

APPENDIX II

FINAL SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
AMENDMENT NUMBER 1
TO THE
Fishery Management Plan for Corals and
Reef Associated Plants and Invertebrates of
Puerto Rico and the
United States Virgin Islands
FOR ESTABLISHING A MARINE CONSERVATION DISTRICT

Caribbean Fishery Management Council

JANUARY 1999

COVER SHEET

RESPONSIBLE AGENCIES: Caribbean Fishery Management Council
National Marine Fisheries Service

TITLE OF PROPOSED ACTION: Amendment Number 1 to the Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands for Establishing a Marine Conservation District

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ABSTRACT:

The Caribbean Fishery Management Council (Council) is proposing an Amendment to the Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands (Coral FMP). This Amendment Number 1 to the Coral FMP proposes the establishment of a Marine Conservation District (MCD) in the Federal waters of the U.S. Virgin Islands in the area known as the “Hind Bank” Southwest of St. Thomas. The proposed MCD will be a “no-take” zone defined as an area where all fishing is prohibited, no anchoring of fishing vessels is allowed and where no removal of species is allowed. The purpose of the MCD is to conserve and manage representative samples of marine habitats and ecosystems and to maintain marine biodiversity as well as healthy fisheries. In addition, MCDs are established for the protection, conservation and management of economically important fish species which are dependent on the well being of the habitat (corals). The FSEIS explores the environmental consequences of the proposed action (establish an MCD) at the selected and alternative sites, and considers the possible economic impacts of a “no-take” MCD on the coral reef resource users and on other species under management through other FMPs (e.g., red hind).

DUE DATE FOR COMMENTS:

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1.0 PURPOSE AND NEED

The importance of corals and reef associated plants and invertebrates lies in their relationship to the marine ecosystem. The coral reef areas are the most productive tropical marine systems and thus are the backbone of the food chains reef-based fisheries. At the end of this food chain are the fishery resources managed under other FMPs, such as red hind and Nassau groupers, yellowtail snappers (Reef Fish FMP) and spiny lobster. Healthy coral reefs serve various functions during the different life stages of the many fish species that inhabit these areas. Coral reefs serve as breeding grounds, nurseries, feeding grounds, and refuge for most protected species, all of which, and including coral reefs, are vulnerable to overfishing. Most species that use coral reefs are vulnerable to overfishing, including corals, and in fact for a number of species there is evidence of growth and/or recruitment overfishing (e.g., red hind) and local economic extinction (e.g., Nassau grouper, jewfish). Additional threats have been identified in the form of natural and anthropogenic stressors. Thus the combined effect of detrimental factors adversely affect the resource. The Council understands the importance of managing corals, simultaneously as fish species and essential habitat, and coral reefs since the fisheries are dependent on the well being of the habitat and thus wise management is needed in the form of no-take MCDs (Marine Conservation Districts).

A major source of mortality of corals and associated seagrasses and invertebrates is sedimentation and pollution, caused predominately by land-based or near shore activities such as deforestation and discharge of untreated sewage. The Council intends to use this Amendment 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. However, the solutions to these problems are not within the Council's jurisdiction.

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, i.e., establishing MCDs. There is no detailed information on the impact of traps on corals and coral reefs, that is physical impact but it is thought that severe damage is inflicted by this type of fishing gear (the most commonly used gear in the U.S. Caribbean) and by anchors. Over 1,500 traps are

dropped on coral reefs on the Southwest of St. Thomas. Changes in species composition from continuous, unregulated fishing have however been documented (e.g., Nassau grouper spawning aggregations not longer occur in the southern part of the U.S. Virgin Islands, and see Section II, 2 of the Amendment for details).

There is a potential for a rapid increase in the exploitation of components of the fishery management unit (FMU) and the U.S. Caribbean may soon become the principal source of tropical western Atlantic organisms for the U.S. and foreign markets, thereby further increasing pressure on resources and intensifying the need for management action. 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 as presented in the Coral FMP (effective date December, 1995).

The discussion on Section II, 2 of the Amendment addresses the issues of corals and coral reefs as essential fish habitat for the reef-based fisheries of the U.S. Caribbean. The specifics are shown by the presence of high relief coral *Montastrea annularis* at the site of the red hind spawning aggregations (Options A and B).

MANAGEMENT OBJECTIVES

- 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.
- 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.

- 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.
- 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.

The objectives are addressed in the Amendment in the following manner. It is continuously reported that coral reefs (locally, regionally and worldwide) are in peril (see Coral FMP). A management option available to the Council is the establishment of MCDs "to conserve and protect the species in the FMU for the maximum benefit of the Nation" since corals are most valuable as habitat for reef-based fisheries, their role in deterring coastal erosion and for their aesthetic and existence value (Objective 1). Objectives 2 and 3 are met through the management strategies of "no take", allowing non-consumptive use of the resource (e.g., diving), or allowing certain types of activities.

Objective 4 is achieved through the proposed action (Management Measure 1/Option A), or at any of the alternative sites (Rejected Options B or C) considered in the Amendment and addressed through a review of the data available for the U.S.V.I. (Amendment document, Section II, 2). However, lack of data should not be a deterrent to management. The intent of the proposed management measure (establish an MCD) is to conserve and managed representative samples of marine habitats and ecosystems and to maintain biodiversity. Objective 5 is addressed in the discussion of the rejected measures and Section V of the Amendment).

ISSUES TO BE CONSIDERED
OVERFISHING - How can we reduce direct and indirect harvests of slow-growing or non-renewable coral reef resources? How can we reduce overfishing of fish stocks such as red hind? Can the protection of essential fish habitat help in the restoration of fish stocks?
ECONOMIC IMPACTS - What are the effects of limiting harvests on commercial collectors and what are the benefits to non-consumptive users? What are the impacts of prohibiting fishing in specific areas?
HABITAT LOSS - What is the effect of continued removal of reef resources on commercial fish stocks and threatened and endangered species? How can we assess the impact of fishing gear and anchoring on coral reefs?
MONITORING & ENFORCEMENT - How can we improve the opportunities for effective monitoring and enforcement of conservation rules?
INEFFICIENT UTILIZATION - How can we reduce harvest mortality of aquarium species? How can we reduce by-catch, if any, in the trap fishery?
INADEQUATE INFORMATION - How can we improve the data base for more effective management of coral resources? And, of associated reef-based fisheries?
REGIONAL MANAGEMENT - What is the best way to ensure a consistent management regime for the U.S. Caribbean?

2.0 PROPOSED ALTERNATIVES

The following proposed action, establishing an MCD IN THE AREA KNOWN AS THE “Hind Bank” Southwest of St. Thomas, USVI (Management Measure 1 (Option A), is intended to address the management objectives of the Coral FMP (discussed above). The alternative sites that have been considered by the Council are presented in the Amendment as Rejected Options B and C, and Option 1A (NO ACTION). Those other options considered and rejected by the Council are presented in the Amendment as Options D through G.

Management Measure 1 (Option A): Establish a no-take Marine Conservation District (MCD), in the EEZ, in the area known as the “Hind Bank” Southwest of St. Thomas, U.S.V.I., within the coordinates specified below.

The rhumb lines connecting the following coordinates enclose the MCD as is shown in Figure 1:

POINT	LATITUDE	LONGITUDE
A	18E13.2'N	65E06.0'W
B	18E13.2'N	64E59.0'W
C	18E11.8'N	64E59.0'W
D	18E10.7'N	65E06.0'W

This area is already subjected (since 1990) to a seasonal closure (December 1 to February 28 of each consecutive year) for the protection of the red hind, *Epinephelus guttatus*, at the spawning aggregation. This seasonal closure was shown to be successful (Beets and Friedlander, 1997) since the average size of individual fish in the aggregation had increased and the number of fish in the aggregation had also increased. Testimony from commercial fishers at public meetings also indicated that they were catching larger fish and more fish in the areas adjacent to the closed bank.

This management measure for establishing and MCD was proposed at the public hearings (October 21-23, 1998) by the St. Thomas/St. John Fisheries Advisory Committee (See Appendix B) and endorsed by other fishers present at the meeting. Furthermore, the proposal included an area around the eastern state waters of St. Thomas. The area in Federal waters is approximately 16 square miles while the area in the state waters is approximately 11 square miles. The proposal (Federal + State) would encompass approximately 27 square miles. Based on the proposal by the fishers of the Virgin Islands, Dr. Nowlis (now at the Northeast Fisheries Science Center) gave a presentation to the Council (February 1998) at which his conclusion was that in some aspects the proposal was superior.

However, the Council does not have jurisdiction over the near shore areas; these are under the authority of the government of the Territory of the U. S. Virgin Islands. The Coral FMP includes a list of recommendations to the local governments including the establishment of MCDs in State waters. The Government of the Territory of the U.S. Virgin Islands has already establish a number of near shore areas of special concern.

The arguments in favor of the fishers' proposal are as follows: (1) The Federal + State waters is the largest in size; (2) it includes both sources and sinks for larvae; (3) it includes greater diversity of habitats and species (i.e., mangroves, seagrasses, coral reefs); (4) its closeness to shore most likely will result in increased tourism; (5) it will require less enforcement since it is proposed by the community; (6) compliance will be higher; (7) it contains known populations of spawning fish (red hind).

The arguments in favor of Option A are as follows: (1) it contains known populations of spawning fish (red hind); (2) the descriptions of the habitat which seems to be required by the spawning populations are available (e.g., Beets and Friedlander, 1997) and *Montastrea annularis* at least seems to be in a healthy condition; (3) Roberts (1997) argues for reserves in areas which are sources of larvae rather than sinks (as the size of fish increases so does the output); (4) it could help in restoring fish stocks of the Nassau grouper *Epinephelus striatus* which once aggregated for spawning in this area (Olsen and LaPlace, 1978); (5) protection is afforded to more than one species (see FMUs (Fishery Management Units) of the Coral FMP, Reef Fish FMP, and Spiny Lobster FMP); (6) Nowlis and Roberts (1997) argue that no-take reserves are more effective in restoring fish stocks that are overfished – the economically extinct Nassau grouper is an example of an overfished species in the area of Option A; (7) catch reports indicate that historically the TSW (Southwest St. Thomas) area has accounted the highest percentage of landings in the St. Thomas/St. John area; (8) the area is already subjected to a 3 month seasonal closure every year since 1990 and the USCG has no recent reports of poaching in the area; and most importantly it has been proposed by the area residents.

The arguments against Option A are as follows: (1) there might be little recruitment of larvae in the Virgin Islands (see Figure 2) as compared to more larvae recruiting to the V.I. if the MCD located at Rejected Option C; (2) the area has been fished longer than the area South of St. John (Rejected Option C) as inferred from the changes in boat size; (3) the smallest of the alternatives is Option A but none of the three options account for more than 3% of the total shelf area. However, Roberts (1997) argues that even small reserves, as long as they are no take zones, could be very effective in restoring fish stocks, specially if the stocks are overfished, because as long as they have the support of the community compliance will be higher.; (4) it is not known what is the per cent coverage or state of corals and seagrasses in any of the areas of the proposed MCDs but lack of information perhaps only argues in favor of establishing an MCD and thus require monitoring to determine the success of the action taken.

Any of the proposed alternatives, except Option 1A (NO ACTION) would offer protection to more than one species or species complex (e.g., See Section II, 2 of the Amendment for a discussion of the

species found in the Federal Waters of the U.S. Virgin Islands). This protection would be in the form of a reduction in fishing mortality which should result in fish growing to a larger size and thus increasing reproductive output (in general, as fish increase in size there is an exponential increase in the number of eggs produced). The reduction in fish mortality is especially important for slow-growing species. A no-take MCD means that all fishing gears will be prohibited. Most fishing gears are not selective and impact both juvenile and adult populations as well as a number of other species which are discarded (e.g., butterflyfish caught in traps are discarded). The value of the fish being protected has already been established in the FMPs.

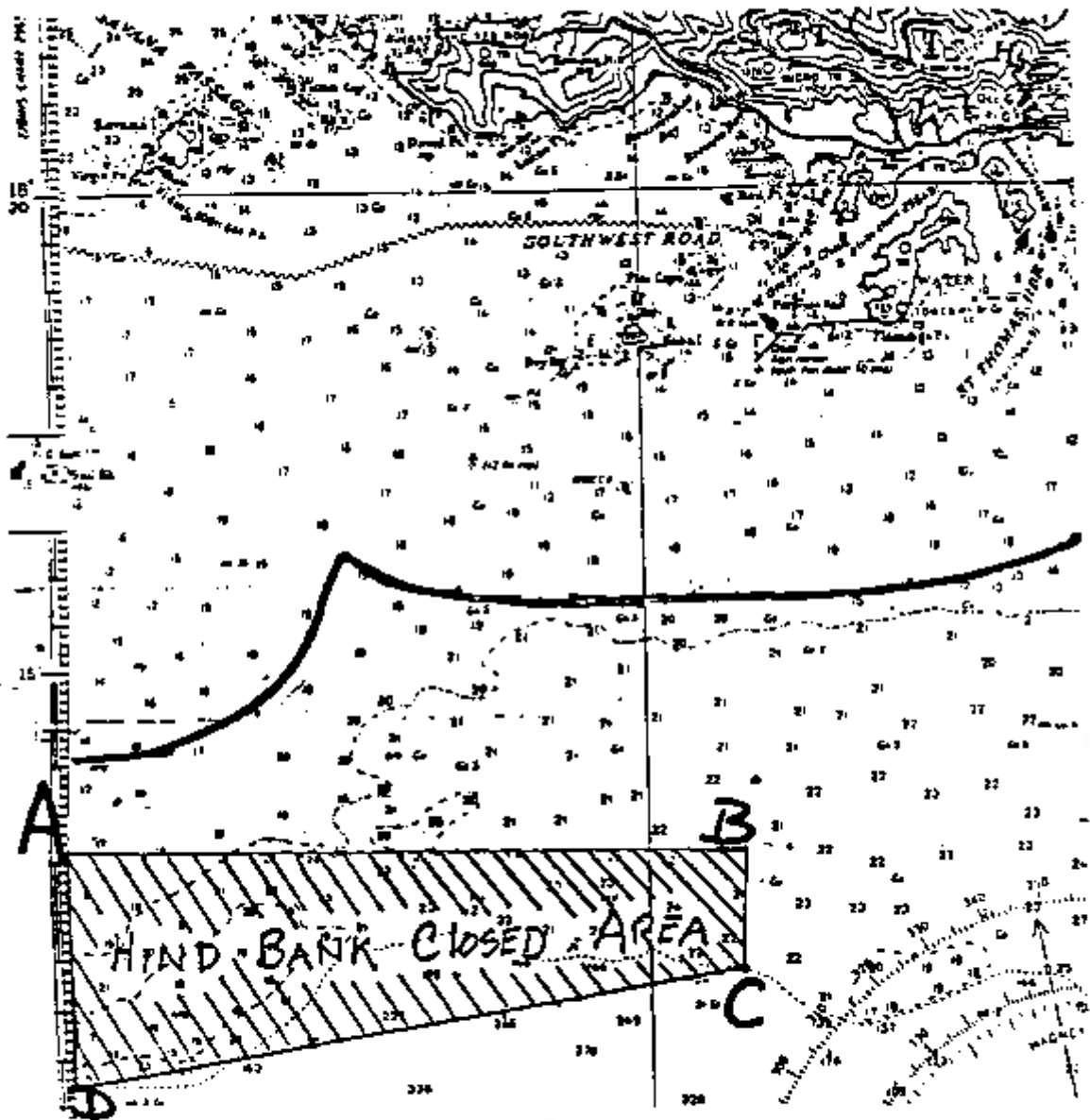
Option 1A - NO ACTION

Coral reef areas of special significance and particularly stressed or vulnerable areas may need protection in addition to measures provided for the majority of the management area. Marine Conservation Districts are designed to direct protective and, therefore potentially burdensome, regulations to only those specific areas requiring this protection. The establishment of coral reef reserves will directly affect the activities of commercial and recreational fishers by causing them to move their activities to other potentially less favorable areas. Short-term dislocations and loss of revenues could be avoided by choosing to take no action. Long-term benefits of preserving habitats as well as species would be foregone.

In the U.S. Caribbean, declining trends have been shown for various fisheries; overfishing has been shown for: Nassau grouper, jewfish (both commercially extinct); red hind (seasonal closures in place to protect spawning aggregations); and localized overfishing of queen conch resources. Appeldoorn et al. (1992) however, did not have sufficient long-term data for a stock assessment of individual species. It has been reported in the literature that it must be realized that we are never going to have all the information needed, especially not in a multi species/multi-gear fisheries, such as is found in the U.S. Caribbean. Under these circumstances, common to the region, one alternative solution is the consideration of establishing MCDs.

The close relationship between spawning aggregations and coral reefs have been shown (Section II, 2 of the Amendment); the declining trends, more so, the dramatic changes in the species composition of the commercial catches have been addressed (see Amendment); and the conditions of coral reefs has been described in general terms in the Coral FMP and in the Amendment document. The fisheries of the U.S. Caribbean are reef-based and the fishing community are dependent on the well being of these fisheries and their habitat. Corals are both a fishery under management and habitat essential to sustain other fisheries. The No Action option would refute the present need for more measures to protect important fish stocks and to comply with the commitment to maintain and restore a sustainable fishery for the future.

Figure 1: Option A establishes a no-take MCD at the "Hard Bank" southwest of St. Thomas, U.S.V.I.



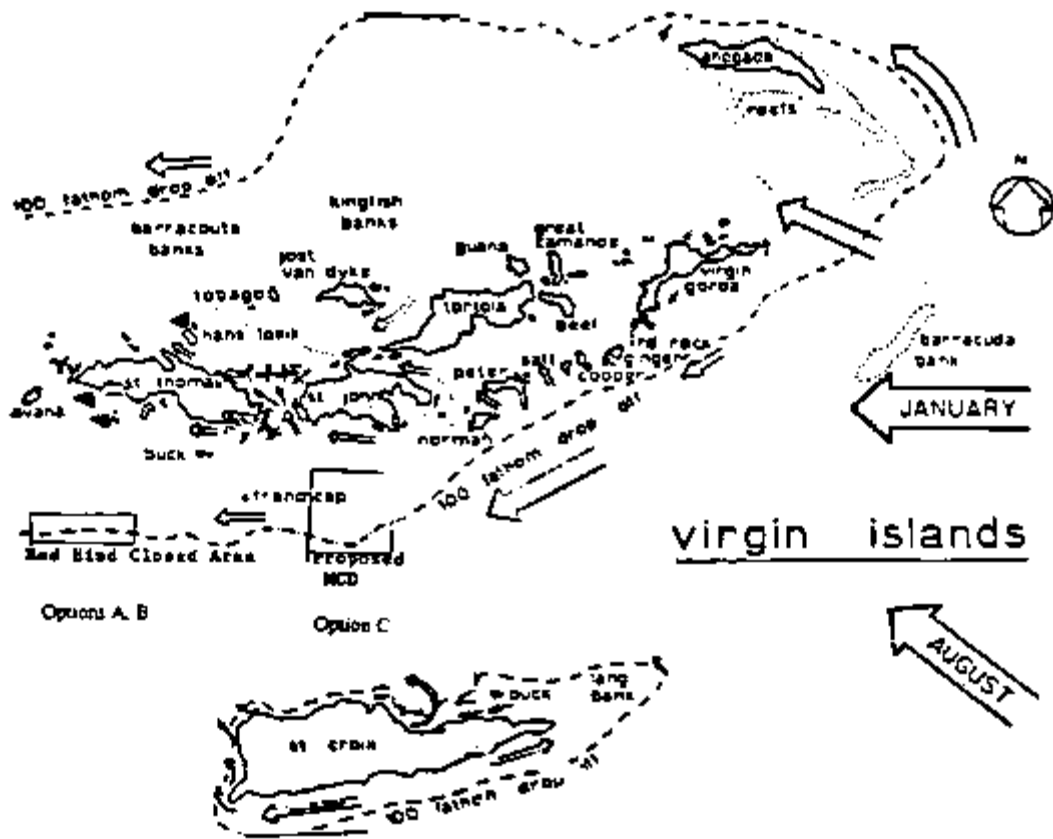


Figure 2. General current patterns on the island platforms (From Dammann, *et al.*, 1969.)
 Triangles north and south of St. Thomas are location of recruitment arrays (From Kojis, 1997.)

Other Alternatives Considered And Rejected by the Council:

Rejected Option B: Establish a no-take Marine Conservation District (MCD) in the EEZ, including the area known as the “Hind Bank” Southwest of St. Thomas, U.S.V.I., but with a modified northern boundary which extends 1 nm north of the present demarcation line of the “Hind Bank”. That is, within the coordinates specified below.

The rhumb lines connecting the following coordinates enclose the MCD as is shown in Figure 3:

POINT	LATITUDE	LONGITUDE
A	18E14.2'N	65E06.0'W
B	18E14.2'N	64E59.0'W
C	18E11.8'N	64E59.0'W
D	18E10.7'N	65E06.0'W

The discussion included under Option A apply to this Rejected Option B. Most of the area, except for the 1 nm added to the north of the “Hind Bank”, has been already subjected (since 1990) to a seasonal closure (December 1 to February 28 of each consecutive year) for the protection of the red hind, *Epinephelus guttatus*, at the spawning aggregation.

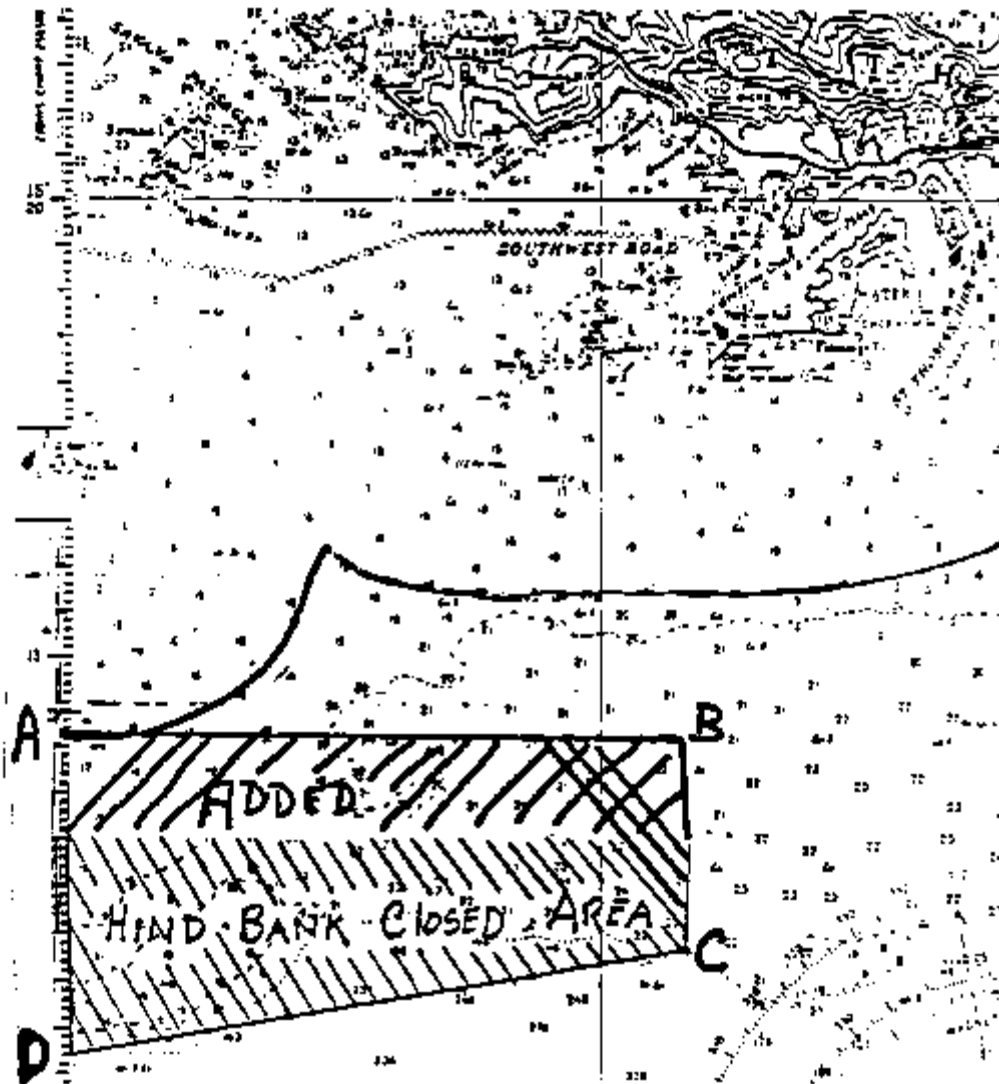
The area enclosed within Rejected Option B is approximately 23 square miles (compared to 16 square miles for Option A and 20 square miles for Rejected Option C). The difference is accounted for by the additional 1 nm area added to the north of the “Hind Bank”. The additional nautical mile is the buffer zone which the commercial fishers fish during the seasonal closure of the red hind spawning aggregation (comments received during orientation meetings and public hearings). All three areas account for less than 3% of the total shelf area. However, even when most reports argue for reserves which include at least 20% of the available area, Roberts (1997) points out that even small reserves will be effective and the effectiveness of the reserve depends largely on enforcement and social constraints. The discussion presented under Section II, 2 and under Option A apply to Rejected Option B since no detailed information for the area, other than TSW and Federal versus state waters is available.

None of the proposed areas are likely to benefit directly from the egg dispersal in the short-term since most groupers and other commercially important species settle in much shallower water preferentially and in mangrove areas (e.g., Boulon, 1990). However, fishers should benefit from the spillover effect but not within the first year of the closure (see for example Hatcher et al., 1995 and Corless et al., 1996 for the assessment of fish emigration from no-take zones in St. Lucia).

Roberts (1997), in a recent essay on how marine reserves can improve fisheries management, argues that the “most effective ones will be located in larval source rather than sink areas”. In this case, both Options A and B comply with this requirement.

There is no information available on the effect of fishing gear (especially traps) on the habitat (corals) which will be protected through the establishment of this MCD. The benefits will accrue since no impacts will be from fishing gear or anchors.

Figure 3: Option B establishes a no-take MCD including the “Hind Bank” and extending the area 1 nm north of present boundary on the southwest of St. Thomas, U.S.V.I.

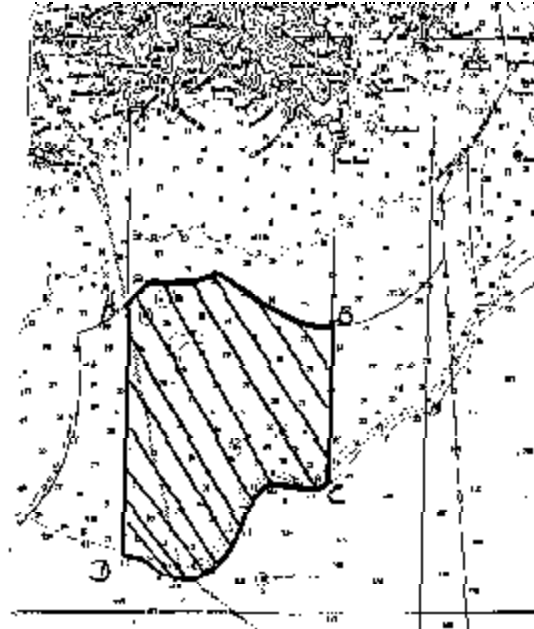


Rejected Option C: Establish a “No-Take” Marine Conservation District (MCD) in the EEZ due South of St. John, U.S.V.I., within the coordinates specified below.

The rhumb lines connecting the following coordinates enclose the MCD as is shown in Figure 4:

POINT	DESCRIPTION	LATITUDE	LONGITUDE
A	South of Bovocoap Point at Boundary with Territorial Sea	18E15.3' N	64E46.9' W
B	South of Ram Head at Boundary with Territorial Sea	18E15.0' N	64E42.2' W
C	SE corner	18E12.1' N	64E42.2' W
D	SW corner	18E11.0' N	64E46.9' W

Figure 4: Proposed MCD south of St. John, U.S.V.I.



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.

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.

The Council is proposing the establishment of an MCD. 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 as long as there is no negative impact on coral from anchoring or injury to corals in any way. Therefore, the Council's preferred option is to prohibit all harvesting within the MCD.

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

Marine fishery reserves, similar to MCDs, have been proposed for the Gulf of Mexico and the South Atlantic reef fish fisheries as replenishment zones. Reserves can protect older and larger individuals of a species and thereby preserve critical spawning stock biomass, intra specific genetic diversity, population age structure, recruitment supply, and ecosystem balance. Additionally they serve to protect diversity within species and community stability. At the 1992 Coral Reef Symposium, in Guam, researchers concluded that marine reserves are effective in addressing the problem of recruitment over fishing, especially for sedentary species. Thus, reserves are designed to maintain reef ecosystem balance and productivity. In addition, marine reserves can provide insurance against management and recruitment failures, simplify enforcement, and are generally understandable and supported as management tools by the general public. Marine reserves can also assist in eco-tourism development. The Coral FMP and the Amendment provide references for the claim that marine reserves are believed to have contributed to the maintenance and continued abundance of reef fish species in certain protected areas worldwide.

The Council established a Marine Reserve Zoning Committee (MRZC) to evaluate areas for inclusion as reserves or MCDs. The MRZC is composed of representatives of the Council staff, the National Marine Fisheries Service, the Department of Natural Resources (DPNR) of the U. S. Virgin Islands, and the Sea Grant College Program. The criteria used to select candidate MCDs include:

- (1) Ecological values: Diversity of species
 - Endangered species habitat
 - Uniqueness of the area
 - Representative ecosystem
 - Importance to commercial species
 - Maintenance of “natural” areas

- (2) Economic values:
 - Traditional fishery location
 - Snorkel/dive site
 - Charter boat anchorage
 - Hurricane shelter
 - Tourist attraction
 - Watershed management

- (3) Social values:
 - Cultural significance
 - Recreation area
 - Aesthetics
 - Education
 - Research opportunities

Figure 4 above shows one of the proposed MCD, an approximately 20 sq. mile area south of St. John, U. S. Virgin Islands, containing a diversity of coral and hard bottom habitats. The specific area of concern is an area known as the pinnacles. However, although fishing activities in the area include floating, hand lining and traps, only very experienced divers use the area. The advantages of setting an MCD in this area include: (see Option A) (1) it encloses fairly healthy but deeper water coral reefs; (2) it is larger than Option A; (3) it is farther away from the main Island of activity (ST. Thomas); (4) it might be a source of coral larvae; and (5) it might enclose yet unknown fish spawning aggregations.

The disadvantages of MCDs include the displacement of effort to other areas already under stress or potentially under stress. A short-term dislocation and loss of revenues is possible, but long-term benefits will far outweigh the short-term losses. Also, if there is no adequate support and compliance from the community at large, and no enforcement, the establishment of the MCD might result in the failure of the MCD concept (e.g., poaching). However, most of those present at the Public Hearings have opposed this Option. And thus the disadvantages of setting an MCD as per Rejected Option C include: (1) increased probability of poaching; and (2) increased costs of enforcement.

The Coral FMP includes a framework procedure to allow additional MCDs to be established through regulatory amendment (see Section 7.0 below and Appendix C).

TABLE I

MARINE CONSERVATION DISTRICT		
ISSUES	No action	MCD (Options A, B, C)
Over fishing	Status quo, progressive deterioration of fish stocks	Stocks should improve
Economic Impacts	No effect on the short term but long term negative effect for commercial fishing	Long term benefits in commercial fishing, positive impacts on tourism.
Habitat Loss	Status quo, progressive deterioration	Prevents further losses
Monitoring & Enforcement	No effects	Relatively easy to enforce (Option A). Harder to enforce (Options B and C)
Inefficient Utilization	No effects	No effects
Inadequate Information	No effects	Research possibilities increase
Regional Management	No effects	Improves and reinforces

Other Options Considered and Rejected

As discussed in the Amendment Number 1 (pages 30-41), the options considered include: (a) same as Rejected Option C, but extending the southern boundary to the 18°10'N line (Rejected Option D (see Amendment document) would not allow trolling along the shelf edge for wahoo, dolphin fish, etc.); and (b) an MCD flushed eastward to the boundary with the British Virgin Islands (Rejected Options E, F, and G). The Council has made numerous attempts at establishing an MCD contiguous with the waters of the B.V.I., the Government of the B.V.I. has participated in Council and orientation meetings as well as in the MCD Workshop held in St. Thomas, U.S.V.I. However, no agreement has been reached to establish such an international MCD. The advantages of an option such as Rejected Options E, F or G would be diluted if the MCD is established in Federal waters only; the U.S.V.I. fishers would have no access to the 'spill over' of fish resources on the eastern side of the MCD. This would only benefit the

fishers of the B.V.I. Neither short-term nor long-term benefits for the fishing community of the U.S. Virgin Islands can be determined, unless it can be ascertained that fish will emigrate northward or westward. There are no reports on spawning aggregations from these areas nor information on unique coral structures or even coral cover.

Other alternatives considered and rejected by the Council included the establishment of shipping lanes (shipping lanes are established by U.S. Congress, the Council does not have jurisdiction over this matter. In addition, the shipping lanes alluded to are within the area of authority of the U.S. Virgin Islands.) and limited entry within the MCD (the Council has adopted the recommendations of scientists, that in order for this MCD to be successful in restoring fish stocks, it should be a no take zone.).

POSSIBLE FUTURE ACTIONS

Several management measures were identified during the development of this Amendment which merit consideration for future action. These measures were not included in the Coral FMP because of insufficient data, but may be added by future amendments as it is being done with the establishment of the MCD. The measures include:

- < 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 the Coral FMP that management of component resources be carried out throughout their range. In particular, given the effect of anthropogenic activities on near shore 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 establishment of no-take MCD will not solve all of the problems and it is worth while to reiterate the exercise of providing specific recommendations regarding corals and

associated plants and invertebrates to the local governments some of which also become important for the identification of EFH (essential fish habitat).

The Coral 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 (eco-tourism)

- / 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 Coral FMP. In addition, Sections 2, 3, and 4 of the Coral FMP contain a Description of the Resource, a Description of the Fishery, and a summary of Capacity Limits. Section II, 1 of the Amendment contains the background information (Section II, 2) regarding the development of the management measure under consideration and a description of the fisheries within the proposed sites for the establishment of an MCD (Management Measure 1 (Option A) and Rejected Options B and C).

Description of the Resource

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.

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.

It is not known what is the per cent coverage or state of corals and seagrasses in any of the areas of the proposed MCDs but, lack of information perhaps only argues in favor of establishing an MCD and thus the required monitoring to determine the success of the action taken.

The physical environment of any the proposed areas for establishing an MCD are also poorly known. Figure 2 shows the Red Hind closed area (Option A; Rejected Option B would add a buffer zone of 1 nm to the north of the northern boundary), the area of Rejected Option C and very sketchily the direction of the current patterns. Work by Kojis (1997) on coral recruitment suggests that if the source of coral larvae is within Rejected Option C, these might recruit in the direction of St. Thomas. However, other mechanisms (smaller scale currents, wind patterns, eddies, tides, etc.) might be responsible for unknown larval distributional patterns. The areas proposed for an MCD (Options A, B, and C) are far enough from shore to suffer to a lesser degree the effect of sewage, run-off, etc., but this does not mean that they can not be affected by other sources (e.g., the Caribbean wide-spread death of the black sea urchin, *Diadema antillarum*) or diseases (black band disease, etc.).

Description of Fishery

Section 3.0 of the Coral FMP and Section II of the Amendment provide a complete description of the fishery. Following is a summary of this information:

History of Exploitation

There is no history of coral and reef associated plants and invertebrates (FMU organisms in the Coral FMP) harvesting from any of the proposed areas for an MCD.

The area of Rejected Option C is only occasionally used by recreational divers and only by those divers who are skilled and very experienced in deep-water diving.

The areas of the proposed MCDs are currently being fished by commercial fishers (over the insular platform) and by recreational fishers who fish for pelagics along the drop-off. It is not known how many recreational fishers venture to the shelf edge for spear fishing, bottom hand-line fishing or to SCUBA dive.

Commercial Fishing

Based on the 1995-96 trip ticket data for St. Thomas and St. John, approximately 14 % of the total reported number of trips taken in the area around these two islands and about 31% of the associated harvest occurred in the Federal waters Southwest of St. Thomas (area encompassing Options A and B). For the Federal waters South of St. John (area encompassing Rejected Option C) the proportion of trips equaled approximately 7 % and the proportion of the total catch about 14 %. It is not possible to determine the details of the fishing effort and catch composition of the areas enclosed within Options

A, B, and C. The details available (see Section II, 2 of the Amendment) are from fishery-independent data and most directly related to the red hind spawning aggregation at the Hind Bank (Option A). With respect to potfish, an estimated 19 % (eight percent in Federal waters South of St. John) of the total 2,034 potfish trips reported by the population of fishermen occurred in the Federal waters Southwest of St. Thomas, while about 40 % (11% from area including Rejected Option C) or 92,000 pounds of the total potfish harvest was taken from the Federal waters encompassing the area of Options A and B. Similarly, 4 and 6.5 % of the total number of hookfish trips occurred in the Federal waters Southwest of St. Thomas and South of St. John, respectively. These trips accounted for about eight and seven percent of the total reported hookfish harvest (in both Territorial and Federal waters). Finally, almost 30% of the total lobster trips reported by all fishers in St. Thomas and St. John occurred in Federal waters Southwest of St. Thomas and accounted for more than 50% of the reported take of lobster. By comparison, lobster trips within the area South of St. John (Rejected Option C) represented only about six percent of the total 1,033 reported trips where lobster was harvested, but this relatively small percentage of the trips accounted for almost 20% of the total reported lobster harvest.

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.

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 of the Coral FMP and Appendix I of this Amendment) contains a complete discussion of this subject. For example, American citizens valued the existence of coral reefs 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.

Commercial Landings and Fishery Habitat

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 healthy 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 U.S. Virgin Islands (reported landings in 1991 totaling 1.9 million lbs) was \$4.8 million.

Status of the Stocks

Stony Corals, Octocorals, Live-rock and Seagrasses

The Coral FMP sets OY for stony corals, octocorals, live-rock and seagrasses at zero (0). 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 Coral FMP does not set OY for these species. However, harvest levels are expected to increase and over harvest 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 over harvesting.

TABLE II

The proposed action establishes a no-take Marine Conservation District in the area known as the “Hind Bank” (Management Measure 1/Option A). The alternative sites of Rejected Options B and C (see Section 2) are also presented in the following table. The alternative No Action results in negative impact to meeting the Objectives of the Coral FMP.

OBJECTIVES	OPTION A	OPTION B	OPTION C
/ 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			

4.0 ENVIRONMENTAL CONSEQUENCES

(A) Preserve Representative Areas and Protection of Habitat

Biological Effects

Elimination of consumptive uses within Marine Conservation Districts (MCDs) will provide a refuge and replenishment area for reef resources and ensure continued abundance and species diversity. The MCD can protect older and larger individuals from fishing pressures and thereby preserve spawning stock biomass, intra-specific genetic diversity, population age structure, recruitment supply, and ecosystem balance. This is specially the case in areas where spawning aggregations have been identified or are suspect to occur and through the establishment of a no-take MCD as is the intent of the Council through this Amendment to the Coral FMP.

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

MCDs provide some insurance against management and recruitment failures, simplify enforcement, are conceptually understood and supported by the general public, and may be important in eco-tourism development. Commercial and recreational fishers could experience increased costs of further restrictions on their activities in reserve areas. On the other hand, maintenance of healthy and diverse coral ecosystems will benefit both consumptive and non-consumptive users and help sustain these benefits over time. One measure of the value of these habitats is discussed in the Regulatory Impact Review (Appendix I). Recent court settlements involving ship groundings on coral reefs off the Florida Keys averaged \$921 per square meter of reef damaged or destroyed. Similarly, in Puerto Rico a recent settlement was reached for US\$1.25 million dollars, for restoration purposes, for a grounding on Mona Island which damaged approximately 700 feet of reef.

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) Effects on Marine Mammals and Endangered Species

Marine mammals do not use coral reef and other hard bottom habitats and they are not expected to be either directly or indirectly affected by the Amendment to the Coral 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 Amendment's proposed MCD is expected to benefit sea turtle conservation. The West Indian manatee will benefit from the protection afforded to seagrass beds with the establishment of a no-take MCD.

(C) MITIGATING MEASURES

The Amendment's establishment of a "no-take" MCD is 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, commercial and recreational harvest of fish.

(D) UNAVOIDABLE ADVERSE IMPACTS

Certain individuals are engaged in the harvest and sale of commercially important fish species from the U.S. Caribbean. These entities will be adversely affected, but only in the short term, by the "no-take" alternative for the proposed MCD. There is at present no known harvest of corals, live rock and certain other species in the FMU from the alternative sites for the proposed MCD.

(E) IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There are not expected to be any irreversible or irretrievable commitments of resources.

5.0 LIST OF PREPARERS

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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 and Appendix C summarize testimony on the Draft FMP/RIR/EIS presented at 3 public hearings or submitted in writing to the Caribbean Fishery Management Council and/or the National Marine Fisheries Service during public comment period. The summaries of previous Public Hearings are included in Appendices A and B. They are not included here because there were new alternatives being considered in this final document. Editorial comments have been incorporated in the various documents as well as appropriate changes recommended by NMFS and others.

Public hearings were held on the following dates and locations in the U.S. Virgin Islands:

1. St. John: June 9, 1998 at the Conference Room of the Legislature Building.
2. St. Thomas: June 10, 1998 at the Conference Room of the Legislature Building.

3. St. Croix: June 11, 1998 at the Conference Room of the Caravelle Hotel in Christiansted.

The general comments received include the following:

1. Comment: Prohibit all anchoring in the MCD.

Response: The Council can prohibit anchoring by fishing vessels but can not prohibit anchoring by other vessels.

3. Comment: Establish an MCD in the area South of St. John and in other areas in the Federal Waters around Puerto Rico.

Response: The Coral FMP includes a framework approach for establishing additional MCDs in Federal Waters. The success of the MCD depends on voluntary compliance and enforcement, as well as on close monitoring of the changes taking place within the MCD. The Council defers establishing additional MCDs to future amendments and after additional data are obtained.