

APPENDIX 4
Fishery Management Plan for Corals and
Reef Associated Plants and Invertebrates of
Puerto Rico and the U.S. Virgin Islands

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE

Fishery Management Plan for Corals and
Reef Associated Plants and Invertebrates of
Puerto Rico and the
United States Virgin Islands

Caribbean Fishery Management Council

July 1994

COVER SHEET

RESPONSIBLE AGENCIES: Caribbean Fishery Management Council
National Marine Fisheries Service

TITLE OF PROPOSED ACTION:
Fishery Management Plan for Corals and
Reef Associated Plants and Invertebrates
of Puerto Rico and the U.S. Virgin Islands

CONTACT FOR FURTHER INFORMATION:

Sr. Miguel Rolón
Executive Director
Caribbean Fishery Management Council
Suite 1108, 268 Muñoz Rivera Avenue
San Juan, Puerto Rico 00918-2577
(809) 753-6910

TYPE OF DOCUMENT: Final Environmental Impact Statement (FEIS)

ABSTRACT:

The Caribbean Fishery Management Council (Council) is proposing a Fishery Management Plan (FMP) for over 100 species of corals and over 60 species of reef-associated plants and invertebrates in Puerto Rico and the U.S. Virgin Islands. The FMP includes a fishery for live invertebrates, taken for the marine aquarium trade, and other coral reef and seagrass resources. The FMP is designed to address the impacts of man's activities on the condition of coral reefs and to respond to the rapidly expanding fishery for aquarium species, especially in Puerto Rico. Except for permitted research, education and restoration programs, the FMP prohibits the harvest of stony corals, sea fans, gorgonians and live-rock; limits harvest of other invertebrates to dip nets and slurp guns; and prohibits the use of chemicals and explosives. The FMP also addresses interstate or international commerce in prohibited species and requires permits and reporting to improve data collection. The FEIS explores the environmental consequences of the proposed actions, and alternative measures, and considers the possible economic impacts of limited harvests, restricted gear, and reporting requirements, on commercial harvesters of coral reef resources.

DUE DATE FOR COMMENTS: OCT. 10, 1995

TABLE OF CONTENTS

Section	Page
1.0 PURPOSE AND NEED	1
2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION	4
3.0 AFFECTED ENVIRONMENT	17
4.0 ENVIRONMENTAL CONSEQUENCES	25
5.0 LIST OF PREPARERS	28
6.0 LIST OF AGENCIES AND ORGANIZATIONS	28
7.0 RESPONSE TO PUBLIC COMMENTS	28

1.0 PURPOSE AND NEED

The FMP was developed for two reasons. The first is a general concern for effects of man's activities on coral reefs and reef-associated resources. The second is related to a new and rapidly expanding fishery for the marine aquarium industry, especially in Puerto Rico (See FIGURES 1 and 2). The Council is concerned about potential impacts of this fishery on both the targeted organisms and on the reef habitat from which they are collected, due to increasing demand and current harvest methods (e.g., chemicals and removal of reef substrate for "live-rock"). Although state laws regulate coral, there is no federal regulation of the taking of coral and coral reefs. No state or federal laws exist to protect reef-associated plants and invertebrates (except for spiny lobster and queen conch). The FMP, in association with state laws, is expected to provide consistent coral regulation in both state and federal waters off Puerto Rico and the U.S. Virgin Islands. Further, the FMP will provide a management scheme for currently unregulated reef-associated plants and invertebrates.

A major source of mortality of corals and associated seagrasses and invertebrates is sedimentation and pollution, caused predominately by land-based or nearshore activities such as deforestation and discharge of untreated sewage. The Council intends to use this plan to bring state and federal agencies together to work on these habitat issues. In particular the Council is concerned about the reduction of sediment input from upland sources, the elimination of discharge of untreated sewage and petroleum products into coastal waters, and higher standards for discharge permits.

Reef habitats surrounding Puerto Rico and the U.S. Virgin Islands are of special concern. Degradation from man-made and natural causes, despite current laws, is compromising these ecosystems. Anthropogenic stress on coral reefs not only directly compromises their condition, and that of the organisms that depend on them, but is also believed to undermine the reefs' ability to recover from natural stress. Loss of coral reef and seagrass habitats directly affects a wide range of organisms including fisheries of considerable commercial and recreational significance in the Caribbean. These resources are heavily dependent on reef habitats for food and shelter. Of particular concern is the loss or degradation of habitats critical for certain life history stages or phases of development.

Important sources of habitat degradation, other than land-based activities, are dredging and dumping, anchor damage, ship groundings, tourist and diver activities, and collection by scientists or commercial fishers. The Council believes that some of these effects can be mitigated by appropriate management action.

There is a potential for a rapid increase in the exploitation of components of the fishery management unit (FMU) and Puerto Rico may soon become the principal source of tropical western Atlantic organisms for the U.S. market, thereby further increasing pressure on resources and intensifying the need for management action. In addition, importation of

marine exotic species by pet shops into Puerto Rico (1,220 boxes in 1991) introduces the potential for exotic introductions into marine waters through release or escape. Certain harvest techniques, such as the use of chemicals and the physical removal of live-rock and corals, or the disturbance of substrate in the course of collecting organisms, damage coral reef habitat.

There is insufficient scientific and fishery information on reefs, most reef-associated invertebrates, and seagrasses, regarding growth rates, life span, colonization patterns, distribution, abundance, landings, catch, effort and mortality, on which to base species-specific recommendations or to determine levels of optimum yield (OY), maximum sustainable yield (MSY), or allowable harvest levels. Little is known of the importance of interspecific associations in the distribution and general health of reef species, although these factors are thought to be critical to the integrity and diversity of the coral reef ecosystem. Given the importance of coral reef and seagrass habitats for commercial and recreational fisheries, for tourism-related activities, and the role of coral reefs in reducing coastal erosion, it is clear that there is a potential for user conflicts. If present trends continue, i.e., increasing coastal development and commercial exploitation, the condition of the coral reefs is expected to continue to deteriorate. The Council has agreed on a proposed set of management objectives to address the problems of coral resources.

MANAGEMENT OBJECTIVES

- O 1. To optimize the benefits to the Nation generated from the resources of coral, live-rock, seagrasses and reef-associated plants and invertebrates, while ensuring their conservation and long-term preservation, through implementation of a management plan consistent with other management plans in the federal waters of the U.S. Caribbean.
- O 2. To minimize adverse human impacts on coral, live-rock, seagrasses and reef-associated plants and invertebrate resources by reducing fishing pressure, wasteful harvest practices, and other anthropogenic stressors directly affecting them, and allowing for the restoration of naturally balanced reef systems.
- O 3. To establish resource data collection and permitting systems, and a research and monitoring program to collect fishery information and develop scientific data necessary to best utilize and preserve components of the management unit, and to enable establishment of an OY for reef-associated invertebrates.
- O 4. To provide, where appropriate, for special management of reef and seagrass habitats of particular concern or ecological importance through the establishment of reserves and other protected areas.

- 5. To increase public and government awareness of the importance and vulnerability of reef, seagrass and reef-associated resources. Informing and educating the general public of the importance of these resources will reduce adverse human impacts and foster support for management. Education of resource users, such as tourists and fishers, will provide more conscientious resource use.
- 6. To provide for and promote a consistent, coordinated and enforced management regime for the conservation and best utilization of reefs, seagrasses and reef-associated resources, in cooperation with state governments and other nations in the region.
- 7. To provide a flexible management system which minimizes regulatory delay while retaining substantial Council and public input into management decisions and which can rapidly adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups, or by area.
- 8. To reduce user conflicts in the fishery management unit through management and recommendations.
- 9. To eliminate or significantly reduce terrigenous sediment, anthropogenic input from upland sources into coastal waters, and the discharge of untreated sewage and petroleum products into coastal waters. This objective may be addressed through recommendations to local governments to encourage compliance with, and enforcement of, laws regulating activities that result in products that negatively affect the condition of reef and seagrass habitats and reef-associated organisms.

ISSUES TO BE CONSIDERED
OVERFISHING - How can we reduce direct and indirect harvests of slow-growing or non-renewable coral reef resources?
ECONOMIC IMPACTS - What are the effects of limiting harvests on commercial collectors and what are the benefits to non-consumptive users?
HABITAT LOSS - What is the effect of continued removal of reef resources on commercial fish stocks and threatened and endangered species?
MONITORING & ENFORCEMENT - How can we improve the opportunities for effective monitoring and enforcement of conservation rules?
INEFFICIENT UTILIZATION - How can we reduce capture and transport mortality of aquarium species?
INADEQUATE INFORMATION - How can we improve the data base for more effective management of coral resources?
REGIONAL MANAGEMENT - What is the best way to ensure a consistent management regime for the U.S. Caribbean?

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The following management measures (proposed actions) are intended to address the management objectives discussed above. Each management measure has a number of alternatives that have been considered by the Council.

MANAGEMENT MEASURE 1: Prohibit the harvest or possession of stony corals, whether alive or dead, except for legally permitted research, education and restoration programs.

Corals and coral reefs are distinctive habitats of limited distribution. Their principal value is non-consumptive. They provide essential habitat to shelter reef-associated fish and invertebrates, and have aesthetic significance for recreational users and tourists. Given the characteristically slow growth rates of stony corals, recovery and regeneration following harvest and other human perturbations are far slower than observed in most other living resources. Stony corals must therefore be considered as a resource that is non-renewable on a human time scale and harvest should be prohibited to ensure no net loss. Since the potential for increase in intensity of harvest and physical damage is high, as demand for marine aquarium organisms and recreational use grows, regulations that protect this resource are urgently needed. However, an exception is appropriate for

research, education and restoration activities to allow data collection, study, and recovery of the depleted resource. Permits would be required for scientific and educational harvest, and restoration programs. Harvest of stony corals is prohibited in state waters of Puerto Rico and the U.S. Virgin Islands without a permit.

ALTERNATIVE 1A § Permit the regulated harvest of stony corals.

Although the majority of corals and coral reefs are non-renewable resources, it may be possible to allow commercial harvest of some of the faster growing species, such as Acropora spp. However, to avoid risk of overharvest, any permitted harvest levels would have to be based on sound scientific information on growth and replacement rates. Since relevant information is not available to indicate a safe level of harvest for any species of stony coral in the management unit, this is not currently a viable management option. Once information becomes available that indicates that harvest may be resumed, the Council intends to amend the plan accordingly.

ALTERNATIVE 1B § Prohibit all harvest of stony corals.

Total prohibition of harvest of stony corals would provide maximum protection for this resource. However, the Council believes that an exemption permitting limited harvest for bona fide scientific, educational, and habitat restoration activities is necessary to enhance our understanding and appreciation of coral resources and to allow for mitigation measures in damaged areas.

ALTERNATIVE 1C § No Action.

Stony corals receive no protection in waters under federal jurisdiction surrounding Puerto Rico and the U.S. Virgin Islands. While the resource does have commercial value, its principal worth is in non-consumptive uses. Regulations are needed to maintain and conserve corals and coral reefs and to prevent their damage and destruction. While this option could provide short-term benefits to those currently taking stony corals, ultimately status quo would negatively impact the resource and, in turn, any industries dependent on the healthy condition of coral resources and on the exploitation of coral-dependent organisms.

MANAGEMENT MEASURE 2: Prohibit the harvest or possession of sea fans and gorgonians (octocorals), live or dead, and any species in the fishery management unit if attached or existing upon live-rock, except for legally permitted research, education and restoration programs.

Octocorals are most valuable as habitat for other organisms and as a source of biomedically active compounds. They have aesthetic, non-consumptive value for recreational divers and have a limited commercial use in the marine aquarium trade. Live-

rock is an integral part of the reef community and is of value as habitat and as a product for the marine aquarium trade. These sessile reef resources are particularly vulnerable to natural and anthropogenic stress because of their sedentary nature and because, especially in the case of live-rock, their replacement rates are characteristically too slow to be considered a renewable resource. Moreover, especially in the case of gorgonians, population dynamics may make these resources less responsive to traditional fishery management approaches and, therefore, possibly more vulnerable to overfishing. Pressure to exploit octocorals and live-rock is expected to grow as market demand for live marine invertebrates increases and as regulations elsewhere (e.g., Florida) become increasingly restrictive. Octocorals and live-rock are believed to be of greater value to the Nation as habitat, for aesthetic use, and, in the case of certain octocorals, as potential sources of medically important compounds, than as a commercially harvested resource to supply the aquarium trade. Permits will be required for exempted research, education and habitat restoration purposes.

ALTERNATIVE 2A — Prohibit the harvest or possession of octocorals and live-rock, except for legally permitted research, education and restoration programs, or in the course of bona fide aquaculture operations.

Local governments could adopt live-rock aquaculture leasing programs, similar to those under development in Florida, to allow individuals to lease submerged lands for commercial purposes. Siting criteria, marking requirements, and other regulations would need to be developed to mitigate potential adverse impacts on the environment and enhance enforcement. Open-water aquaculture operations could affect marine ecosystems by changing species composition and distributions of natural communities. Without controls on allowable substrate in aquaculture operations, there is the potential to introduce organic and inorganic contaminants. Additionally, stony corals will settle on the aquaculture substrate and their harvest and sale will need to be specifically addressed. Stony coral aquaculture and sale will be an inevitable by-product of live-rock aquaculture operations.

Open-water live-rock culture has not yet been attempted on a commercial basis. One 5-acre lease site off Florida's west central coast (Tarpon Springs) is expected to begin operations shortly. Land-based, closed systems for live-rock aquaculture would also require a permitting process for collection of "seed-stock", some type of facilities inspection, and testing of discharge waters. Open-water systems require much less capital investment and are therefore favored by potential investors in Florida. The degree of interest in live-rock aquaculture in the U. S. Caribbean is unknown.

ALTERNATIVE 2B § Permit the regulated harvest of octocorals and live-rock.

Given the importance of octocorals and live-rock as non-consumptive resources and the lack of definitive information regarding growth and replacement rates and natural

abundance, recommendations of sustainable harvest levels are not possible at this time. However, octocorals rejuvenate removed portions and grow faster than stony corals. Thus, limited harvest of certain octocoral species may be possible in the future based on appropriate scientific findings that could help establish sustainable harvest levels. Once information becomes available that indicates harvest of octocorals or live-rock can be resumed, the Council intends to amend this plan accordingly.

ALTERNATIVE 2C S Prohibit all take of octocorals and live-rock.

Total prohibition of take of octocorals and live-rock would provide maximum protection for this resource. However, the Council believes that an exemption permitting limited harvest for scientific and habitat restoration activities is necessary to enhance our understanding and appreciation of these resources, and to allow mitigation measures in damaged areas.

ALTERNATIVE 2D S No Action.

Octocorals and live-rock receive no protection in waters under federal jurisdiction in the U.S. Caribbean. While these resources have limited commercial value in the aquarium trade, their primary worth is in non-consumptive uses and as potential sources of biomedically active compounds. Regulations are needed to maintain and conserve octocorals and live-rock and to prevent their damage or destruction. While this option could provide short-term benefits for those currently harvesting octocorals and live-rock, ultimately, the status quo would negatively impact the resource and, in turn, the industries and other organisms dependent on them.

MANAGEMENT MEASURE 3: Prohibit the sale or possession of any species whose harvest is prohibited unless the specimen entered the management area in interstate or international commerce and is fully documented as to point of origin.

It may be necessary to document the legal possession of prohibited species that were harvested from, or purchased, outside the area and arrived in interstate or international commerce. The burden of proof, however, should be upon the person possessing prohibited species (for sale or exchange) to establish the chain of possession beginning with (1) the name and home port of the vessel or the name and address of the individual harvesting the species, (2) the date and port of landing of the species, (3) information specified in 50 CFR 246 for marking containers or packages of organisms that are imported, exported, or transported in interstate commerce, and (4) a statement signed by the dealer attesting that the species was harvested from an area other than the management area. Failure to maintain such documentation or to promptly produce it at the request of an authorized law enforcement agent could be considered prima facie evidence that the prohibited species was harvested from the management area and is in illegal possession.

ALTERNATIVE 3A § No action.

Without specified procedures to provide a "paper trail" documenting the origin of a specimen, a person in possession of a prohibited species would not be able to prove legal possession. Additionally, enforcement personnel should be able to assume, in the absence of specific documentation, that the prohibited species was taken from the management area and not imported legally.

MANAGEMENT MEASURE 4: Prohibit the use of chemicals, plants or plant derived toxins, and explosives to harvest organisms in the coral fishery management unit, except for legally permitted research, education and restoration programs.

Synthetic chemicals, natural products derived from plant species, and explosives, including powerheads on spear guns, would be prohibited. Chemicals currently being used to harvest reef-associated organisms include the fish anesthetic, quinaldine, gasoline, and bleach. These substances are known to be detrimental to both fish and invertebrate species on both long- and short-term bases. Since other, less damaging, methods are available to successfully harvest these organisms, this proposed prohibition would not preclude harvest of the majority of commercial organisms.

ALTERNATIVE 4A § Permit the regulated use of chemicals, including those derived from plant species, and explosives to harvest corals and associated invertebrates.

Under this option, the harvest of corals and associated invertebrates with synthetic chemicals, plant derivatives, and explosives would be allowed under permit. However, in the opinion of the Council, the toxic nature of quinaldine, the most commonly used chemical method of collection, and the destructive nature of explosives, combined with the availability of effective alternative methods, precludes the adoption of this alternative.

ALTERNATIVE 4B § No action.

Continued unregulated use of chemicals is expected to result in both short- and long-term detrimental effects on coral resources, especially sessile reef-associated organisms. It is widely understood that explosives have devastating effects on reef communities. Quinaldine, the most popular chemical collection method, is a coal tar derivative used in the manufacture of dyes and explosives. Although its effects on most species are inconclusive, quinaldine is known to be toxic to some organisms. The use of quinaldine is prohibited, along with the use of other chemical substances and explosives, under the Reef Fish FMP and by state laws of Puerto Rico and the U.S. Virgin Islands.

MANAGEMENT MEASURE 5: Limit harvest of fishery management unit organisms to hand-held dip nets, slurp guns, by hand, and other non-habitat destructive gear, except for legally permitted research, education and restoration programs.

Gear methods commonly used to harvest marine aquarium invertebrates include hand-held dip nets, chemicals such as quinaldine, and slurp guns. A crow bar or similar instrument is sometimes used to remove live-rock and to overturn corals and coral heads to allow access to organisms sheltering underneath. Some of these methods can damage the reef habitat and are a source of incidental mortality for other reef-associated organisms. Of the traditional gear employed in the harvest of marine aquarium organisms, only hand-held dip nets and slurp guns represent no threat to coral reefs and associated organisms and are effective for the majority of commercial organisms. While most invertebrates may be collected with dip nets and slurp guns, certain collections for scientific, educational, or restorative purposes may require the use of chemicals (such as anesthetics) or nets such as cast nets. Accordingly, an exemption for certain permitted gear is proposed.

ALTERNATIVE 5A S Limit harvest of marine aquarium invertebrates to hand-held dip nets and slurp guns and to current levels of harvest.

There is insufficient information to allow evaluation of OY for reef-associated invertebrates in the FMU. Although an estimate of current harvest levels could be based on reported exports, this may be an underestimate due to the substantial but unquantified on-island trade. The Council does not believe that any of these species are in current danger of being overfished, with the possible exception of Condylactis sp. which constitutes over 50 percent of the export trade, by number. When additional information becomes available, this option will be re-evaluated.

ALTERNATIVE 5B S Prohibit harvest of reef-associated invertebrates.

Maximum protection of invertebrate species in the FMU would be afforded by a total prohibition of harvest. However, because the majority of reef-associated invertebrates are thought to be currently harvested in low numbers and may be able to sustain limited harvest activity at these levels, a total prohibition is not justified at this time. If, however, harvest levels increase or certain species are considered to be particularly vulnerable to harvest, the Council intends to reconsider this option.

ALTERNATIVE 5C S No action.

Reef-associated invertebrates, with the exception of spiny lobster, receive no protection in waters under federal jurisdiction in the U.S. Caribbean. There is growing pressure to increase exploitation of this resource in Puerto Rico and, to a lesser extent, in the U.S. Virgin Islands as demand for marine aquarium organisms grows and as restrictions are increasingly applied elsewhere. Puerto Rico has the potential to become the major world

source of Caribbean invertebrate species for the aquarium trade. While this option could provide short-term benefits for current harvesters, the potential exists for significant damage to coral resources from certain methods of harvest such as toxins and crowbars. Ultimately, status quo would negatively impact the resource and, in turn, the industries dependent on the exploitation of coral resources.

MANAGEMENT MEASURE 6: Require a permit (up to a year) to harvest or possess organisms in the fishery management unit in the EEZ.

An annual permit would be required to harvest, maintain, and/or sell reef-associated invertebrates in the FMU. The permit system would be operated by local governments, with the assistance of the National Marine Fisheries Service (NMFS). NMFS could screen and recommend approval or disapproval of any applications from the U.S. mainland. Permit applicants would have to supply information regarding species to be collected, quantities, unit value, collection areas, and gear used. A permit would be denied anyone with an outstanding violation in any state or federally regulated fishery. Issuance of a permit would be subject to acceptance by permittees of minimum standards of maintenance, handling, and transport of live marine organisms. An appropriate fee would be charged to recover costs of administering the permit system. A permit system is needed to determine present effort in the fishery and to identify participants. It would also facilitate introduction of a limited entry system, in the event such a system is warranted. Special permits would also be available for research, education and restoration purposes for other components of the FMU (stony corals, octocorals, and live-rock). Research, education and restoration permits would be awarded on a case-by-case basis following submission of a research plan, including species and quantities to be collected, and area of collection.

ALTERNATIVE 6A S No action.

Harvesters and exporters of invertebrates for the marine aquarium trade and other commercial users are not currently licensed in Puerto Rico and their activities are not regulated.

The U.S. Virgin Islands requires permits for both harvest and export; however, most commercial harvest occurs in Puerto Rico. A permit system for the entire management area is needed to establish area-wide participation in the fishery, to help limit access to the fishery should this become necessary, and for consistent management for the entire FMU.

MANAGEMENT MEASURE 7: Require harvesters, dealers, and exporters of species managed under the Plan to acquire a permit (up to one year), to submit records on a regular basis and to report harvest, shipments, and unit costs.

Reports would be required by the permit agency to more accurately determine actual participation in the fishery, catch, and effort. This data would allow managers to assess the status of resources in the FMU and make informed decisions on future management measures. Permit data could also be used to estimate mortality of organisms collected by the aquarium trade between the time of capture and shipping. Permit data would also be used as the foundation for the development of a limited access system for the fishery, if necessary, and could help establish OY for invertebrate species. Reporting intervals and other requirements should be patterned after systems already tested and proven successful in other fisheries.

ALTERNATIVE 7A § No action.

No action would result in a continuing lack of information upon which to base management decisions and a growing potential for overharvest. A number of management actions and recommendations have already been deferred by the Council's Scientific and Statistical Committee (SSC) and Advisory Panel (AP) because of insufficient data. Indecision on proper management actions, including establishment of OY, would be expected to continue in the absence of a permit and reporting system. Information on the number of participants and the amount of catch and effort is currently too incomplete to develop limited access programs should this prove to be necessary.

Establishment of Marine Conservation Districts (MCDs) -- Deferred Alternative.

The Council is considering the establishment of MCDs. An MCD is a discrete geographical area of special value and significance to the marine ecosystem that is to be maintained in its natural state. The purpose of the MCD is to conserve and manage representative samples of marine habitats and ecosystems and to maintain marine biodiversity. The expected effects of establishing MCDs under this FMP are (1) to provide refuge and replenishment areas to ensure continued abundance and diversity of reef resources; (2) to protect critical spawning stock and recruits from depletion and overfishing, thus increasing abundance of fishery resources; (3) to protect coral and coral habitat, and (4) to improve opportunities for eco-tourism.

Based on comments received on the draft FMP/EIS, the Council decided to defer the establishment of MCDs until more information is available and further consultation with the user groups is carried out.

TABLE I

Effects of Management Measures (1-7) and their Alternatives on the Issues:

1. STONY CORAL ALTERNATIVES				
ISSUES	No Action	Limit Harvest	No Harvest w/exceptions	No Harvest
Overfishing	Continuing adverse impacts.	Lessens adverse impacts.	Eliminates most impacts.	Maintains OY.
Economic Impacts	No effects on commercial users.	Minor effects.	Negative impact on harvesters.	Negative impact on harvesters.
Habitat Loss	Continuing adverse impacts.	Lessens adverse impacts.	Eliminates most impacts.	No "net" loss.
Monitoring & Enforcement	No effects.	Enforcement problems.	Enforcement problems.	Enforcement problems.
Inefficient Utilization	No effects.	No effects.	Lessens impacts.	Eliminates problem.
Inadequate Information	No effects.	No effects.	No effects.	No effects.
Regional Management	No effects.	Improves.	Improves.	Improves.
2. SOFT CORAL / LIVE-ROCK ALTERNATIVES				
ISSUES	No Action	Limit Harvest	No Harvest w/exceptions	No Harvest
Overfishing	Continuing adverse impacts.	Lessens adverse impacts.	Eliminates most impacts.	Maintains OY
Economic Impacts	No effects on commercial users.	Minor effects.	Negative impact on harvesters.	Negative impact on harvesters.
Habitat Loss	Continuing adverse impacts.	Lessens adverse impacts.	Eliminates most impacts.	No "net" loss
Monitoring & Enforcement	No effects.	Enforcement problems.	Enforcement problems.	Enforcement problems.
Inefficient Utilization	No effects.	No effects.	Lessens impacts.	Eliminates problem.
Inadequate Information	No effects.	No effects.	No effects.	No effects.
Regional Management	No effects.	Improves.	Improves.	Improves.

TABLE I (CONT.)

3. DOCUMENTATION ALTERNATIVES			
ISSUES	No Action	"Paper-trail" Required	
Overfishing	No effect.	Discourages illegal possession.	
Economic Impacts	No effect.	Minor to commercial interests.	
Habitat Loss	No effect.	Discourages illegal possession.	
Monitoring & Enforcement	No effect.	Major improvement.	
Inefficient Utilization	No effect.	No effect.	
Inadequate Information	No effect.	Minor improvement.	
Regional Management	No effect.	Improves.	
4. CHEMICALS/EXPLOSIVES ALTERNATIVES			
ISSUES	No Action	Limit Use	Prohibit Use
Overfishing	Continues adverse effects.	Lessens incidental taking.	Ends incidental taking.
Economic Impacts	None on commercial users.	Minor effects.	Minor effects.
Habitat Loss	Continuing adverse impacts.	Some improvement.	Major improvement.
Monitoring & Enforcement	No effects.	Enforcement intensive.	Enforcement needed.
Inefficient Utilization	Continues adverse effects.	Some improvement.	Eliminates incidental take.
Inadequate Information	No effects.	No effects.	No effects.
Regional Management	No effects.	Positive benefits.	Positive benefits.

TABLE I (CONT.)

5. GEAR RESTRICTION ALTERNATIVES				
ISSUES	No Action	Limit Harvest by Gear	Limit Harvest by Gear/Quota	No Harvest
Overfishing	Unknown.	Expected benefits.	Expected benefits.	Positive effects.
Economic Impacts	None on commercial users.	Minor effects.	Moderate effects.	Major effects.
Habitat Loss	Continues adverse impacts.	Protects from nets, etc.	Protects from nets/overfishing.	Complete protection.
Monitoring & Enforcement	No effects.	Enforcement needs.	Enforcement needs.	Easier to enforce.
Inefficient Utilization	Continues adverse impacts.	Decreases capture mortality.	Decreases capture mortality.	Eliminates capture mortality.
Inadequate Information	No effects.	No effects.	No effects.	No effects.
Regional Management	No effects.	Positive effects.	Positive effects.	Positive effects.
6. HARVESTER PERMIT ALTERNATIVES				
ISSUES	No Action	Permits Required		
Overfishing	Unknown.	Unknown.		
Economic Impacts	None.	Minor.		
Habitat Loss	No effects.	No effects.		
Monitoring & Enforcement	Continues adverse impacts.	Improves.		
Inefficient Utilization	No effects.	No effects.		
Inadequate Information	Continues adverse impacts.	Improves.		
Regional Management	No effects.	Positive effects.		

TABLE I (CONT.)

7. DEALER/EXPORTER PERMIT ALTERNATIVES		
ISSUES	No Action	Permits/Reports Required
Overfishing	Unknown.	Unknown.
Economic Impacts	None.	Minor.
Habitat Loss	No effects.	No direct effects.
Monitoring & Enforcement	Continues adverse effects.	Greatly improves.
Inefficient Utilization	No effects.	No effects.
Inadequate Information	Continues adverse effects.	Greatly improves.
Regional Management	No effects.	Positive effects.

POSSIBLE FUTURE ACTIONS

Several management measures were identified during the development of this FMP which merit consideration for future action. These measures were not included in the FMP because of insufficient data, but may be added by future amendment. The measures include:

- < establishing marine conservation districts in the EEZ
- < setting quotas for the harvest of reef-associated invertebrates
- < limiting entry into the aquarium fishery, including establishment of a control date for possible use in determining historical participation
- < establishing temporary closures (e.g., spawning season or area closures)
- < prohibiting harvest of additional vulnerable or rare species
- < developing maintenance, handling, and transportation standards to minimize mortality in the aquarium trade for reef-associated invertebrates
- < prohibiting the introduction of exotic marine organisms

SPECIAL RECOMMENDATIONS:

It is the basic premise and goal of this FMP that management of component resources be carried out throughout their range. In particular, given the effect of anthropogenic activities on nearshore reefs, especially in state waters, state cooperation is essential for effective

management. Solutions to the problems of reef management may only be found through a combination of state and Federal action. One of the more critical issues is the elimination of discharge of untreated sewage and petroleum products into coastal waters.

The FMP provides the following recommendations to the governments of Puerto Rico and the U.S. Virgin Islands:

- / Establish permitted anchoring sites in coral reef areas
- / Identify habitats of special concern or ecological importance
- / Create marine conservation districts to provide a monitoring baseline and to increase productivity by enhancing the spawning potential of individuals in the protected area with resulting benefits for both local fisheries and eco-tourism

Candidate areas include: Culebra (including the Península Flamenco area), Cordillera, Vieques Sur, Vieques Norte, Bahía de Jobos, Isla Caja de Muertos, Margarita, Islas Mona and Desecheo in Puerto Rico; south of St. John, and the reserve areas in St. Croix, as proposed by the U.S.V.I. Department of Planning and Natural Resources.

- / Develop a comprehensive mapping of coral and rock reef areas over the insular platform
- / Harmonize state and federal laws
- / Ensure compliance with discharge and dredging laws
- / Permit only tertiary water treatment standards for identified coral areas
- / Develop a code of standards for the maintenance, handling, and transportation of fish and invertebrates traded live and ensure compliance with existing regulations on the treatment of live animals
- / Extend existing data collection programs to include data collection on the marine aquarium trade through port sampling, inspections of maintenance facilities, and pet shops, and airport monitoring
- / Cooperate with NMFS to ensure consistent and integrated permit and data collection systems
- / Regulate diving activities to reduce damage to reef areas from direct physical contact and recreational collecting

- / Emphasize the importance of the reef ecosystem in the development of tourism (ecotourism)
- / Introduce a permit system for those who collect and market live marine organisms
- / Develop management measures for seagrass habitats
- / Prohibit the release of exotic marine species into island waters
- / Enforce existing regulations to protect coral resources and habitats

3.0 AFFECTED ENVIRONMENT

Goenaga and Boulon (1992) provide a description of the corals and coral reefs of Puerto Rico and the U.S. Virgin Islands. This report is included as Appendix 1 of the attached FMP. In addition, Sections 2, 3, and 4 of the FMP contain a Description of the Resource, a Description of the Fishery, and a summary of Capacity Limits.

Description of the Resource

Species in the FMU

The FMU includes all corals, reef-associated invertebrates, and marine plants. Following is a list of the common names of the major groups. See Table 1 of the FMP for a more detailed description and species listings.

- #Stony Corals
 - Reef-building corals (Scleractinians)
 - Fire Corals (Hydrocorals)
 - Black Corals
- # "Live-rock"
- # Octocorals
 - Gorgonians
 - Sea Fans
- # Sea Anemones
- # Sponges
- # Tube Worms

Mollusks

Snails
Nudibranchs
Clams, Scallops
Oysters
Octopus

Crustaceans

Shrimp
Crab

Echinoderms

Starfish
Brittlestars
Feather Stars
Sea Urchins

Bryozoans (moss animals)

Sea Squirts

Marine Algae

Sargassum
Watercress (Halimeda spp)
Green Feather, Green Grape Algae (Caulerpa spp.)
Mermaid's Fans and Cups (Udotea spp.)
Coralline Algae

Seagrasses

Turtle Grass
Manatee Grass
Sea Vines

Stony Corals

Coral reefs are among the most productive ecosystems on earth, supporting a higher biological diversity than any other system, with the possible exception of tropical rain forests. The structural complexity of the reefs produces a baffle effect, which acts to reduce wave energy. Stony corals buffer the shoreline and prevent erosion. The biodiversity of the reef system sustains coastal reef fisheries and has provided chemical compounds of medical significance. Their biodiversity and aesthetic value is also responsible for the rapid growth of recreational diving and other tourist activities. For example, the National Park Service reported an increase

in annual visitors to the underwater trail in Trunk Bay, St. John, U.S. Virgin Islands from 20,000 in 1966 to 170,000 in 1986. A study in the Biosphere Reserve of St. John also noted an increase in the average daily number of boats using the park from 10 in 1966 to 80 in 1986.

Live-rock

"Live-rock" means any hard substrate (including dead coral or rock) to which is attached, or which supports, any living marine organism listed in the FMU. A market has developed for live bottom substrate found in tropical or semi-tropical areas to create "living reefs" or "mini-reefs" in home aquaria. About 400 tons are reported taken annually in Florida. Live-rock is collected by chipping off portions of the reef (presumably without stony corals present) or by removing substrate adjacent to the reef. This hard substrate is also an integral component of the reef habitat and important for the maintenance of reef-associated fish, invertebrates and plants. The sessile invertebrate communities that make up live-rock are an important food base for commercially important fish and shellfish. Furthermore, the physical and topographical complexity of live-rock provides critical shelter and habitat for a wide range of organisms. A number of studies have shown a positive correlation between increased habitat complexity and increased fish abundance and diversity.

Rock and dead coral surfaces are also vital substrates for the settlement of larval phases of benthic organisms which cannot settle on living coral. Suitability of substrate is one of the major factors controlling the distribution of many species. Little is known of the generation rates of live-rock complexes. In terms of the hard substrate, replacement is likely to be in the order of geological time. Any harvest is expected to result in net loss of this substrate.

Benthic Invertebrates and Algae

The benthic invertebrates and marine algae included in the FMU are a highly diverse group of organisms involved in the marine aquarium trade, either as individuals or as members of communities that comprise live-rock. Many of these organisms have only been identified to the level of family or genus. Identification to species is particularly difficult for gorgonians, sponges and brittlestars. Data are needed to document the distribution and abundance of harvested species and to evaluate their relative contributions to reef communities. One indication of the importance of benthic organisms in reef communities is the results of a study on a reef south of Ponce, Puerto Rico. In sample areas, researchers found 13-17 percent calcareous algae, 2-15 percent boring sponges, and 5-15 percent encrusting gorgonians among 11-22 percent live coral cover.

Seagrasses

Seagrass communities are highly productive and provide nutrients and habitat for many reef species of plants, fish, and invertebrates. They protect coral reefs by dampening wave action and slowing currents to enhance sediment stability and increase the accumulation of organic and inorganic material. While their distribution patterns in Puerto Rico and the U.S. Virgin Islands are poorly described, seagrasses are thought to be highly vulnerable to pollution, sedimentation, and other human activities in the U.S. Caribbean.

Description of Fishery

Section 3.0 of the Coral FMP provides a complete description of the fishery. Following is a summary of this information:

History of Exploitation

The taking of reef-associated invertebrates for the aquarium trade is a relatively new activity which began about 1970 in Puerto Rico. By the mid to late 1980s there began a rapid expansion from a handful of harvesters/dealers/exporters to an industry that employs up to 100 people. In the U.S. Virgin Islands, harvest and export of aquarium species is regulated by permit and this industry remains relatively underdeveloped. Harvest of aquarium species remains unregulated in Puerto Rico.

The expansion of the aquarium trade in Puerto Rico over the past two decades is attributable to three factors. First, there has been a general increase in demand for live marine organisms, especially in the U.S. and Western Europe, because improvements in technology have enabled more people to successfully maintain marine aquaria and "mini-reefs" in their homes.

Second, the excellent transport facilities in San Juan airport have made Puerto Rico a very attractive location for the harvest and export of Caribbean species. Finally, increasing restrictions on the collection of organisms in Florida waters, declines in abundance in the Philippines, and a recent trade embargo against Haiti, have all made Puerto Rico an increasing important source of Caribbean organisms.

Commercial Fishing

Commercial harvest and export of reef-associated organisms is allowed under permit in the U.S. Virgin Islands. Of the 28 permits that have been issued on St. Thomas since 1990, 26 were for "private use" and 2 were considered commercial. The private use category included public aquariums and research facilities. St. Croix issued 25 permits, mostly for small numbers of organisms for private and commercial use. Detailed information on the species composition of permitted harvests is not available.

In Puerto Rico, commercial harvest of black coral and octocorals is allowed under permit. No information is available regarding the number of permits issued. Gorgonians and at least one species of stony coral (*Tubastrea aurea*) are on export lists of local harvesters and shipments of corals by mail have been reported. Allegedly, boxes of corals and most live-rock are shipped from regional airports (e.g., Aquadilla and Ponce) where there are no inspections of shipments by the Puerto Rico Department of Natural Resources (PRDNR). A recent shipment containing 300 live corals was intercepted by PRDNR, suggesting that harvest and export of corals may occur in substantial quantities.

In early 1993, approximately 6 companies were known to export live invertebrates from Puerto Rico for the aquarium trade. An additional 7 companies are involved in intra-island trade, wholesale and retail, and also import Indo-west Pacific species. About 14 companies sell imported marine fish and invertebrates, largely of Indo-west Pacific origin. About 25 percent by number of the live exports from Puerto Rico are invertebrates (including corals) and live-rock. FIGURE 1 details species composition of 133 shipments of live marine invertebrates from Puerto Rico between December 1991 and August 1992 ("Set 2").

FIGURE 1 shows that the principal invertebrates species harvested for the export trade are anemones, starfish, fan worms, shrimp, crabs, urchins, and live-rock. The most heavily exploited species (>50 percent by number) is the sea anemone, *Condylactis* sp. Starfish, especially brittlestars, are also among the more heavily exploited species groups. Combined, live-rock, sea fans, and stony corals accounted for 3.7 percent by number of a random sample of reported exports. Principal harvest areas in Puerto Rico are north and south of the Rincón peninsula, Punta Arenas in Cabo Rojo, along the northwest coast to Arecibo, the island of Desecheo, La Parguera, the southwest coast and southeast of Ponce at the island of Caja de Muertos. Harvesters indicate that they rotate areas of collection to avoid local depletion.

Recreational and Non-Consumptive Uses

The principal recreational value of coral resources involves tourism and the diving industries. In 1991, tourist expenditures were \$708.1 million in Puerto Rico and \$1,390.8 million in the U.S. Virgin Islands. In the 1970s, there were only 3-4 dive schools in Puerto Rico. Now there are 35-45 dive operations. The Board of Tourism is promoting Puerto Rico's underwater environment and sport fishing as part of a program of eco-tourism. Already, about 37 (17 percent) of the 221 marine recreational facilities in Puerto Rico and the U.S. Virgin Islands are dedicated partially or wholly to SCUBA training and equipment sales. In addition to spear fishing and possible collection of marine life for home aquariums or as souvenirs, sport divers want to see and photograph abundant, diverse and undisturbed coral resources.

The U.S. Virgin Islands is the major diving destination in the U.S. Caribbean. About 25-30 dive businesses are currently operating in the U.S. Virgin Islands, up from 20 in the 1980s. An underwater trail in Trunk Bay, St. John, is utilized daily by hundreds of tourists. The National

Park Service on St. John has documented annual increases of visitors to Trunk Bay beach from 20,000 in 1966 to 170,000 in 1986.

These figures give one indication of the value of the resource to the local economy. Other methods of assigning values to coral reef resources are based on interviews with coastal residents. The FMP's Regulatory Impact Review (see Appendix 3) contains a complete discussion of this subject. For example, Australian citizens valued the existence of their Great Barrier Reef at about \$36 per resident adult. Using this figure, the recreational-use value of the coral reefs of the U.S. Caribbean would be about \$76 million.

Medicinal Uses

Octocorals are a source of important biomedically active compounds. Prostaglandins, derived from the gorgonian, Plexaura homomalla, are among the most potent biological materials. They have been used to stimulate uterine contractions, reverse effects of cyanotic congenital heart disease, and hold much promise for medical research. Three species of Pseudoplexaura contain compounds that are active against human cancers of the nasopharynx and lymphocytic leukemia. Gorgonians have been collected in the La Parguera area of Puerto Rico and off the southwest coast of St. Thomas for scientific and commercial purposes related to their medical properties. The impact of these activities is unknown.

There are also collections of soft corals, sponges, and macroalgae for extraction of chemicals for pharmacological purposes. The frequency and extent of this activity are unknown but collections are thought to result in localized damage to reef and other coastal resources. Antimicrobial, antileukemic, anticoagulant and cardioactive chemicals have recently been isolated from a number of other reef-associated invertebrates. Section 3.4 of the FMP provides further information and references.

Commercial Landings and Fishery Habitat

From January 1990 to December 1992, an estimated 5,507 boxes of live marine aquarium fish and invertebrates (about 182,000 organisms) were exported from Puerto Rico through the San Juan airport (See FIGURE 2). This is considered to be an underestimate of harvest levels for the following reasons: (1) mail shipments are not included; (2) exports from regional airports are not included; (3) on-island sales are not included; (4) losses due to pre-shipment mortality (possibly 10-20 percent) are not included.

Of the total recorded shipped, about 25 percent were invertebrates (see Appendix 2 of the FMP). Wholesale unit prices range from \$0.25 to \$12.00, but average \$2.00 to \$3.00 a unit. The current value of invertebrates exported for the aquarium trade is probably in excess of \$114,000 annually. If on-island trade is included the total value may be several times this estimate.

A primary economic value of reef and seagrass habitats lies in their importance to commercial fisheries, including reef fish, conch, and lobster. Since most of the fisheries production in the U.S. Caribbean is dependent on the existence of coral reefs, some of the economic value of the reef can be approximated by fishery landings data. The ex-vessel value of the commercial fisheries of Puerto Rico (employing about 1,219 fishers) was about \$4.3 million in 1991. The U.S. Virgin Islands reported landings in 1991 totalling 1.9 million lbs worth \$4.8 million.

Status of the Stocks

Stony Corals, Octocorals, Live-rock and Seagrasses

The FMP sets OY for stony corals, octocorals, live-rock and seagrasses at zero (0), except as may be authorized for research and habitat restoration. The Council believes that the greatest overall benefit to the Nation, and the most effective use of these resources is as habitat providing food and shelter for fish, conch, lobster, turtles, and manatees, the production of medically important compounds, and their aesthetic value to non-consumptive users. Given their restricted distributions and their typically slow growth and regeneration rates, these resources must be considered non-renewable, limited habitats of special concern.

Other Reef-associated Invertebrates

Little information is available regarding natural abundance, sustainable harvest levels, or actual level of current harvest for these organisms. Export figures provide only a minimum estimate of annual harvest. Because of insufficient data, the FMP does not set OY for these species. However, harvest levels are expected to increase and overharvest is known to cause depletion in certain species, e.g., the Bahama starfish in Florida. Thus, information is urgently needed to determine abundance, harvest levels, and capture-induced mortality, so that allowable harvest levels may be determined, especially for the more heavily exploited species in the FMU (e.g., Condylatis and brittlestars). Restrictions have already been placed on harvest of marine aquarium species in Florida in response to overharvesting.

TABLE II PROPOSED ACTIONS* AND THE FMP'S OBJECTIVES

OBJECTIVES	1	2	3	4	5	6	7
/ Optimize benefits to Nation	++	++	+	++	++	+	++
/ Minimize impacts on resources	++	++	+	++	++	+	+
/ Establish data collection systems						+	++
/ Establish marine reserves							
/ Educate users						+	+
/ Provide consistent rules	++	++	++	++	++	++	++
/ Provide flexible management	+	+	+	+	+	+	+
/ Reduce user conflicts	+	+	+	+	+	+	+
/ Recommend measures to reduce pollution							

***MANAGEMENT MEASURES:**

- 1- Prohibit harvest/possession of stony corals except for research, education and restoration.
- 2 - Prohibit harvest/possession of soft corals/live-rock except research/education/restoration.
- 3 - Require documentation of legal possession.
- 4 - Ban use of chemicals/explosives for reef-associated invertebrates.
- 5 - Restrict gear used for reef-associated invertebrates.
- 6 - Require harvester permits.
- 7 - Require harvester/dealer permits/reports.

4.0 ENVIRONMENTAL CONSEQUENCES

(A) Protection of habitat and non-renewable resources

Biological Effects

Corals, live-rock, and seagrasses are unique among fishery resources in that they serve as habitat for developmental stages of fish and invertebrates. For example, seagrass beds trap nutrients to feed reef species at some stage in their life cycles. Marine algae and invertebrates are the foundation of the food supply for all commercial fisheries. The structural complexity of coral communities including live-rock, and seagrass beds, provides shelter for juvenile fish and invertebrates, such as lobster. For the endangered West Indian manatee, and endangered and threatened sea turtles, reefs and seagrass beds are critical habitat. Sessile plants and animals are particularly vulnerable to pollution and sedimentation from upland sources and any additional harvest is likely to result in a net loss of habitat. Additionally, stony corals and live-rock, by virtue of their limestone structure, grow so slowly that they can be considered non-renewable resources on any human time-scale. Octocorals and perhaps other sessile invertebrates, have such unique population dynamics that they may not be amenable to current fishery management practices. Best available scientific information indicates that corals, live-rock, and seagrasses should not be harvested at any levels, unless necessary for medical research, habitat restoration, or other scientific purposes. Because many of these species, especially among the gorgonians, contain medically-active compounds, it is particularly important that we prevent depletion before researchers have had the opportunity to determine their usefulness in human medicine.

Socio-economic Effects

In Puerto Rico, about 40 fishers harvest live fish and invertebrates for the aquarium trade. By number, about 25 percent of exports are invertebrates. Less than 4 percent is live-rock and corals. Seagrasses are not commercially harvested in the U.S. Caribbean. The wholesale (ex-vessel) value of the approximately 45,500 live invertebrates reported exported annually is about \$114,000 (assuming a \$2.50 average cost per unit); therefore the reported export of stony corals, live-rock, and octocorals is valued at less than \$5,000 annually. In the short-term, the prohibition of harvest of all corals, live-rock, and seagrasses is expected to have negligible economic impacts on current harvesters. Potential profits, especially from the export of live-rock, are expected to be in the millions, however, should demand continue to increase. Florida estimated that the ex-vessel value of the live-rock harvest off Florida would rise to \$3.5 million by 1995, in the absence of protective regulations.

In addition to the value of the commercial and recreational fisheries that are dependent on reef and seagrass habitats, the non-consumptive value of these habitats needs to be

assessed. Tourists visiting Puerto Rico and the U.S. Virgin Islands expect to see abundant, diverse, and undisturbed reef and seagrass habitats. The almost \$2 billion in income from tourism needs to be weighed against the demands of aquarists and the current and potential incomes of island fishers. In the long-term, all segments of society may be better served by complete protection of reef and seagrass habitats for future generations.

(B) Limits on Allowable Fishing Gear

Biological Effects

A ban on the use of chemicals and explosives to take species in the FMU, and the specification of hand-held slurp guns and dip nets as the only allowable gear, are designed to increase survival of targeted species and protect non-targeted species from incidental mortality. Quinaldine, the most commonly used chemical agent, is a coal tar derivative used in the manufacture of dyes and explosives. Its stunning effect on reef fish, lobsters, and other invertebrates makes collection easier, but it also reportedly decreases the targeted organisms' survival and damages surrounding, usually sessile organisms, including corals. Hand-held dip nets and slurp guns should allow experienced fishers to harvest all allowable species without bycatch or increased capture mortality.

Socio-economic Effects

Marine aquarium fishers may experience increased costs of operation once proposed gear restrictions are in place. Using chemicals or large nets would be expected to increase harvesting efficiency but with concomitant bycatch and incidental mortality of surrounding organisms. In the long-term, users of these resources will benefit from the maintenance of stable and diverse reef populations. Continuing the use of poisons and explosives to harvest coral resources is probably inconceivable for most informed citizens and visitors to the U.S. Caribbean, regardless of the costs to affected fishers.

(C) Requiring Permits and Reports

Biological Effects

The FMP proposes a permit and reporting system for harvesters, dealers, and exporters of species in the FMU. A permit system can be used to determine present effort and identify participants in the fishery. It can also be used to introduce a limited entry system, if needed. Limited entry is one way to reduce participation and decrease capture mortality and bycatch in the fishery due to inexperience. Marine aquarium fishers in Florida are petitioning their state legislators to limit entry into their fishery. Required reports from collectors, harvesters, and exporters could be used to estimate capture-induced, maintenance, and transport mortality of invertebrates species. Permit data could allow the

Council to determine OY for a number of highly exploited species, such as anemones and brittlestars.

Socio-economic Effects

A fee would be charged to recover costs of administering the permit system. Up to 100 marine aquarium harvesters, dealers, and exporters are expected to apply for permits to harvest reef-associated invertebrates. The Regulatory Impact Review (Appendix 3) estimates the total administrative and reporting costs of this program at \$6,500 or approximately \$65 per applicant.

(D) Effects on Marine Mammals and Endangered Species

Marine mammals do not use coral reef and other hard bottom habitats, or seagrass beds; and they are not expected to be either directly or indirectly affected by the FMP. Of the endangered or threatened species under NMFS jurisdiction in the U.S. Caribbean, the hawksbill sea turtle (Eretmochelys imbricata) and the green sea turtle (Chelonia mydas) may use reef areas for foraging and shelter. The FMP's prohibitions on harvest of reef associated species including live rock, and the prohibitions on potentially damaging gear, are expected to benefit sea turtle conservation.

(E) MITIGATING MEASURES

The FMP's gear restrictions are designed to mitigate potential effects on habitat and species by gear used to take certain reef associated plants and invertebrates for the live aquarium trade.

(F) UNAVOIDABLE ADVERSE IMPACTS

Certain individuals and corporations (approximately 6 companies in Puerto Rico) are engaged in the harvest, sale and export of live marine invertebrates from the U.S. Caribbean. These entities will be adversely affected by the prohibitions on harvest and possession of corals, live rock and certain other species in the FMU.

(G) IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There are not expected to be any irreversible or irretrievable commitments of resources in addition to increased costs of enforcement.

5.0 LIST OF PREPARERS

Yvonne Sadovy, Ph.D.
Biologist
Caribbean Fishery Management Council

Graciela García-Moliner
Biologist
Caribbean Fishery Management Council

Georgia Cranmore
Ecologist
National Marine Fisheries Service

6.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Office of Ecology
U.S. Department of State
U.S. Department of Agriculture
U.S. Department of the Interior
U.S. Fish and Wildlife Service
National Park Service
U.S. Department of Transportation
U.S. Coast Guard
U.S. Environmental Protection Agency, Region II
Commonwealth of Puerto Rico
Government of the U.S. Virgin Islands

7.0 RESPONSE TO PUBLIC COMMENTS

This section summarizes testimony on the Draft FMP/RIR/EIS presented at 5 public hearings or submitted in writing to the Caribbean Fishery Management Council and/or the National Marine Fisheries Service during public comment period. Included, herein, are the written depositions and letters received, as well as Council's responses to comments on this FMP. (NOTE: THE MAJORITY OF THE DEponents AND COMMENTS RECEIVED WERE IN FAVOR OF MANAGEMENT MEASURES 1 THROUGH 7 OF THE FMP. MANY OF THE COMMENTS ADDRESSED THE ORIGINALLY PROPOSED MARINE CONSERVATION DISTRICT, MOSTLY OPPOSITION TO ITS IMPLEMENTATION DUE TO LACK OF SCIENTIFIC AND SOCIO-ECONOMIC DATA. MANAGEMENT MEASURE 8 HAS BEEN RESERVED IN THIS FMP. THE COUNCIL DECIDED TO DEFER THE ESTABLISHMENT OF MCDs UNTIL MORE INFORMATION IS AVAILABLE AND

FURTHER CONSULTATION WITH THE USER GROUPS IS CARRIED OUT THUS, THE COMMENTS ON THE SUBJECT ARE NOT INCLUDED IN THIS SECTION). THE * DENOTES COMMENTS REGARDING MCD's WITHOUT RESPONSE AT THIS TIME). Editorial changes suggested and submitted by government agencies' officials have been incorporated already in the FMP.

Public hearings were held on the following dates and locations:

- | | | |
|---------------|------|------------------|
| 1. St. Thomas | (14) | February 1, 1994 |
| 2. St. John | (2) | February 2, 1994 |
| 3. St. Croix | (1) | February 3, 1994 |
| 4. Cabo Rojo | (6) | February 8, 1994 |
| 5. Fajardo | (9) | February 9, 1994 |

Numbers in parenthesis indicate number of persons who spoke at the hearings. In addition, nineteen (19) written comments were received and included herein.

1. Comment: Enforcement of the law has to be done at the "time and site" of harvest; and heavy fines should be established.

Response: The Council concurs that enforcement should be done at site of embarkment and at sea. The FMP calls for enforcement at "site and time" of harvest. The drafting of regulations should include the appropriate fines allowed under the Magnuson Act.

2. Comment: All licensed harvesters/dealers and exporters should pay revenue to export.

Response: At present, the Secretary of Commerce does not have authorization under the Magnuson Act to collect fees beyond the cost of issuing a permit.

3. Comment: Possession of prohibited species should be outlawed. There should be strict and "visible inspection" of people involved in the harvest of species in the FMU.

Response: Possession of prohibited species is already mentioned in the language of the appropriate management measures of the FMP. The Council also concurs that field inspections should be conducted as part of enforcement.

4. Comment: There should be a plan to provide education to the school systems and the general public about the FMP itself, so that people become aware of it.

Response: The FMP acknowledges the importance of education and makes allowance for permitting of institutions and persons involve in educating the public. In addition, the Council is involved in an education program that includes this and other implemented FMPs.

5. Comment: Regulate educators and investigators rather than exempt them from regulation in the FMP. Reasons for this comment include: (1) "these groups also damage the reef"; and (2) "this would allocate resources to educators and researchers while disallowing commercial fishers access to the resources."

Response: Exemptions to management measures are needed for future research and education that will assist in the conservation of the resource.

6. Comment: Suggests the establishment of a licensing system or a quota for the fisheries covered under this FMP.

Response: A permitting system is established in the FMP. Quotas have not yet been considered since the Council does not have enough information for establishing quotas.

7. Comment: Not only dealers, but every person harvesting species in the FMU should be required to have a permit.

Response: The intent of the Council is that anyone who harvests should have a permit (Management Measures 6 and 7).

8. Comment: Rules and regulations being developed for the industries should be stronger in terms of natural environment protection and should be enforced. "Oil spills are damaging not only the reefs and corals, but also the fishes, the environment, and tourism."

Response: The Council has included various recommendations to the local governments (Section 7.5.1 of the FMP) toward minimizing the negative effects caused by industries and other human activities.

9. Comment: Aquaculture should be allowed in the FMP.

Response: The Council, after careful consideration of the inclusion/exclusion of aquaculture in Management Measure 2, decided that in federal waters there is no need, at this time, to allow for aquaculture of live-rock. However, if the need arises, allowance could be considered for aquaculture of live-rock in federal waters.

10. Comment: Anchoring should be prohibited in all areas where corals could be damaged by this action.

Response: The Council is not allowed to include anchoring prohibitions in the FMP because of statute limitations under the Magnuson Act. However, recommendations in Section 7.5.1 of the FMP include the establishment of mooring buoys in pertinent coral areas.

11. Comment: Concern about the compatibility of the plans [regulations] made by the Council with those of the Puerto Rico government. "If this Plan is enforced in federal waters, the collectors and persons fishing for aquarium fishes could move to local waters, to be protected under the local government jurisdiction." This will increase the catch of the species in the FMU.

Response: The local government representatives have stated that their Agency (PRDNRE) will establish compatible regulations to preclude the above mentioned situation from occurring.

12. Comment: Coordination should be established with fishing groups and associations, to enhance enforcement capabilities.

Response: The Council endorses this idea and will include it as part of the agenda in the orientation meetings with other agencies and the public.

13. Comment: Opposed to allow legally permitted research, education and restoration programs (Management Measures 1, 2, 4, and 5) because of the damage it may cause to the coral and the coral reef resources.

Response: The Council considers that although the needed research could be destructive, it could assist in the conservation, monitoring and management of the resources.

14. Comment: Concern about encouraging depletion of corals and coral reef resources in Caribbean areas outside Council jurisdiction.

Response: The Council promotes pan-Caribbean management of the species included in FMPs (See Objective 6 of this FMP). Whenever possible, and so requested, the Council assists other countries in the development of management plans.

15. Comment: There is no SIA in this FMP.

Response: The Council understands the SIA is not a requirement under the Act for approval or disapproval of an FMP. Still, the Council believes that when the appropriate information is available, an SIA should be an integral part of any FMP. In the case of the present FMP there is no available information to prepare an SIA. However, since Management Measure 8 has been reserved, and this is the management measure that

most likely will have a significant social impact, the lack of an SIA should not be hindrance to the approval of this FMP.

16. Comment: Concern about the permitting process and differences between federal waters in Puerto Rico and USVI.

Response: The intent of the Council is to have a uniform permitting system across the areas of jurisdiction (Federal waters, Puerto Rico and the U.S. Virgin Islands) following the Magnuson Act requirements and the compatible regulations to be established by the local governments.

17. Comment: Concern about the harvesting prohibitions when the fishery is so small and thus have an equally small effect on the ecology of the coral reefs.

Response: The Council believes that although, at the present time, the fishery for live-rock and other species in the FMU could be considered small, a conservative approach is warranted given the expansion of these activities in the past few years. The noted increase in the aquarium trade might significantly affect the habitat for the reef fish and other important species in the area.

18. Comment: There is lack of scientific data for this FMP.

Response: The best available data have been used in the preparation of this FMP, as per the Magnuson Act.