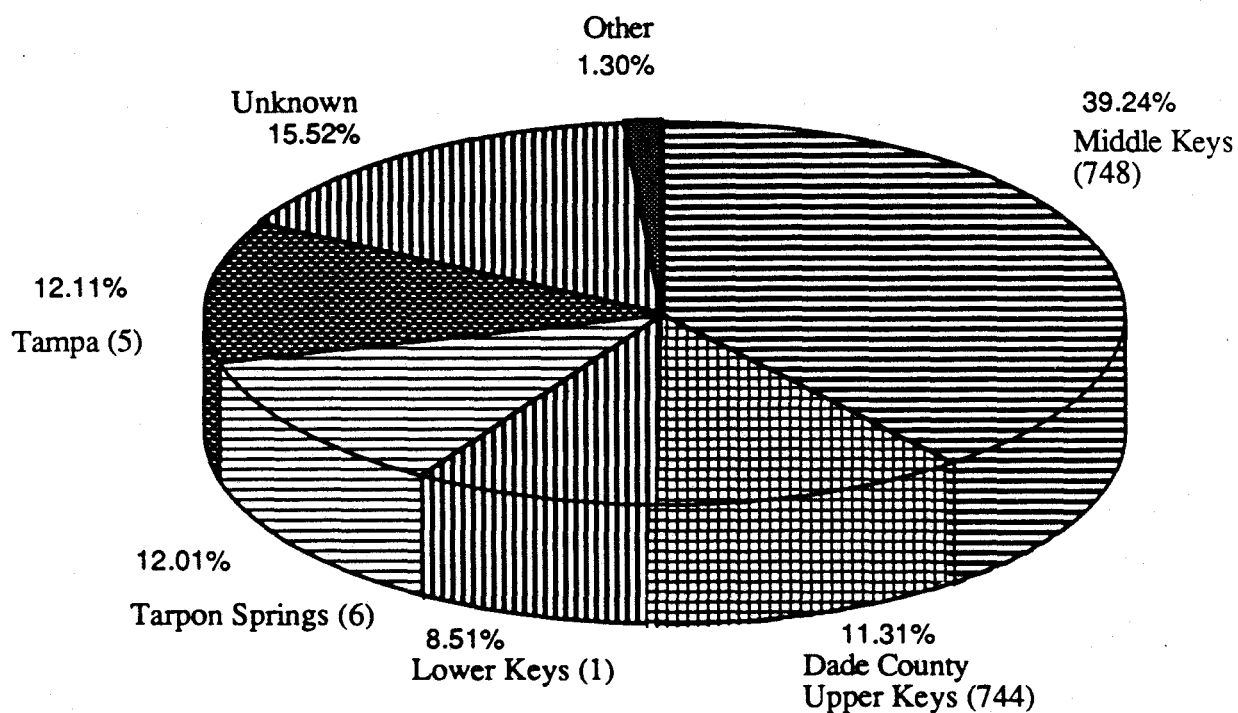


FIGURE 2
Live Rock Landings, 1991 - Feb., 1993
Collection Areas



Landings by Area of Live Rock from the EEZ off Florida, (FDEP).

FIGURE 3

Major Florida East Coast Live Rock Landing Areas-

(Jan. 1991 - Feb. 1993)
(as a % of total State landings)

Area 748 - 39.2%
Area 744 - 11.3%
Area 1 - 8.5%

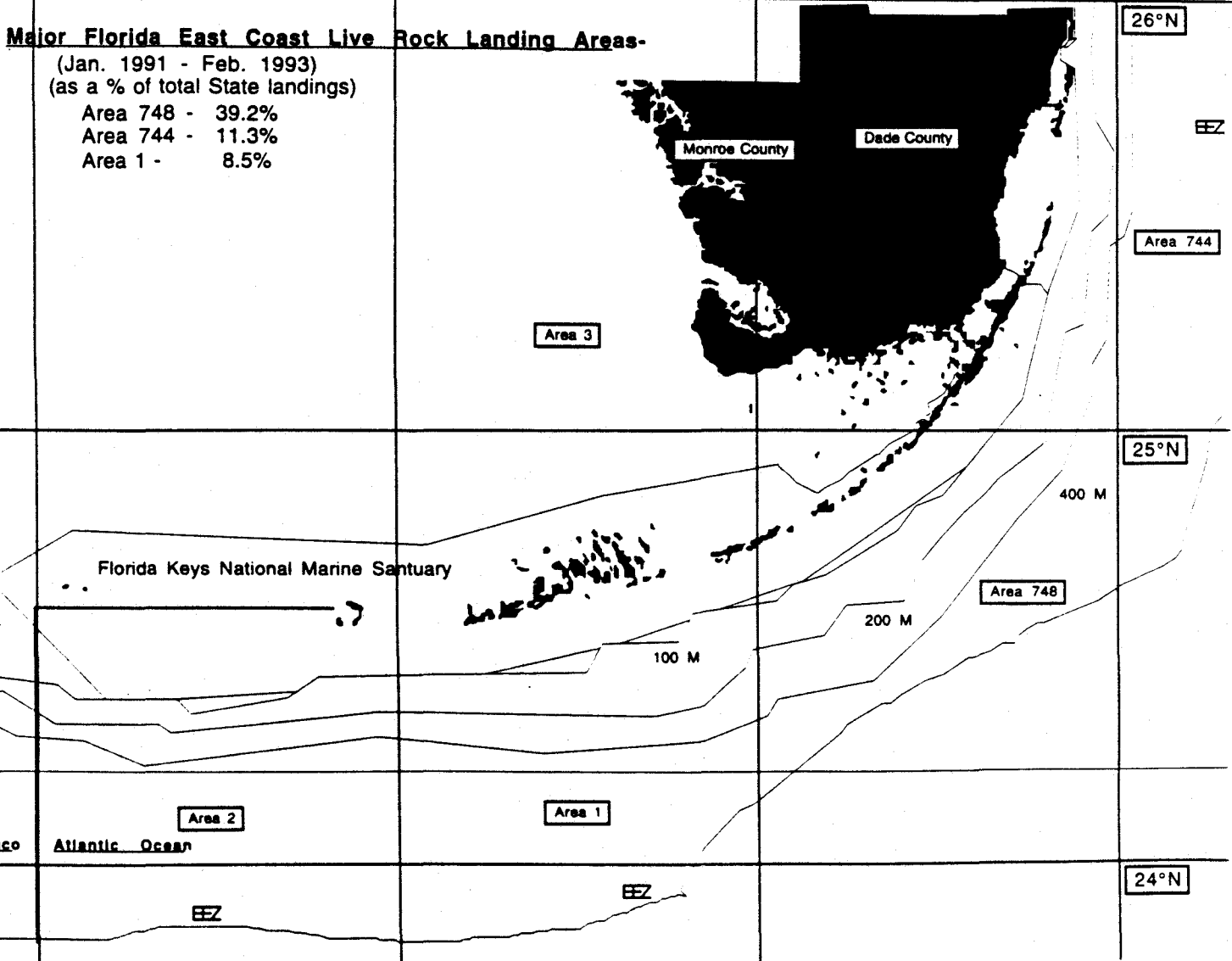


FIGURE 4

Major Florida West Coast Live Rock Landing Areas

(Jan. 1991 - Feb. 1993)

(as a % of total State landings)

Area 5 - Tampa - 12.11%

Area 6 - Tarpon Springs - 12.01%

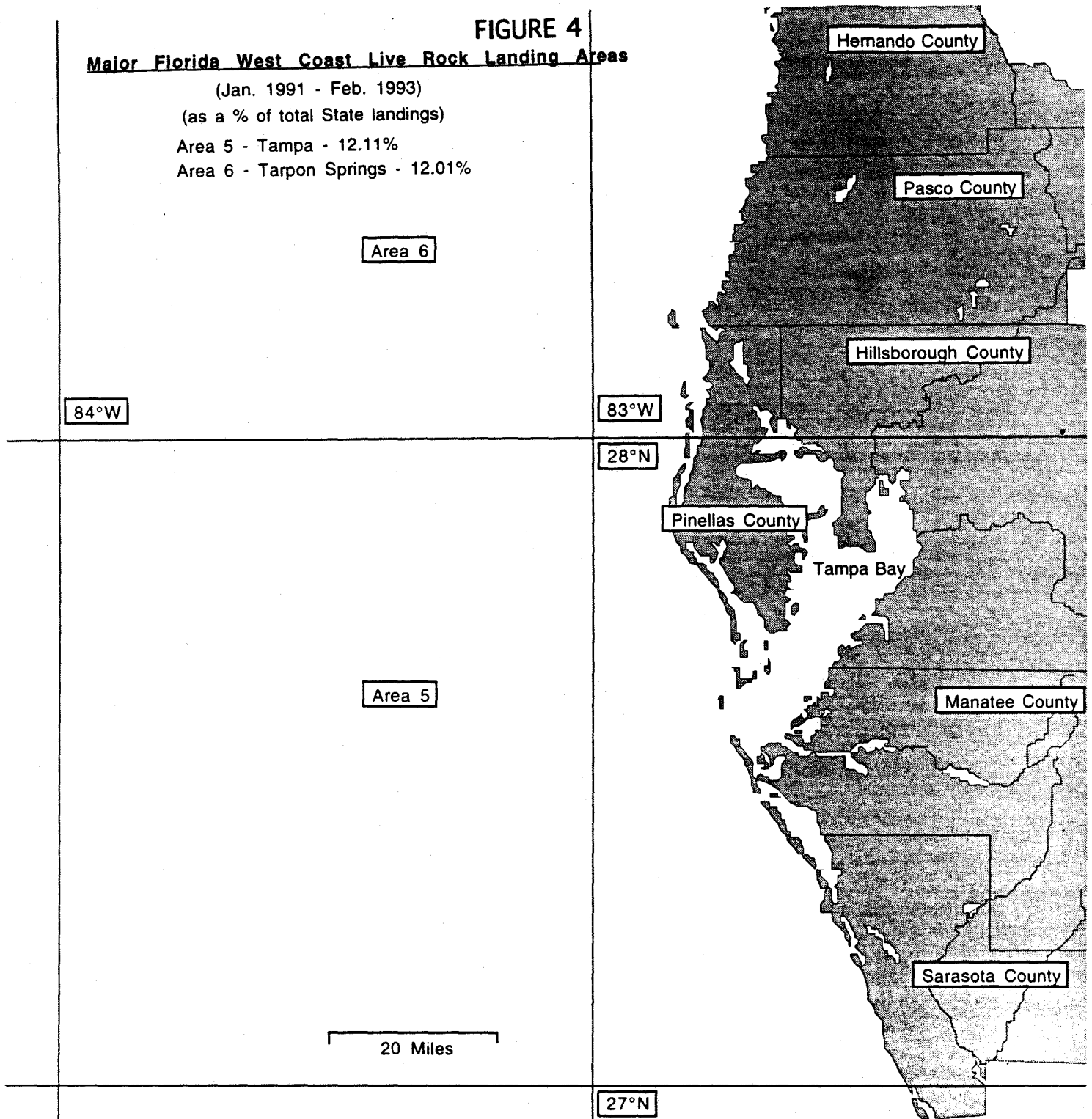
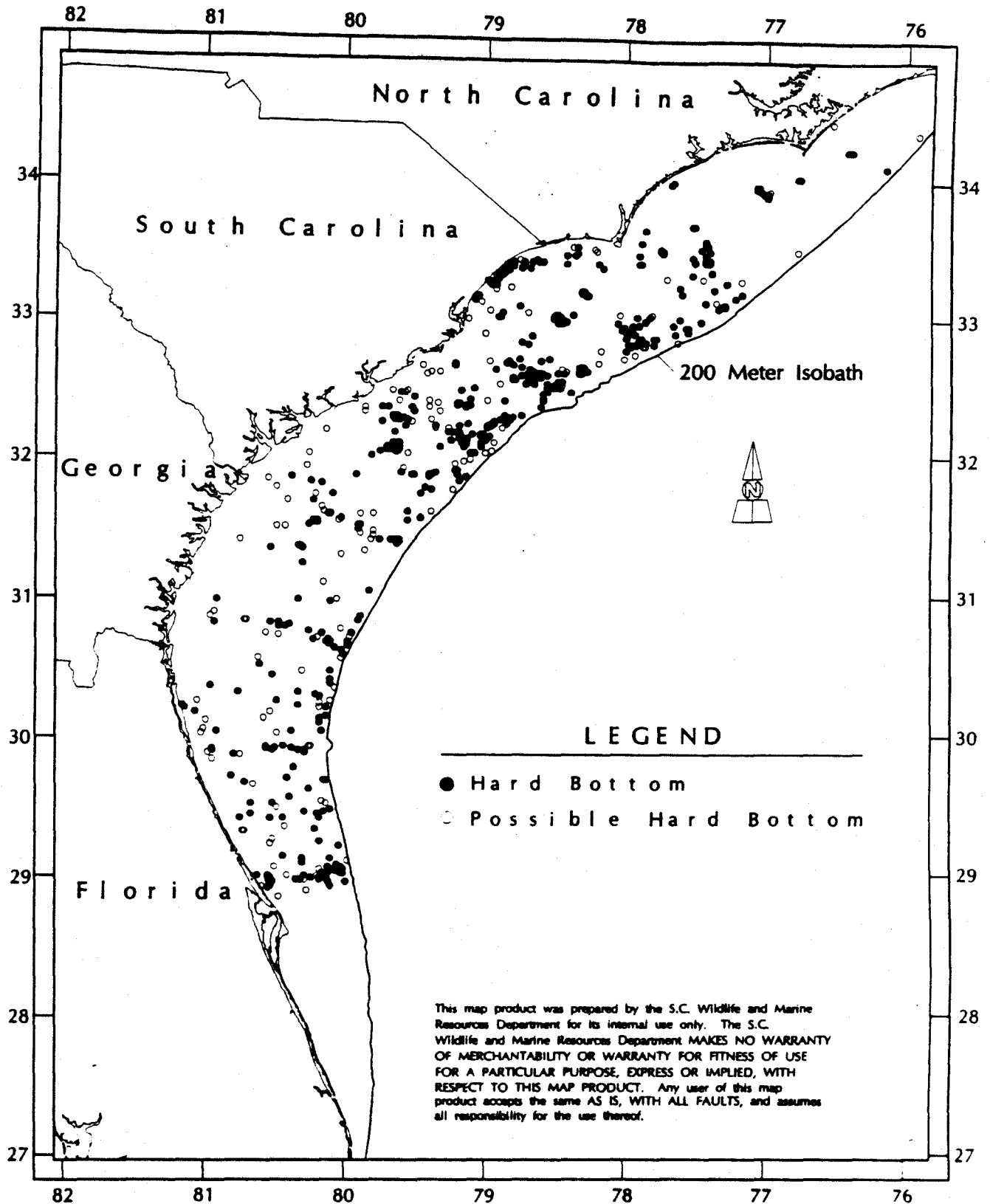


FIGURE 5

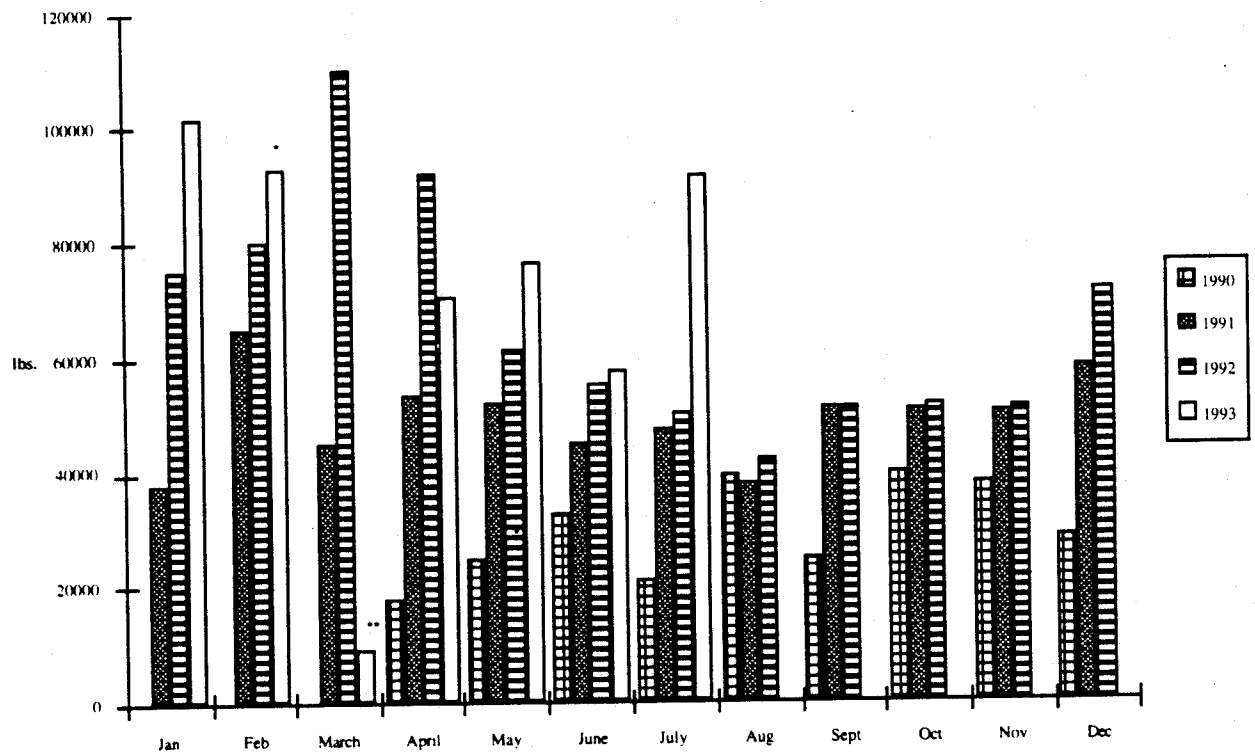


*circles only indicate existence of hard bottom and not actual total bottom area.

Draft distribution map of live bottom habitat in the South Atlantic Bight identified in the SEAMAP bottom mapping program. (NOAA, SCWMRD, 1993)

FIGURE 6

Trends in Monthly Live Rock Landings (EEZ off Florida 1990-1993).



- State quota filled February 12, 1993
- March 31, 1993 Preliminary injunction preventing enforcement of state quota issued.

Trends in Monthly Live Rock Landings from the EEZ off Florida (FDEP).

APPENDIX A

Habitat Information Needs

The following research needs relative to coral habitat are provided so that state, federal, and private research efforts can focus on those areas that would allow the Councils to develop measure to better manage coral and their habitat:

1. Identify optimum environmental and habitat conditions that limit coral production;
2. Determine the relationship between coral reefs and estuarine habitat conditions;
3. Quantify the relationships between coral growth and production and habitat;
4. Identify additional areas of particular concern for coral;
5. Determine methods for restoring reef habitat and/or improving existing environmental conditions that adversely affect reefs;
6. Identify mitigative methods for preserving and/or establishing reef;
7. Determine the impacts of trap fishing and trawling on coral and reef habitats.

Habitat Protection Programs

State and federal agencies and laws and policies that affect coral habitat are found in Section 7.0 of the Coral EIS and FMP (1982). Specific involvement by other federal agencies are identified below.

Office of Coastal Zone Management, Marine Sanctuaries Program, NOAA: Specifically, this program manages and funds the marine sanctuaries program. On-site management and enforcement are generally delegated to the states through special agreements. Funding for research and management is arranged through grants.

National Marine Fisheries Service: The enactment of the Magnuson Act provides for exclusive management of fisheries seaward of state jurisdiction. This includes both specific fishery stocks and habitat. The process for developing FMPs is highly complex. It includes plan development by various procedures through fisheries management councils. National Marine Fisheries Service implements approved plans. The Coast Guard, National Marine Fisheries Service, and states enforce fishery management plans. Fishery management plans for billfish, corals, and coral reefs, coastal migratory pelagics, red drum, reef fish, shrimp, spiny lobster, stone crab, sharks, snapper and grouper, and swordfish are in force in the Gulf of Mexico and South Atlantic.

National Park Service: National parks and monuments are under the jurisdiction of National Park Service. Management, enforcement, and research are accomplished in house.

Minerals Management Service: This agency has jurisdiction over mineral and petroleum resources on the continental shelf. Management has included specific lease regulations and mitigation of exploration and production activities in areas where coral resources are known to exist.

Fish and Wildlife Service: Fish and Wildlife Service assists with environmental impact review, develops biological resource evaluations, and administers the endangered species program with the NMFS. In the Keys area, the Fish and Wildlife Service manages several national refuges for wildlife.

Geological Survey: In the coral reef areas, the Geological Survey has conducted considerable reef research and assisted or cooperated with other institutions and agencies to facilitate logistics and support of coral reef research.

Coast Guard: The 1978 Waterways Safety Act charges the Coast Guard with marine environmental protection. The Coast Guard is the general enforcement agency for all marine activity in the federal zone. Among the duties are enforcement of sanctuary and fishery management regulations, managing vessel salvage, and coordinating oil spill cleanup operations at sea.

U.S. Army Corps of Engineers: The Corps contracts and regulates coastal engineering projects, particularly harbor dredging and beach renourishment projects. The Corps also reviews and is the permitting agency for coastal development projects, artificial reefs, and offshore structures.

Environmental Protection Agency: This agency has a general responsibility for controlling air and water pollution. Disposal of hazardous wastes and point-source discharge permitting are Environmental Protection Agency functions. Certain mineral and petroleum exploration and production activities are managed by Environmental Protection Agency. Environmental research germane to waste disposal and pollution also are funded.

Federal environmental agencies such as the National Marine Fisheries Service, Minerals Management Service, Fish and Wildlife Service, and the Environmental Protection Agency also analyze projects proposing inshore and offshore alterations for potential impacts on resources under their purview. This is similar to the function of the Council's Habitat Protection Committees. Recommendations resulting from these analyses are provided to the permitting agencies (the Corps for physical alterations in inshore waters and territorial seas, the Minerals Management Service for physical alterations in the Outer Continental Shelf or the offshore Exclusive Economic Zone (EEZ) and Environmental Protection Agency for chemical alterations). Even though the Corps of Engineers issues permits for oil and gas structures in the EEZ, they only consider navigation and national defense impacts, thus leaving the rest to the Department of the Interior, in a nationwide general permit.

Environmental Protection Agency is the permitting agency for chemical discharges into the Gulf of Mexico, under the National Pollution Discharge Elimination System (NPDES) program of the Clean Water Act for chemicals used or produced in the Gulf (i.e., drilling muds, produced water or biocides) and then released, or under the Ocean Dumping Regulations of the marine Protection, Research and Sanctuaries Act if the chemicals are transported into the Gulf for the purpose of dumping. When discharge or dumping permits are proposed, federal and state Fish and Wildlife Agencies may comment and advise under the Fish and Wildlife Coordination Act and National Environmental Protection Act. The Council may do likewise under the Magnuson Act and National Environmental Protection Act. The Councils also protect reef fish habitat under the Corals and coral Reefs Fishery Management Plan.

Habitat Recommendation

The coral resources contribute to the food supply, economy, health of the nation, and provides habitat for recreational and commercial fishing opportunities and aesthetic enjoyment. The

continued use of these resources can only be assured by the wise management of all aspects of habitat. Increased productivity may not be possible without habitat maintenance and regulatory restrictions.

Recognizing that all species are dependent on the quantity and quality of their essential habitats, it is the policy of the Councils to protect, restore, and improve habitats upon which commercial and recreational marine fisheries depend, to increase their extent and to improve their productive capacity for the benefit of the present and future generations. This policy shall be supported by three objectives which are to:

1. Maintain the current quantity and productive capacity of habitats supporting important commercial and recreational fisheries, including their food base. (This objective may be accomplished through the recommendation of no loss and minimization of environmental degradation of existing habitat);
2. Restore and rehabilitate the productive capacity of habitats which have already been degraded; and
3. Create and develop productive habitats where increased fishery productivity will benefit society.

To achieve these goals the Councils have formed Habitat Protection Committees and Advisory Panels. The purpose of the committees is to bring to the Council's attention activities that may affect the habitat of the fisheries under their management. The Councils pursuant to the Magnuson Act, will use their authorities to support state and federal environmental agencies in their habitat conservation efforts and will directly engage the regulatory agencies on significant actions that may affect habitat. The goal is to ensure that habitat losses are kept to the minimum and that efforts for appropriate mitigation strategies and applicable research are supported.

APPENDIX B

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL HABITAT AND ENVIRONMENTAL PROTECTION POLICY (as amended- August , 1991)

POLICY:

SAFMC HABITAT AND ENVIRONMENTAL PROTECTION POLICY

Recognizing that all species are dependent on the quantity and environmental quality of their essential habitats, it is the policy of the South Atlantic Fishery Management Council to:

Protect, restore and develop habitats upon which commercial and recreational marine fisheries depend, to increase their extent and to improve their productive capacity for the benefit of present and future generations. (For purposes of this policy, habitat is defined to include all those things physical, chemical and biological that are necessary to the productivity of the species being managed.)

Policy Objectives:

- 1) To protect the current quantity, environmental quality and productive capacity of habitats supporting important commercial and recreational fisheries. (This objective will be accomplished through the recommendation of no net loss or significant environmental degradation of existing habitat in the short term.)
- 2) To support and promote the net gain of fisheries habitat as a long term objective that will be accomplished through;
 - a) the restoration and rehabilitation of the productive capacity of habitats which have already been degraded and;
 - b) the creation and development of productive habitats where increased fishery production is probable.

The Council shall assume an aggressive role in the protection and enhancement of habitats important to marine and anadromous fish. It shall actively enter Federal decision-making processes where proposed actions may otherwise compromise the productivity of fishery resources of concern to the Council.

APPENDIX C

SAFMC POLICY STATEMENT CONCERNING DREDGING AND DREDGE MATERIAL DISPOSAL ACTIVITIES

Ocean Dredged Material Disposal Sites (ODMDS)

The shortage of adequate upland disposal sites for dredged materials has forced dredging operations to look offshore for sites where dredged materials may be disposed. These Ocean Dredged Material Disposal Sites (ODMDSs) have been designated by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (COE) as suitable sites for disposal of dredged materials associated with berthing and navigation channel maintenance activities. The South Atlantic Fishery Management Council (SAFMC; the Council) is moving to establish its presence in regulating disposal activities at these ODMDSs. Pursuant to the Magnuson Fishery Conservation and Management Act of 1976 (the Magnuson Act), the regional fishery management councils are charged with management of living marine resources and their habitat within the 200 mile Exclusive Economic Zone (EEZ) of the United States. Insofar as dredging and disposal activities at the various ODMDSs can impact fishery resources or essential habitat under Council jurisdiction the following policies concerning its role in the designation, operation, maintenance, and enforcement of activities in the ODMDSs:

Policies:

The Council acknowledges that living marine resources under its jurisdiction and their essential habitat may be impacted by the designation, operation, and maintenance of ODMDSs in the South Atlantic. The Council may review the activities of EPA, COE, the state Ports Authorities, private dredging contractors, and any other entity engaged in activities which impact, directly or indirectly, living marine resources within the EEZ.

The Council may review plans and offer comments on the designation, maintenance, and enforcement of disposal activities at the ODMDSs.

ODMDSs should be designated or redesignated so as to avoid the loss of live or hard bottom habitat and minimize impacts to all living marine resources.

Notwithstanding the fluid nature of the marine environment, all impacts from the disposal activities should be contained within the designated perimeter of the ODMDSs.

The final designation of ODMDSs should be contingent upon the development of suitable management plans and a demonstrated ability to implement and enforce that plan. The Council encourages EPA to press for the implementation of such management plans for all designated ODMDSs.

All activities within the ODMDSs are required to be consistent with the approved management plan for the site.

The Council's Habitat and Environmental Protection Advisory Panel when requested by the Council will review such management plans and forward comment to the Council. The Council may review the plans and recommendations received from the advisory sub-panel and comment to the appropriate agency. All federal agencies and entities receiving a comment or recommendation from the Council will provide a detailed written response to the Council regarding the matter pursuant to 16 U.S.C. 1852 (i). All other agencies and entities receiving a comment or recommendation from the Council should provide a detailed written response to the Council regarding the matter, such as is required for federal agencies pursuant to 16 U.S.C. 1852 (i).

ODMDSs management plans should indicate appropriate users of the site. These plans should specify those entities/ agencies which may use the ODMDSs, such as port authorities, the U.S. Navy, the Corps of Engineers, etc. Other potential users of the ODMDSs should be acknowledged and the feasibility of their using the ODMDSs site should be assessed in the management plan.

Feasibility studies of dredge disposal options should acknowledge and incorporate ODMDSs in the larger analysis of dredge disposal sites within an entire basin or project. For example, Corps of Engineers analyses of existing and potential dredge disposal sites for harbor maintenance projects should incorporate the ODMDSs as part of the overall analysis of dredge disposal sites.

The Council recognizes that EPA and other relevant agencies are involved in managing and/or regulating the disposal of all dredged material. The Council recognizes that disposal activities regulated under the Ocean Dumping Act and dredging/filling carried out under the Clean Water Act have similar impacts to living marine resources and their habitats. Therefore, the Council urges these agencies apply the same strict policies to disposal activities at the ODMDSs. These policies apply to activities including, but not limited to, the disposal of contaminated sediments and the disposal of large volumes of fine-grained sediments. The Council will encourage strict enforcement of these policies for disposal activities in the EEZ. Insofar as these activities are relevant to disposal activities in the EEZ, the Council will offer comments on the further development of policies regarding the disposal/ deposition of dredged materials.

The Ocean Dumping Act requires that contaminated materials not be placed in an approved ODMDS. Therefore, the Council encourages relevant agencies to address the problem of disposal of contaminated materials. Although the Ocean Dumping Act does not specifically address inshore disposal activities, the Council encourages EPA and other relevant agencies to evaluate sites for the suitability of disposal and containment of contaminated dredged material. The Council further encourages those agencies to draft management plans for the disposal of contaminated dredge materials. A consideration for total removal from the basin should also be considered should the material be contaminated to a level that it would have to be relocated away from the coastal zone.

Offshore and Nearshore Underwater Berm Creation

The use of underwater berms in the South Atlantic region has recently been proposed as a disposal technique that may aid in managing sand budgets on inlet and beachfront areas. Two types of berms have been proposed to date, one involving the creation of a long offshore berm, the second involving the placement of underwater berms along beachfronts bordering an inlet. These berms would theoretically reduce wave energy reaching the beaches and/or resupply sand to the system.

The Council recognizes offshore berm construction as a disposal activity. As such, all policies regarding disposal of dredged materials shall apply to offshore berm construction. Research should be conducted to quantify larval fish and crustacean transport and use of the inlets prior to any consideration of placement of underwater berms. Until the impacts of berm creation in inlet areas on larval fish and crustacean transport is determined, the Council recommends that disposal activities should be confined to approved ODMDSs. Further, new offshore and nearshore underwater berm creation activities should be reviewed under the most rigorous criteria, on a case-by-case basis.

Maintenance Dredging and Sand Mining for Beach Renourishment

The Council recognizes that construction and maintenance dredging of the seaward portions of entrance channels and dredging borrow areas for beach re nourishment occur in the EEZ. These activities should be done in an appropriate manner in accordance with the policies adopted by the Council.

The Council acknowledges that endangered and threatened species mortalities have occurred as a result of dredging operations. Considering the stringent regulations placed on commercial fisherman, dredging or disposal activities should not be designed or conducted so as to adversely impact rare, threatened or endangered species. NMFS Protected Species Division should work with state and federal agencies to modify proposals to minimize potential impacts on threatened and endangered sea turtles and marine mammals.

The Council has and will continue to coordinate with Minerals Management Service (MMS) in their activities involving exploration, identification and dredging/mining of sand resources for beach renourishment. This will be accomplished through membership on state task forces or directly with MMS. The Council recommends that live bottom/hard bottom habitat and historic fishing grounds be identified for areas in the South Atlantic region to provide for the location and protection of these areas while facilitating the identification of sand sources for beach renourishment projects.

Open Water Disposal

The SAFMC is opposed to the open water disposal of dredged material into aquatic systems which may adversely impact habitat that fisheries under Council jurisdiction are dependent upon.

The Council urges state and federal agencies, when reviewing permits considering open water disposal, to identify the direct and indirect impacts such projects could have on fisheries habitat.

The SAFMC concludes that the conversion of one naturally functioning aquatic system at the expense of creating another (marsh creation through open water disposal) must be justified given best available information.