

**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
INCLUDING REGULATORY IMPACT REVIEW AND
INITIAL REGULATORY FLEXIBILITY ANALYSIS AND A
FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT**

CARIBBEAN FISHERY MANAGEMENT COUNCIL

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I. INTRODUCTION

The Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands (FMP) became effective in December, 1995, except for section 670.23(b) of the regulation which became effective in March, 1996. The FMP was prepared under the authority of the Magnuson Act by the Caribbean Fishery Management Council to establish a management system for the coral reef resources within the Exclusive Economic Zone (EEZ) and the waters under the authority of the Commonwealth of Puerto Rico and the Territory of the U.S. Virgin Islands, from the shoreline to the edge of the insular platform.

The existing FMP establishes regulations to restrict the taking of coral reef resources in or from the exclusive economic zone (EEZ) around Puerto Rico and the U.S. Virgin Islands. It prohibits the harvest or possession of stony corals, sea fans, gorgonians and any species in the fishery management unit if attached to, or existing upon live-rock; it prohibits the sale or possession of any prohibited species unless imported and fully documented as to a point of origin outside the EEZ; it prohibits the use of chemicals, plants or plant derived toxins, and explosives for harvest (consistent with the Caribbean Council's Reef Fish FMP); and it restricts harvest of other invertebrates to dip nets, slurp guns, by hand and other non-habitat destructive gear.

At the time of submission of the FMP for Secretarial review, a management measure establishing a Marine Conservation District (MCD) was reserved. This amendment proposes to establish a "no-take" Marine Conservation District in the area known as the "Hind Bank" Southwest of St. Thomas, USVI. This action is identified as Management Measure 1 in Section IV of this Amendment. The Council will also prohibit anchoring of fishing vessels in the designated MCD. However, it is the intent of the Council that a fisher dragged into the MCD by a fish hooked outside the MCD will be given the opportunity to present his or her case for "innocent-take" to the appropriate authorities.

The Magnuson-Stevens Conservation and Management Act (Magnuson-Stevens Act) defines fish as "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and bird."

II. STATEMENT OF THE PROBLEM

The principal value of coral reefs (including live-rock) is considered to be non-consumptive and are viewed as essentially non-renewable resource (Coral FMP, 1994). The importance of corals and associated plants and invertebrates lies in their relationship to the marine ecosystem. Coral reefs are among the most productive tropical marine systems, and are the backbone of the ecosystem's food chain. Undeniably, at the end of the food chain are the fishery resources managed under other FMPs (e.g., spiny lobster, reef fish). Healthy coral reefs serve various functions during the different life stages of the many fish species that inhabit these areas. Among these functions, they serve as feeding grounds (serve as food

for a number of species and as ‘hunting grounds’ for others), nurseries, breeding grounds (e.g., red hind and mutton snapper, among others), and refuge (for juvenile groupers, butterflyfish, and snappers, among others). 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). The combined effect of anthropogenic detrimental factors such as sedimentation (increases with land development, deforestation), oil pollution, sewage discharge, dredging, scientific activities, anchoring, deployment of fishing gear, unregulated fishing pressure (e.g., causing changes in species composition), among others (Rogers, 1985; Goenaga and Boulon, 1992) and natural phenomena (storms and hurricanes) adversely affect coral reefs and ultimately other fisheries. In the U. S. Caribbean, the fisheries (grouper, snappers, coral) are dependent on the well being of the habitat (corals, sea grasses) and the integrity of the marine ecosystem. Understanding the complexity of marine ecosystems and the necessity of conserving and managing corals simultaneously as fish species and essential habitat, the Caribbean Fishery Management Council deems it wise management to establish of a marine conservation district, both to curtail future problems with the fisheries, as well as to improve the conditions of the fisheries in the U.S. Caribbean.

The Council is proposing the establishment of an MCD in the U.S. Caribbean EEZ; specifically in the EEZ of the waters southwest of St. Thomas, U.S. Virgin Islands (see Section IV). 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. In addition, MCDs are established for the protection, conservation and management of economically important species. Taking into consideration the slow growth, for the most part, of corals and associated species, their vulnerability to harvesting and to other types of stressors (Coral FMP), as well as the problems associated with other already managed species (e.g., spiny lobster, queen conch, reef fish species) which utilize corals and coral reefs, MCDs are expected to offer the following benefits: (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, (e.g., tours in small submarines and/or glass bottom boats, so long as they do not anchor or injure coral in any way.) (Plan Development Team, 1990; Bohnsack, 1993, among many others). Marine Conservation Districts (MCDs) are recommended as a viable option for management of fish resources in the region (e.g., Bohnsack, 1993; Goodridge et al., 1996; Nowlis, 1997; Roberts, 1997 and other references therein). Their introduction would address a number of the future management considerations outlined in Section 7.3 of the FMP. MCDs are areas of non-consumptive usage which are designed to ensure persistence of reef fish stocks (including corals) and habitat (Plan Development Team, 1990).

The establishment of a no-take MCD, in the proposed location, is expected to benefit species under management through other FMPs; as an example: it will increase the protection to an already known red hind spawning aggregation (seasonal area closure since 1990) and to the coral *Montastrea annularis* identified in the Essential Fish Habitat (EFH) Generic Amendment (1998) as EFH for spawning red hind.

The existing FMPs are mostly single-species plans (i.e., spiny lobster and queen conch) or provide management measures for single species (e.g., size limit for the yellowtail snapper under the Reef Fish FMP or seasonal area closures for red hind and mutton snapper under the same FMP). The Coral FMP on the other hand affords protection to numerous coral species grouped under the common names of stony and soft corals. These organisms are afforded protection by prohibiting all harvesting of the species in the fishery management units (FMU). The Coral FMP states that these resources are distinctive habitats of limited distribution, one of the greatest value of which is perceived to be as habitat for reef-associated and reef-dependent organisms.

Appeldoorn et al. (1992) recommended the establishment of no harvest zones to improve spawning stock size of fish in the U. S. Caribbean, especially since the Reef Fish FMP (1985) stated that this fishery was overfished. The commercial extinction of various species in the U.S. Caribbean shows the decline in the reef fish fisheries which, in part has been curtailed by the establishment of seasonal area closures. These seasonal area closures have proven to be successful at least for the red hind as shown by Beets and Friedlander (1997).

Recent work on modeling the outcome of marine reserves indicates that these are more effective when fisheries are over-fished (Nowlis and Roberts, 1997). A number of fisheries in the U.S. Caribbean are over-exploited (e.g., red hind (Sadovy and Figuerola, 1989); corals (Coral FMP, 1994)) or overfished and economically extinct in the area. The Report to Congress (NMFS, 1997) lists the Nassau grouper and the jewfish as overfished; the CFMC has prohibited all harvesting of these species in federal waters. These groupers aggregate for spawning over areas of high coral relief (e.g., Olsen and LaPlace, 1978). Most fishing effort for groupers occurs at the time of spawning making these species extremely vulnerable to overfishing. The indirect effect of this type of fishing include: disappearance of key predators and hence changes in species composition (of fish and corals) and increased damage to corals because of anchors and fish traps, among others. Over-exploitation and overfishing have been problems recognized in the area because of decreasing average size of fish, changes in species composition, changes in sex ratios, etc. (Beets, 1987; Bohnsack, 1987; Appeldoorn et al., 1992; Parrack et al., 1994) even when there is not enough long-term data to show statistically the existence of these problems. The disappearance of the Nassau grouper from the local fisheries is a case in point. This is however no reason not to take preventive action. Lack of management can impact the reef ecosystem by disturbing the natural biological balance of interacting and co-dependent organisms. Although it is known that the establishment of reserves imposes short-term losses (i.e., loss of fishing ground), the long-term benefits of these areas offset these losses (e.g., increasing fish yields, maintaining bio-diversity, increasing fish size, and emigration of fish to surrounding areas, in time, either as adults or as larvae.)

Why establish an MCD? As stated in the FMP, the principal value of reefs is considered to be non-consumptive and reefs are considered non-renewable. Coral reefs are among the most productive and bio-diverse ecosystems on earth. In addition, coral reefs serve as habitat for a great number of species (See FMUs in Reef Fish, Spiny Lobster, Queen Conch and Coral FMPs), serve as feeding grounds, spawning and nursery grounds. Reef fish fisheries, that is, the fisheries of the U.S. Caribbean, are dependent on the

well being of coral reefs. Noticeable changes in the species composition of commercial catches have been documented (Garrison, 1997). Some of these changes have been in response to the commercial extinction of certain species (e.g., red hind has replaced Nassau grouper), while others have been in response to changes in the composition of coral reef associated species. For example, coral species being replaced or out-competed by sponges or algae since once predators (groupers and snappers) are removed, herbivores (e.g., parrotfishes) increase in numbers (Hughes et al., 1987). Garrison (1997) showed a decrease in the catch rates and relative abundance, in traps, of groupers, triggerfish, angelfish, snappers, and parrotfishes and a simultaneous three-fold increase in catch rates of tangs in the National Park waters around St. John. This is also of concern because the fishery in the near shore, shallow waters of St. John is most likely targeting juveniles. Thus any of the proposed alternative sites for the establishment of an MCD (Options A, B, or C) will serve a number of functions for the complex of coral reef-based fisheries in addition to protecting corals.

The idea of establishing a no-take zone has been discussed at least since 1992 and the options previously considered under the FMP and as Draft Amendment Number 1 taken to public hearings (see Appendices A, B, and C). These options are reviewed here (See History of discussion below and Rejected Options in Section IV). An MCD is proposed to protect a delicate and unique ecosystem which is essential to the health of the fisheries in the area. Some options considered included unique spawning areas for groupers (e.g., areas of *Montastrea annularis*) and others included unique coral structures commonly known as pinnacles. The MCD is best established and maintained when it is supported by the community and co-managed and enforced by interested parties (White, 1988) (See Appendix C).

What are the criteria to determine the area for establishing an MCD? The criteria for selection of 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
 - Recreational area

Aesthetics
Education
Research opportunities

This set of criteria was developed by the Marine Reserve Zoning Committee (MRZC) created by the Council, in June 1993, at the 78th CFMC meeting in St. Thomas. The MRZC was composed of two representatives from the U.S. Virgin Islands, two representatives from Puerto Rico, two representatives from NMFS, two representatives from the CFMC, and one representative from the Sea Grant College Program. The MRZC discussed the criteria for establishing an MCD, the purpose and objectives, the possible benefits that could be expected from this action and the areas recommended for an MCD. The MRZC developed the list of criteria based on the local needs to be met through the establishment of a no-take zone, the available literature (e.g., Plan Development Team, 1990, etc.), and through communication with the proponents of the concept (e.g., Dr. Jim Bohnsack) as well as with local experts. Most of the literature consulted has been cited in the Amendment document.

Similar to marine fishery reserves proposed for reef fish in the U.S. South Atlantic (Plan Development Team, 1990), MCDs are areas of non-consumptive usage which are designed to ensure persistence of reef fish stocks and habitat. MCDs, by analogy with the marine fishery reserves, are intended primarily to protect older and larger fish. The benefits derived from this are the protection of the critical spawning stock biomass, intra-specific genetic diversity, population age-structure, recruitment supply, and ecosystem balance while maintaining reef fish fisheries. It has been proposed that reserves are most effective in addressing the problem of recruitment overfishing, especially for sedentary species (DeMaritini, Coral Reef Symposium in Guam, 1992). Thus these serve to maintain ecosystem balance and productivity. MCDs are expected to supply larvae to other fishing areas. MCDs are believed to have been important in maintaining the high abundance of many species of reef fish in certain protected areas worldwide (e.g., Alcalá and Russ, 1990; Roberts and Polunin, 1991; Russ, 1985). In addition, MCDs can provide some insurance against management and recruitment failures, simplify enforcement and assist in the development of eco-tourism. The prohibition of anchoring by fishing vessels within the MCD reduces destruction of habitat and species in the FMU as well as the costs of enforcement.

1. History of discussion:

The proposed MCD was included in the Draft Coral FMP taken to public hearings in 1993. A suggestion was made to the Council to conduct a number of orientation and discussion meetings to disseminate information on the MCD. Among the reasons given for opposing the establishment of an MCD were (see Section 7.0 of the FEIS in the Coral FMP): (a) lack of data on the number of people affected economically by the proposed closing of a prime fishing ground (both directly, commercial fishers and divers, and indirectly, restaurants, etc.); (b) lack of information and assurance on the benefits of the MCD; (c) opposition to the proposed alternative of allowing certain activities in the MCD (e.g., recreational trolling) while prohibiting others (e.g., 'floating' or float fishing); (d) lack of information on the fishing activity (e.g.,

effort, species harvested) in the proposed area; (e) not well defined monitoring program to assess the impact and effectiveness of the MCD; (f) the proposed area was too large.

The first orientation meeting was conducted in St. Thomas on December 22, 1993. This was followed by a Workshop, hosted by the CFMC, on Marine Reserves (March 15, 1994), and three other meetings on June 22, 1994, August 30-31, 1994, and the last of which was held in St. John on September 28, 1994. Public Hearings for the establishing of an MCD South of St. John (Option C) were conducted in the U.S. Virgin Islands on March 12-14, 1996 (Appendix A).

The following user groups were identified and public announcement of all meetings was made by the Council:

- a) Commercial fishers
- b) Divers/Diving Businesses
- c) Recreational/Sport Fishers and Charters
- d) Scientists
- e) Managers (local and federal)
- f) Cruise Ships (passing)
- g) Aquarists/Artists

At one time or another, all user groups voiced their opinions and suggestions. The most acceptable option would have been an MCD which included the federal waters at the boundary with the British Virgin Islands (B.V.I.) and have the B.V.I. government close an area in their waters. The Council pursued this option to its maximum extent. However, after various meetings involving representatives from the B.V.I. government, the U. S. government (both territorial and federal including the Department of State) an agreement with the B.V. I. could not be reached.

The fishers stated at the first orientation meeting (December 1993) that the most pressing problems affecting fisheries included: a) pollution in near shore areas due to sewage and other outflows; b) recreational fishers selling their catch; c) the commercial fishers always giving up something and being regulated; and d) extensive damage to gear from cruise ships and conservationists. Solutions to the problems included: a) enforce laws which prevent pollution; b) licensing of recreational fishers; c) allow certain fishing in the MCD; d) consider other options for establishing the MCD; and e) establish shipping lanes.

The Workshop on Marine Reserves included: a) a presentation by Dr. Jim Bohnsack (NMFS) on the status of the fishery in the U.S. Caribbean and management options among which he described the establishing of MCDs; b) a presentation by Ms. Sara George of St. Lucia who discussed the different types of reserves (e.g., no-take, fishing allowed, anchoring allowed, etc.) being established in St. Lucia and the user conflicts which ensued during the development of the management strategy; c) discussion of the U. S. V. I. landings data presented by Mr. Stephen Meyers, DFW/DPNR; d) summary of survey conducted by the Council; and e) presentations by Ms. Monica Lester (commercial fisher), Mr. Andre Webber (recreational diver)

and Mr. Spike Herbert (sports fisher). The various user groups were in favor of the concept of an MCD as long as each user group had access to the reserved area; thus it would not be a no-take MCD.

At the September 28, 1994 meeting in St. John commercial fishers present reported that most fishers in St. John are part time fishers and mostly use hand lines for fishing. The proposed action triggered the following responses: a) the area should be well marked; b) fishing should be allowed for licensed commercial fishers using hand lines or there should be times/seasons for legal fishing; and c) there should be fines for illegal fishing.

Public Hearings were held in the U.S. Virgin Islands between March 12 and 14, 1996 on the establishing of an MCD South of St. John. These are summarized in Appendix A of this Amendment. An Options Paper was prepared in August 1996.

The Council contracted for a Rapid Socioeconomic Evaluation of the Proposed Marine Conservation District in 1996. The document is available at the Council's office for review.

At the August, 1997 meeting the Council voted to prepare the Draft Amendment Number 1 to the Coral FMP establishing the MCD south of St. John, this original preferred option is designated rejected Option C in this document. The Draft Amendment Number 1 (dated September 1997) was taken to Public Hearings in the U.S. Virgin Islands in October 1997. The summary minutes of the hearings and the written comments received at the Council's Office are summarized in Appendix B of this Amendment. After receiving public comment, the Council voted to expand the array of options and take this new document to Public Hearings. The two options (Management Measure 1 or Option A and rejected Option B) added to the document would establish a no-take MCD in the Federal waters Southwest of St. Thomas at the site known as the red hind bank (see Section IV of this Amendment). The comments received at the public hearings included a proposal by the St. Thomas/St. John Fisheries Advisory Committee which would closed simultaneously the "hind bank" (see Management Measure 1 in this document) and the Territorial waters around the eastern side of St. Thomas "which encompass Long Point southwest to include Buck Island and Capella Rock then East to Dog Rock then diagonally East along Thatch Cay to Cocki Point, excepting the area from the shoreline to fifty feet offshore for bait fisherman" (see Appendix B for charts of recommended areas). The Council does not have jurisdiction within the 3 nm territorial waters of the U.S. Virgin Islands and this Amendment does not consider establishing MCD in areas outside the EEZ.

The Council took final action on this matter after the Public Hearings of June 1998 (Appendix C). This final draft proposes a no-take marine conservation district, in the EEZ, in the area known as the "Hind Bank" Southwest of St. Thomas, U.S.V.I. The management measure has the support of the community and compliance is expected to be high.

2. Commercial landings

Aquarium Trade

Commercial harvest of reef-associated organisms is allowed in the U.S. Virgin Islands state waters under permit (Indigenous and Endangered Species Permits Act 5665 of 1990). No specific information was available to determine collection sites but most collections are predominately in shallow territorial waters. In Federal waters, the Council through the implementation of the Coral FMP prohibited all harvesting of coral species and reef-associated organisms, and through Amendment 2 to the Reef Fish FMP prohibited the capture of certain species (red hind, mutton snapper, butterfly fish, and seahorses) for the aquarium trade.

Commercial Fishing

Historically, commercial fishers in the U. S. Virgin Islands have been required to have a fishing license and to submit catch reports of their fishing activities. These catch reports or trip tickets have been filled in various ways, monthly reports or yearly reports of daily trips. Nevertheless, it is possible to estimate annual landings from the catch reports and in recent years to determine the area where fishing took place (state waters versus federal waters, and Southwest of St. Thomas versus Southeast of St. Thomas). Before 1992, landings data for the south coasts of St. Thomas and St. John had been grouped and only divided into TSW and TSE (St. Thomas Southwest and Southeast including the south side of St. John, respectively). Figure 1 shows these areas prior to 1992. In 1992, TSE was divided in two sections and landings from south of St. John were reported separately (Figure 2). After 1995, reporting of catch includes a greater number of areas around St. Thomas/St. John (Figure 3).

Figures 4 and 5 show the percent catch of the total landings of potfish and lobster reported by commercial fishers from 1989 through 1995 for all reporting areas. The acronyms are as follows: MLT= multiple fishing areas; JSW=St. John southwest; JSE= St. John southeast; JS= St. John south; JN=St. John north; TSW=St. Thomas southwest; TSE=St. Thomas southeast; TNW=St. Thomas northwest; TNE=St. Thomas northeast; BBB=British Virgin Islands; TTT=unknown fishing location. The number of licensed commercial fishers has remained fairly stable through the years but the percent reporting has varied. The landings from the “Hind Bank” are reported under TSW and includes both territorial and federal water fish catches.

In 1989/1990 (commercial landings are reported from July through June), TSE accounted for 6.2% of the total finfish landings of the U.S.V.I. (DPNR, 1990) and TSW accounted for 9.5%. It was not possible to look at the landings from St. Thomas and St. John separately and it was not possible to determine the percent of the catch from Federal waters; this is the case unless specified otherwise. The DPNR report estimated total projected landings (i.e., a correction factor to account for under-reporting was used for the calculation of projected landings) at 751,182 lbs. There were a total of 198 licensed commercial fishers in St. Thomas/St. John of which 106 reported landings. A total of 2,674 lbs of lobster were reported from the TSE area (about 4.2% of the total shellfish) and 5,129 lbs from TSW (about 8% of the total shellfish). Total value of the reported catch in the U.S.V.I. was \$1,605,064.

In 1990/1991 TSE accounted for 8.9% of the total landings (DPNR, 1991). A total of 51,020 lbs of fish (9% potfish) and 10,045 lbs of lobster (15%) were reported for the TSE area. Lobster accounted for about 15% of the total lobster landings reported for St. Thomas/St. John. TSW accounted for 13% of the potfish and 17% of the lobster harvested by pots. There were 182 licensed commercial fishers of which 131 reported landings. Total projected landings were reported as 797,687 lbs for St. Thomas/St. John.

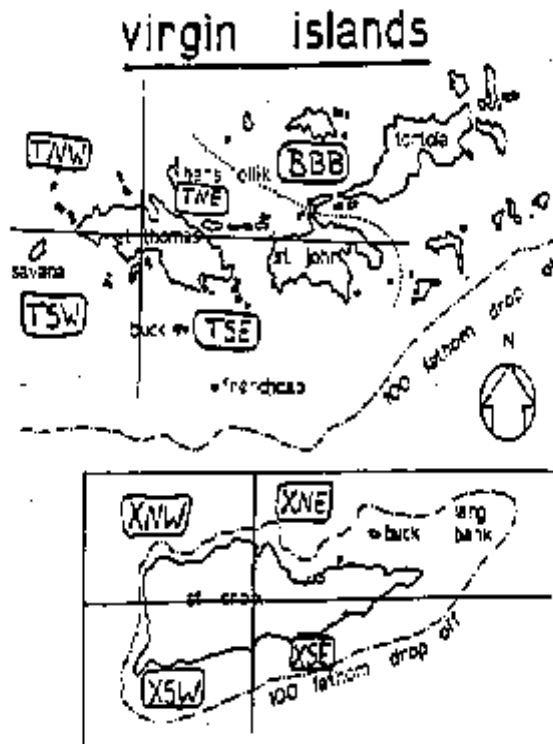


Figure 1: Geographical fishing areas in the U.S. Virgin Islands prior to 1992.

Virgin Islands Fishing Areas

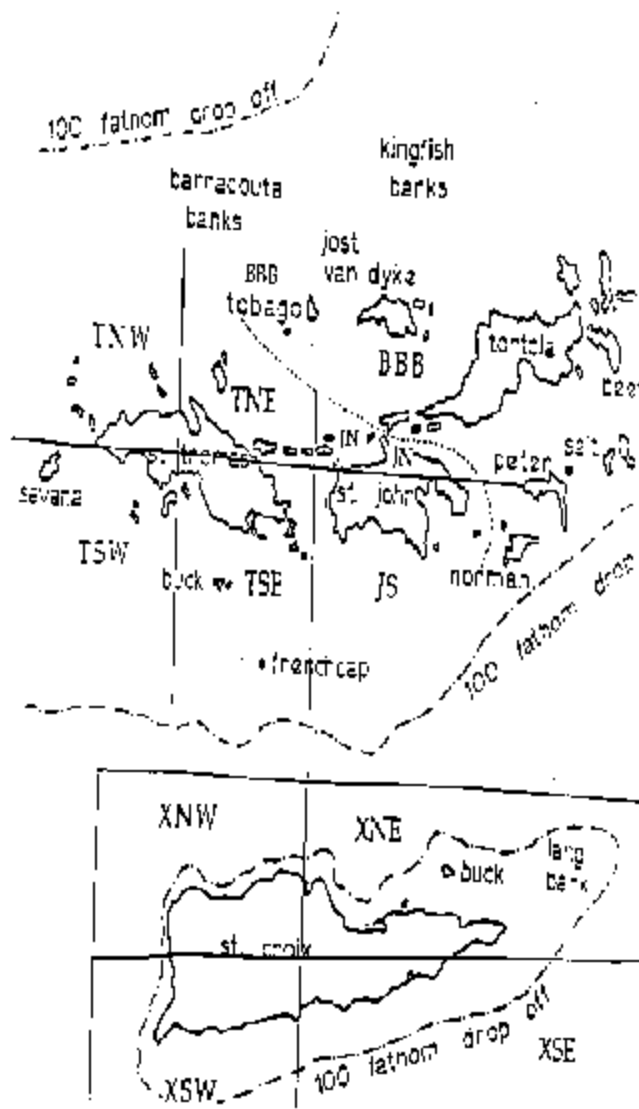


Figure 2. Geographical fishing areas in the U.S. Virgin Islands prior to 1995.

Virgin Islands Fishing Areas

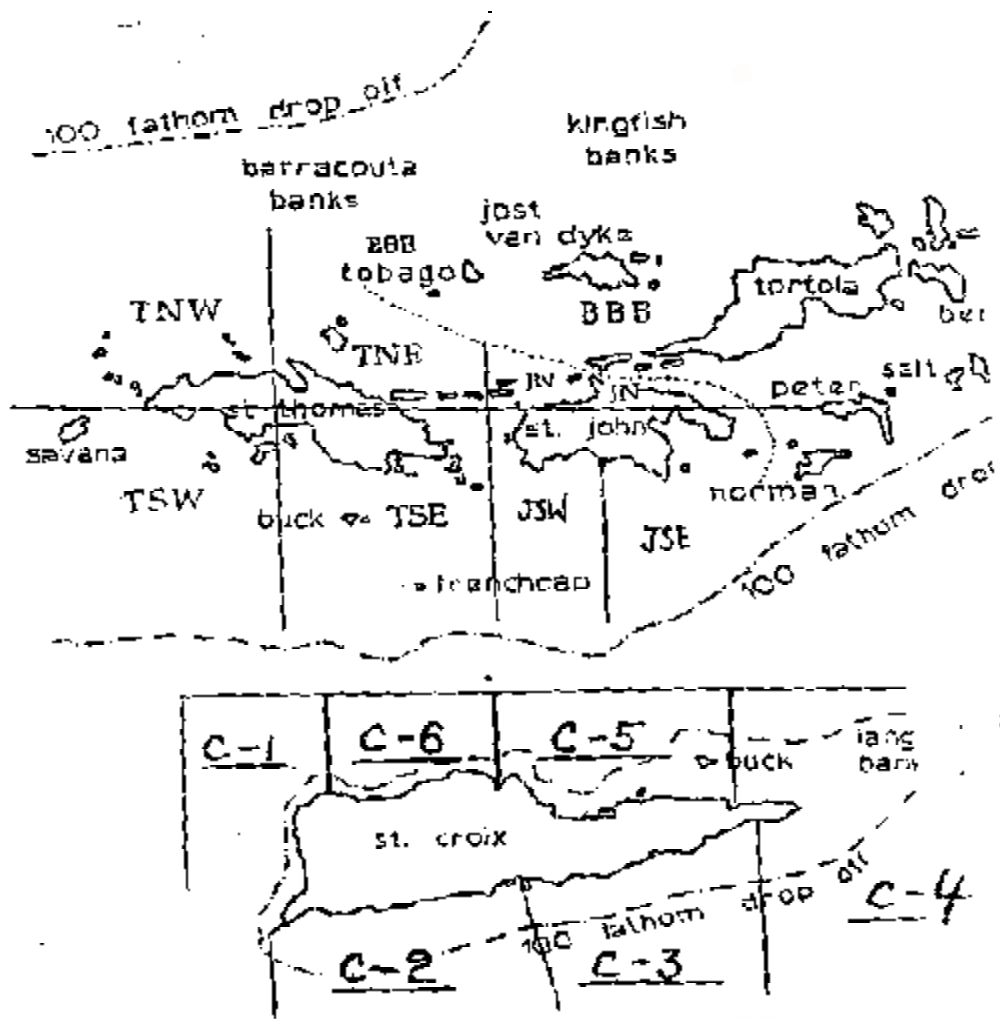


Figure 3: Geographical fishing areas in the U. S. Virgin Islands after 1995

Figure 4: Potfish Landings USVI

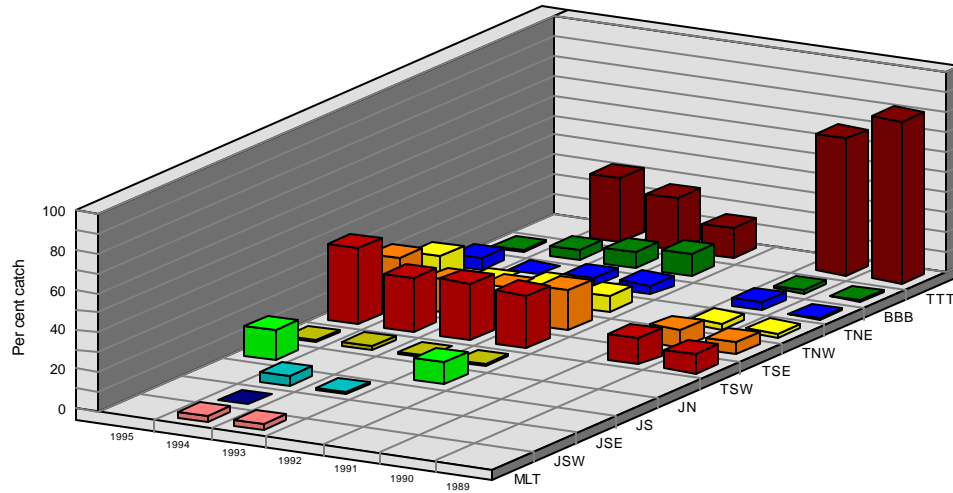
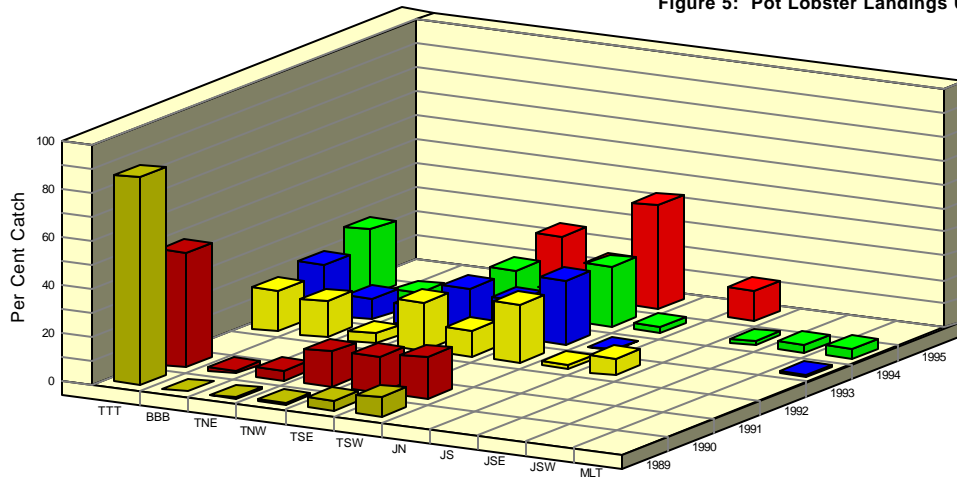


Figure 5: Pot Lobster Landings USVI

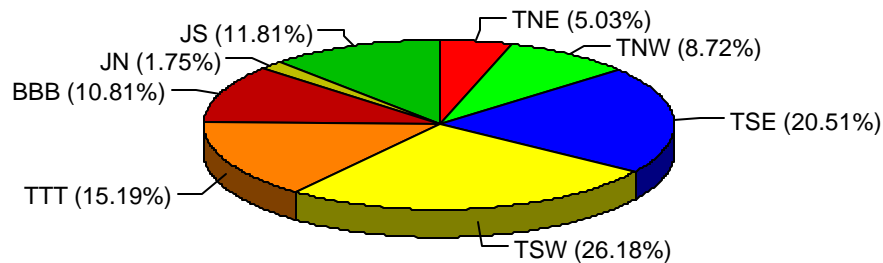


Comments received from the commercial fishers at the Public Hearings for the Coral FMP suggest that even if fishing was done in the area designated as TSE, the catch might still be reported as TSW; that is, reported as the home port rather than the harvest area. In most cases however, between 1989 and 1991 there were few monthly reports which included the area from where fish were taken.

In 1991/1992, there were 231 licensed commercial fishers of which 160 reported landings. Changes in the reporting method showed total landings of 81,536 lbs reported for the island of St. John. A total of 6,000 traps were reported for St. Thomas/St. John (DPR, 1993).

Between July 1992 and June 1993, the potfish landings in JS (St. John South, Figures 2 and 3) accounted for 12% of the total landings (as reported by Mr. Stephen Meyer at the 80th CFMC Meeting in La Parguera, November 29-December 1, 1993). Figure 6 shows potfish landings for St. Thomas-St. John (in pounds) between July, 1992 and June, 1993). The two areas of interest, TSW and JS, accounted for 27 and 11 per cent of the total reported potfish landings, respectively. Lobsters harvested by pots accounted for 24 (TSW) and 7 (JS) per cent.

Figure 6: USVI Potfish Landings 92-93



The CFMC conducted an Orientation Meeting in St. Thomas on December, 1993. Those present indicated that (1) there was fishing activity in, at the time, proposed area for the MCD (rejected Option C); (2) one of the primary fishing activities in the area was floating; and (3) the targeted species were yellowtail snapper (*Ocyurus (Lutjanus) chrysurus*) and hardnose (*Caranx crysos*). The CFMC conducted a survey and concluded that the fishing activity in the area was greater than previously believed or determined from the catch reports. The type of fishing (i.e., floating, fish pots and seasonal hand line fishing) that takes place in the area appears important to the economics of the commercial fisheries.

The results of the survey showed that all 15 commercial fishers interviewed fish all areas south of St. Thomas/St. John; the two sport fishers interviewed fish only the drop off along the south coast; 11 of the commercial fishers target hardnose, exclusively by floating, and almost exclusively in the area south of St. John (all other species and gear reported are equally distributed throughout the southern coast of the St. Thomas/St. John area). Fishing for hardnose occurs mostly during the months of May through September. Floating is also done for yellowtail snapper throughout the year. Floating or float fishing is defined as fishing done by throwing bait in the water (chumming), using a small anchor and hand line drift.

Among other species reported were other jacks, wahoo, tunas and dolphin fish (February through October), red hinds, and Nassau, yellowfin and tiger grouper.

The information on fishing in the proposed areas is incomplete. However, this should not be used as an excuse to postpone taking action. The Council has taken action and is proposing to establish a marine conservation district to protect essential fish habitat and fish, specifically spawners.

Comments received at the Council indicate that probably about 1,500 traps might be fished in the originally proposed MCD (rejected Option C). A possible consequence of the establishment of an MCD in any of the areas considered is the relocation of effort to the west (nearer to St. Thomas in the case of rejected Option C) or to the local (shallower) waters. In the case of the proposed Management Measure 1 (Option A) and the rejected Option B, the effort would be relocated to the South of St. John or driven further into shallower waters. Or, effort could be concentrated in the perimeter of the MCD. If this is the case, information on the movement of fish, for example of red hinds after spawning, is needed. Little information is available on the home range or movement of fish. In shallower water, for example, red hinds have overlapping home ranges and are all females (García-Moliner, 1986).

The data for 1993-1994 and 1994-1995 are summarized in the Three Year Summary Report (1997) but detailed information for the areas South of St. John is not available. The reason for the missing data are not known and no attempt will be made to speculate on the matter. The TSW potfish landings accounted for 29 and 27 per cent and lobster harvested by pots accounted for 27 and 25 per cent, for each year 1993-1994 and 1994-1995, respectively. The two areas JSE and JSW accounted for less than 5% in any one of the years (see Figures 4 and 5).

Table 1 shows the landings data available from the areas south of St. John summarized from the data presented at the CFMC's 88th meeting for the period July 1995 to February 1996. The area south of St. John (as per Figure 3) accounts for 9.8% of the total potfish landings reported in the U.S.V.I. between July 1995 and February 1996. This information was presented at the 88th CFMC Meeting in St. Thomas, March 27-28, 1996 by Mr. Stephen Meyer, Chief of Fisheries, DFW/DPNR. It was estimated that 1.3% of the potfish landings reported are from fish harvested in the federal waters. An estimated 5.3% of the landings are from both the federal and the local waters. There were 168 commercial fishers registered in St. Thomas/St. John in 1995/1996.

Table 1: Per cent, by area, of the total commercial landings from the U.S.V.I. (Potfish) between July, 1995 and February, 1996. (Summarized information from the data presented by Mr. Steve Meyers at the 88th CFMC meeting in St. Thomas, U.S.V.I. on March 27-28, 1996.) (See Figure 4 for area location.)

Area	Per cent
JN-JSE-JSW	0.1
JS	1.2
JSE	7.7
JSE-BBB	0.4
JSE-JSW	0.4
JSW	0

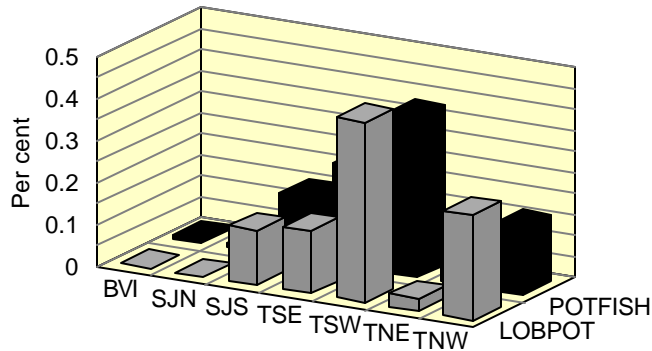
Approximately, 9.8% of the total landings reported in the U.S.V.I. are harvested in the vicinity or inside the area of the rejected Option C.

The incomplete set of landings data for the U.S. Virgin Islands shows that in 1990-1991 15% of the lobsters landings were reported from the TSE area. In 1995-1996, 11.1% of the lobsters harvested in the U.S. Virgin Islands were reported from the JSE-JSW areas, (from a total of 4,362 lbs of pot lobster and 262 lbs of dive lobster reported for the area). Pot lobsters were mostly reported from both the federal and local waters while dive lobsters were mostly from local waters.

However, it is still unknown how many commercial/recreational fishers actively fish in the area of the proposed MCD (Management Measure 1) or in the originally proposed area (rejected Option C). The survey conducted by the CFMC showed that 1 to 5 fishers, out of a total of 17 fishers interviewed, do not fish in this area South of St. John. Downs et al. (1997) interviewed 22 commercial fishers in the St. Thomas/St. John area of which 14 actively fish in the area south of St. John (rejected Option C).

A more complete data set for 1995-1996 was analyzed. The new data analyzed for the period July, 1995 to June, 1996 consisted of over 4,000 records from the St. Thomas-St. John commercial landings statistics. The areas reported in the trip tickets by the commercial fishers included those shown in Figure 3, in addition to areas identified in the records as JNW (St. John northwest) and JS (St. John south). The areas considered for the MCD are enclosed within the limits of the Federal waters southwest of St. Thomas and South of St. John, but it is not possible to determine the total number of trips or the total pounds of fish and shellfish harvested from within the MCDs. Options A (now Management Measure 1) and B are within the area known as TSW and rejected Option C is within the areas known as JSW (St. John southwest), JSE (St. John southeast), and JS. TSW accounted for 38% of the potfish landings and 43% of the lobster harvested with pots. JS in general accounted 15% of the potfish and 13% of the pot lobster (Figure 7). A summary of the more detailed description of the results of the 1995-1996 data set follows (see Appendix I).

Figure 7: USVI per cent catch by area
1995-1996



A total of 25 fishers were identified in the 1995-1996 trip ticket database as having fished in the Federal waters southwest of St. Thomas. The average catch per trip in Federal waters for these 25 fishers is higher than that reported by them from other areas (i.e., 207 lbs/trip in Federal waters to 152 lbs/trip in non-Federal waters), except for lobster which is lower in Federal waters (73 lbs/trip in Federal waters; 82 lbs/trip outside St. Thomas southwest Federal waters). These data are summarized in Table 2. See Appendix I for more detail.

A total of 21 commercial fishers were identified in the 1995-1996 trip ticket database as having fished in the Federal waters south of St. John. The average catch per trip in Federal waters for these 21 fishers is lower than that reported by them from other areas (i.e., 147 lbs/trip in Federal waters to 171 lbs/trip in

non-Federal waters), except for lobster which is higher in Federal waters (118 lbs/trip in Federal waters; 92 lbs/trip outside St. John Federal waters). These data are summarized in Table 2.

Table 2: Trip and per cent catch information based on 21 identified fishers who reported trips in the Federal waters of St. John and 25 identified fishers who reported trips in the Federal waters of southwest St. Thomas between July, 1995 and June, 1996. (See Appendix I).

	Percentage of trips inside St. John's Federal Waters		Percentage of trips inside St. Thomas Southwest Federal Waters	
	Trips (%)	Catch (%)	Trips (%)	Catch (%)
Total	7.0	10.7	14.4	31.1
Potfish	7.8	12.0	18.8	40.4
Hookfish	6.5	7.3	4.2	8.1
Lobster	6.3	19.1	29.9	56.3

Keithly and García-Moliner (1997) reported that the southwest area of St. Thomas seemed to be the preferred fishing grounds for potfish and lobster pot fishing, during 1995-1996, as determined from the landings data. Of 1,629 and 351 potfish and lobster pot trips reported by the commercial fishers of the USVI during the July (1995) - June (1996) period, 619 (38%) and 160 (43%) occurred in this area (TSW).

Fishery-dependent data were analyzed (Appeldoorn et al., 1992) for the U.S.V.I. and it was reported that most likely the reef fish fishery was overexploited in the area. Among the recommendations made by Appeldoorn et al. (1992) to manage the fishery were to decrease fishing effort and to establish no harvest zones.

Beets (1993) reports that CPUE (catch per unit of effort) for the South side of St. John, from a fishery-independent study, was 5.71 fish/trap and 1.57 kg/trap. The study was conducted between August 1989 and June 1990, but the results of the study were probably affected by the passing of Hurricane Hugo through the U.S. Virgin Islands in September 1989. A total of 6 traps were soaked between 4 and 14 days (total of 200 trap hauls for the study period) at depths between 20 and 30 meters. The dominant species in the catch were squirrel fishes and grunts from a reported 48 species sampled. *Holocentrus rufus*, the long spined squirrelfish accounted for 18.6% of the total catch. Trap fishing in the South side of St. John was estimated by Beets (1993) to be two thirds higher than the effort on the North side of St. Thomas/St. John.

Fishery-independent data (October - December, 1992) do not show that within the sampling quadrats of the SEAMAP-Caribbean Program (Figure 8 from PRDNER, 1994) and included within the originally

proposed MCD (rejected Option C) (i.e., quadrats 9, 10, 11, 13, 14, and 15) significant numbers of fish were sampled either by hook and line (n=14) or traps (n=3) (data supplied by S. Meyers, DFW/DPNR). Preliminary results for the period April 1993 to March 1994 also show non-significant numbers of fish sampled from the MCD area (n=13 fish) (Dixon and Maidment, 1994).

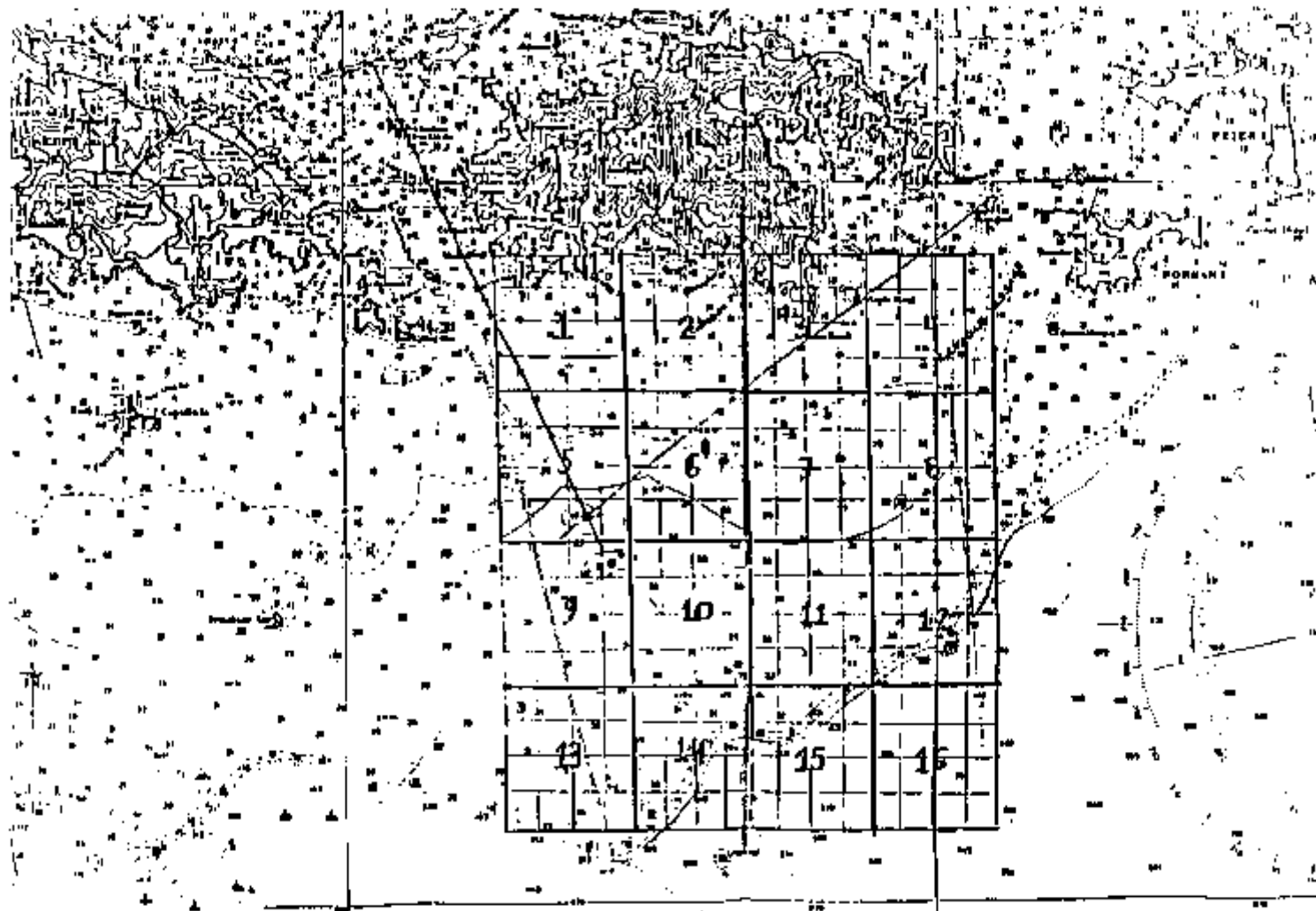


Figure 8: Sampling Area SEAMAP-Caribbean St. John, USVI

The same kind of fishery-independent data collected by SEAMAP-Caribbean does not exist for the area southwest of St. Thomas. Fishery-dependent data however, indicated that in general the red hind fishery was showing signs of decline: (1) decline in CPUE; (2) average size; and (3) significantly skewed sex ratios (Sadovy and Figuerola, 1989). In 1988, the Fisheries Advisory Committee of St. John/St. Thomas recommended complete closure to fishing of a red hind spawning area during the spawning season because of concerns about reduced landings (Sadovy and Figuerola, 1989; Minutes from Council Meetings). Also, the historical loss of spawning aggregations of the Nassau grouper and the apparent trend shown by its replacement in the fishery, the red hind, propelled the Council into action to protect the red hind spawning aggregation in 1990. In 1990, Federal Regulations were promulgated to enact a seasonal area closure in the red hind bank southwest of St. Thomas.

In 1997, Beets and Friedlander evaluated the effect of the closure on the spawning aggregation of red hinds. Over 400 red hinds were collected from the red hind bank, during January, using traps and hand lines. Video samples and direct transect sampling (while SCUBA diving) were also done. The average size of the red hind harvested at the 1997 aggregation was 365.7 mm TL, larger than the average size reported for 1988 (295.2 mm TL, Beets and Friedlander, 1992). The average size of red hinds reported for the 1984-1989 period was also smaller than the mean total length reported by Olsen and LaPlace (1978) for the 1974-1975 period (342 mm TL). A shift to smaller sized fish in the commercial catch was also reported by Beets and Friedlander (1992) through 1988. Intense sampling of the 1988-1989 spawning aggregation showed a skewed sex ratio (1:15 males to females) with average sizes of 397 mm and 339.6 mm TL for males and females, respectively. Sex ratio in the 1997 aggregation was 1:4 males to females while in 1974-1975 was 1:6 males to females. These sex ratios varied during the time period of spawning being more female biased earlier in the season.

The spawning aggregation primary site as described by Beets and Friedlander, (1997) extends from 18°12.2'N; 65°0.10'W to 18°12.2'N; 65°0.40'W. The largest catches of red hind occurred at the eastern side of the spawning area. The dominant coral at this site was *Montastrea annularis*. These flattened colonies of *Montastrea annularis* measured 0.5-1 m in diameter by 0.5-1 m in height. Erosion of the side of the corals shielded mushroom-type structures. These structures of high relief, compared to the mostly low relief but densely covered shelf edge ridge of southern St. Thomas, offers shelter. These structures are atypical in the Virgin Island shelf. Olsen and LaPlace (1978), described the red hind spawning site within the grouper bank but farther east of the one described by Beets and Friedlander (1997), both however at depths of 20 fathoms. The bottom topography is described as a series of “coral ridges, parallel to the 100 fathom curve. These ridges were usually 100 m across and separated by calcareous sand which ranged from 50 to 300 m in width”. The dominant coral, *Montastrea annularis*, measured less than 1 m in diameter. Clavijo and Tobias (1985) reported that the 1985 red hind spawning aggregation was small and spawning was limited to a short period of time around the full moon of January. The aggregation of February did not materialize. Of 23 red hinds collected (size range 245-410 mm TL) only 1 was ripe (female collected 2 days after the full moon and measuring 320 mm TL). Dives at the aggregation site (depth of 30 - 45 m) resulted in the following description: “bottom consisted of well developed coral patches interspersed with sandy depressions.” In 1986, the aggregation was fished in December, January

and February. Size range from 250 to 475 mm (Clavijo et al. 1986). In 1989, dives at the site were made and water depth of the shelf edge reef was 38-48 m. “The substrate was dominated with dense scleractinian cover, primarily plates of *Montastrea annularis*.”

Large red hind predators include cubera snappers (*Lutjanus cyanopterus*) and sharks (Beets and Friedlander, 1997). Predators reported by Olsen and LaPlace (1978) included *Mycteroperca venenosa* (yellowfin grouper), *Carcharhinus springeri* (reef shark), *C. limbatus* (blacktip shark), *Gynglymostoma cirratum* (nurse shark), *Sphyrna barracuda* and *Scomberomorus cavalla* (kingfish).

Other species aggregating at the red hind bank in St. Thomas include: the yellowfin grouper, *Mycteroperca venenosa* (aggregating in March), the yellowtail snapper, *Ocyurus (Lutjanus) chrysurus*, parrotfish, *Sparisoma viride*, the creole wrasse, *Clepticus parrae*, and the creole fish, *Paranthias furcifer* (Olsen and LaPlace, 1978); the Nassau grouper *Epinephelus striatus* once had spawning aggregations at the “grouper bank” but few individuals are seen in the area anymore.

At present, the management measure which established a seasonal closure for red hind seems to have been successful, both in terms of the fish at the aggregation -- larger size, more fish, and the food chain established in the area (large predators). The unique features of coral formations of predominantly *Montastrea annularis*, “required” by aggregating spawners have been described by Olsen and LaPlace (1978) and most recently by Beets and Friedlander (1997). Although there are no coordinates specified by Olsen and LaPlace (1978) to identify the study site, an approximation indicates that these aggregations might use more than one site (e.g., 20 fathom isobar) and thus this would mean that these features are found throughout the already demarcated area of the “hind bank”.

A detailed map of the “Hind Bank” would be the logical step. Once this is done, the data can be used to find similar areas and (a) allow for controlled fishing (e.g., limited access) or (b) develop other possible management measures.

Corals, in general, are of slow growth. *Montastrea* in particular has been reported as having annual growth rates of 0.4 - 1.2 cm/yr in the USVI (Coral FMP: Gladfelter et al., 1978; Dodge and Brass, 1984; Hubbard and Scaturro, 1985; Huston, 1985; Goenaga, 1988 as reported by Edwin Hernandez). This means that the dimensions of *M. annularis* described by Olsen and LaPlace (1978) and Beets and Friedlander (1997) are more than 100 years old; perhaps somewhat older since erosion of the sides of the coral were described as giving it mushroom appearance. These structures might topple in time or under the force of storms and it could be hypothesized that the aggregations move within the area searching for these features in what has been described as a low relief platform.

Montatrea annularis reproductive type has been described as spawner, meaning that eggs and sperm are shed into the water column and the larvae (planulae) can spend variable amounts of time in the water column, and hermaphroditic (Szmant-Froelich 1986 and Szmant 1991). Its spawning season has been described as taking place between mid-August and mid-September (Szmant-Froelich 1986). *M.*

annularis grows optimally in temperatures between 27 and 29° C and temperatures above 30°C have been related to bleaching events (Goenaga and Canals 1990).

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.

There is at present no harvest of coral species or live-rock allowed in the Federal waters of the U.S. Caribbean.

3. Recreational, Charter and Sport Sectors

There is no information on the recreational fishing effort in the areas of the proposed MCDs. Thus information on the fishing activity at the proposed sites for establishing an MCD by privately owned vessels either for deep sea fishing, trolling or diving (spear fishing) is unknown.

Downs et al. (1997) identified 10 sport charter operations in the St. Thomas-St. John area. These fish the drop off on the southern side of St. John seasonally and for half day charters.

Diving activities in the area of rejected Option C are restricted to skilled divers because of the depth. According to Downs et al. (1997), there is no commercial dive use (either commercial spear fishing using SCUBA or for hire boats taking tourists SCUBA diving) of the area within rejected Option C.

4. History of Marine Reserves

Since the early 1960's there have been initiatives for the creation of marine reserves under non-emergency situations. That is, knowing that the resources would become increasingly exploited, as population and technology increased, there have been recommendations for the creation of marine reserves (Björklund, 1974).

MCDs, by analogy with the marine fishery reserves, are intended primarily to protect older and larger fish. The benefits derived from this is the protection of the critical spawning stock biomass, intra-specific genetic diversity, population age-structure, recruitment supply, and ecosystem balance while maintaining reef fish fisheries. It has been proposed that reserves are most effective in addressing the problem of recruitment overfishing, especially for sedentary species (DeMaritini, Coral Reef Symposium in Guam, 1992). Thus they serve to maintain ecosystem balance and productivity. MCDs are expected to supply larvae to other fishing areas. MCDs are believed to have been important in maintaining the high abundance of many

species of reef fish in certain protected areas worldwide (e.g., Alcalá and Russ, 1990; Roberts and Polunin, 1991; Russ, 1985). Ballantine (1991; 1995) reviews the ecological, biological, social, scientific, and economic factors relevant to marine reserves. Roberts and Polunin (1991) review the information available from marine reserves around the world. Tables 3 and 4, from Roberts and Polunin (1991) summarize the reported effects of marine reserves on fish size and abundance. Davis (1989) also summarizes information on refugia and refers to specific cases of success. One of these being the Philippines where after five years the mean harvest per fisher per day had tripled, making production in adjacent areas extremely high. However, after 10 years the reserve was ransacked and in 2 years yields declined by 50%.

Corals are organisms which are essential for tropical fisheries. Degradation of coral reefs and an increasing number of diseases have been reported in near shore areas. Information on the source of coral recruits, especially on reef forming species is lacking. Kojis (1997) recommends that deep water coral species (e.g., *Agaricia lamarcki*) be monitored to determine recruitment rates in the proposed area of the MCD (depth of 18 to 35 meters) and the source of these recruits.

Table 3: Reported Effects of Marine Reserve Protection on Fish Size from Roberts and Polunin, 1991

Study	Findings
Bell (1983) Banyuls-Cerbere Mar. Res. (France)	Overall modal size class for 18 species vulnerable to fishing larger in reserve than fished control site. Same pattern for two sparids studied separately: <i>Diplodus vulgaris</i> and <i>D. sargus</i> .
Ross (1985) Sumilon Is. Res. (Phillippines)	The average weight of individual serranids in reserve was 1.9 and 2.0 times greater than in two control sites.
Ayling and Ayling (1986) Southern Great Barrier Reef (Australia)	<i>Plectropomus leopardus</i> on average nearly 10 cm longer on unfished than fished reefs, 78% over 35 cm total length versus only 46% in fished areas.
McClanahan and Muthiga (1988) Malindi Mar. Res. (Kenya)	Mean size of all fishes combined substantially greater in lagoons of protected versus fished reefs.
Beinssen (1989) Boult Reef (Australia)	<i>Plectropomus leopardus</i> (Serranidae) on average around 13 cm longer on Boult Reef (after 3.5 years protection from fishing) than on nearby Fitzroy Reef.
Buxton and Smale (1989) Tsitsikamma Coast Natl. Park (South Africa)	Mean size of <i>Petrus rupestris</i> (Sparidae) in reserve 43.7 cm total length versus 23.4 cm in control area ($p < 0.05$). No significant differences for two other sparids studied.

Table 4: Reported effects of marine reserve protection on fish abundance from Roberts and Polunin, 1991 (“Where statistical tests have been performed the significance levels are shown: *, $p<0.05$, **, $p<0.01$, ***, $p<0.001$; NS, not significant. Studies are arranged in date order.”)

Study	Findings
Bell (1983) Banyuls-Cerbere Mar. Res. (France)	Overall density of 18 fished species over 2 times greater inside than outside reserve ***. Two sparids studied in detail showed the same pattern: <i>Diplodus vulgaris</i> *** and <i>D. sargus</i> * both 2.3-2.6 times more common in reserve.
Russ (1985) Sumilon I s. Res. (Phillippines)	Overall abundance of fish greater in reserve than two control sites*. Serranid densities 3* and 25* times greater in reserve; biomass 6* and 31* times greater.
Ayling and Ayling (1986) Southern Great Barrier Reef (Australia)	Overall density of <i>Plectropomus leopardus</i> (Serranidae) 16% greater on unfished than fished reefs (NS). Densities of individuals >35 cm long nearly 2 times greater on unfished reefs*.
Samoylis (1988) Kenyan parks and reserves	No significant difference in overall, or commercial, fish abundance between three protection levels. Significantly greater serranid biomass in reserves than in unprotected areas *** or parks*.
Alcala (1988) Apo I s. Res. (Phillippines)	Mean overall fish density 1.4 times higher inside reserve than in control areas*.
Buxton and Smale (1989) Tsitsikamma Coast. Natl. Park (South Africa)	Two sparids, <i>Petrus rupestris</i> and <i>Chrysoblephus laticeps</i> , respectively 13* and 14** times more abundant in reserve than in control area. No difference for third species of sparid.
Clark et al. (1989) Looe Key Reef. Florida (USA)	Lutjanid abundance increased 93% and haemulid by 439% following 2 years protection from spearfishing. All 15 spearfishing target species censused increase in density**.
White, quoted in Clark et. at. (1989) 3 reserves (Phillippines)	Total fish abundance increased by 173%, 89% and 45% respectively in Apo, Pamilican and Balicasag reserves over a 1 year period of protection. Lutjanid abundances increased by 47%, 213%, and 2850%, respectively.
Russ and Alcala (1989) Sumilon I s. Res. (Phillippines)	Following collapse of protection, mean densities of fishes decreased by: 94% for lutjanids and lethrinids**, 60% for caesionids*, 55% for pomacentrids*, 60% for carangids and scombrids (NS), 45% for serranids (NS) and 79% for chaetodontids*. Densities of scarids and labrids increased by 182%** and 217%** respectively..
McClanahan and Shafir (1990) Malindi Mar. Res. (Kenya)	Total fish densities 3.6 times higher*** in the reserve lagoon than lagoons of unprotected reefs.

Examples from other areas

Although none have been established yet, there are three marine reserves proposed for Puerto Rico. These are in local waters and include: (1) Turrumote, off La Parguera on the Southwest coast (García- Sais, 1994); (2) Tourmaline, off Mayagüez on the West coast (Vicente, 1996); and (3) a section of the Island of Culebra, off the East coast (Vicente, 1995).

Saba, Netherland Antilles

Part of the reserve established in Saba has been closed to fishing since 1987 and the remainder is only subjected to light fishing pressure. Estimates in 1991 and 1993 show biomass to have increased in both the unfished areas (5 out of 6 target species) as well as in the fished areas (Roberts and Polunin, 1993). Overall biomass of commercially important families increased by 60% and size of fish also increased. However, fishing pressure decreased during those years due to changes in the employment sector on the island.

Barbados

Rakitin and Kramer (1996) report that reserves do indeed protect fish stock and that there is emigration of fish from the reserves. They showed that mean size of fish was larger in the reserve for 18 out of 24 species, that the abundance of larger fish was higher in the reserve and that trap catches were high in the reserve and boundaries decreasing with distance from the protected area.

Belize

The Hol Chan Marine Reserve has been a no take reserve since 1987. It is a small reserve (2.6 km²) for which Roberts and Polunin (1994) report a standing stock of 340 g/m² in the center of the reserve and 77 g/m² in the periphery. This value on the periphery of the reserve is two times higher than that reported for the adjacent fished areas. The larger size of the commercially important fish in the reserve is expected to be significant in the replenishment process in the area since larger fish egg production is higher.

New Zealand

Ballantine has reviewed the experience of New Zealand with all types of marine reserves (e.g., Ballantine, 1991) and has concluded that even when not all species will respond rapidly to protection, no take marine reserves are the most successful. The response of the species will depend on the life history traits such as growth rates, reproductive output, migrations patterns, etc. Marine reserves are most successful when they are established in areas where they are seen and therefore protected. Results indicate that, as suggested by Ray (1976) the boundaries of the marine reserves are leaky, users having access to the resource escaping the reserve, at the same time that the resource will be protected for a longer period of time than if the reserves were not established.

MacDiarmi and Breen (1992) report that between 1978 and 1992 the density and mean size of spiny lobster (*Jasus edwardsii*) increased two years after the establishment of a marine reserve at Cape Rodney to Okakari Point. Populations of spiny lobster, especially of female lobsters, increased in the reserve as compared to 5 sites where commercial fishing is allowed. Although they do not dismiss the possibility that the increase in abundance could have had occurred naturally, the increase was threefold between 1978 and 1983 and twofold between 1983 and 1990.

Not all the results obtained are positive. Cole et al. (1990) could not show significant differences in abundances of fish and invertebrates between sites sampled inside and outside the reserve.

III. OBJECTIVES OF THIS AMENDMENT

The objectives of the Coral FMP are to conserve and protect the species in the FMU for the maximum benefit of the Nation, to fairly allocate resources among different user groups, to reduce the potential for user conflict, to identify data gaps which impede management, and to provide relevant recommendations to the states.

The objectives of the Coral FMP are unchanged and addressed in this 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 (see Discussion of Management Measures).

Objective 4, "To provide, where appropriate, for special management of reef and seagrass habitats of particular concern or ecological importance through the establishment of reserves or other protected areas" is achieved through the proposed action considered in this amendment and addressed through a review of the data available for the U.S.V.I. (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 this amendment).

Marine Conservation Districts are marine areas with special value or significance to the marine ecosystem that will be maintained in their natural state. The MCDs can be maintained or restored to their natural state by prohibiting all harvesting and anchoring of fishing vessels within the designated districts. The Council's objectives for establishing MCDs are to: (1) conserve and manage representative samples of marine habitats and ecosystems, and to maintain marine biodiversity; (2) conserve and manage economically important species; (3) preserve, enhance, protect and restore coral reefs and associated organisms which

are critical to fisheries resources; (4) protect and preserve coral beds as natural areas for the greatest benefit of the Nation.

IV MANAGEMENT ALTERNATIVES AND REJECTED OPTIONS

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 9 :

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

Discussion: In 1988, the Fisheries Advisory Committee of St. John/St. Thomas recommended complete closure to fishing of a red hind spawning area during the spawning season because of concerns about reduced landings (Sadovy and Figuerola, 1989; Minutes from Council Meetings). That area is described by the coordinates specified above. In 1990, Federal Regulations were promulgated to enact a seasonal area closure in the red hind bank southwest of St. Thomas. The information which led to this decision by the Council revealed the decline in the red hind fishery; decline in CPUE, average size of red hinds, and significantly skewed sex ratios (Sadovy and Figuerola, 1989). At present, the management measure which established a seasonal closure for red hind seems to have been successful, both in terms of the fish at the aggregation -- larger size, more fish, and the food chain established in the area (large predators) (Beets and Friedlander, 1997). (Also, see Section II, 2 for details). The unique features of coral formations of predominantly *Montastrea annularis*, “required” by aggregating spawners have been described by Olsen and LaPlace (1978) and most recently by Beets and Friedlander (1997) also seem to in a healthy state.

The comments received at the public hearings of October, 1997, for Amendment Number 1 to the Coral FMP, included a proposal by the St. Thomas/St. John Fisheries Advisory Committee which would closed simultaneously the “hind bank” (Management Measure 1 (Option A)) and the Territorial waters around the eastern side of St. Thomas “which encompass Long Point southwest to include Buck Island and Capella

Rock then East to Dog Rock then diagonally East along Thatch Cay to Cocki Point, excepting the area from the shoreline to fifty feet offshore for bait fisherman” (see Appendix B for charts of recommended areas). The Council does not have jurisdiction within the 3 nm territorial waters of the U.S. Virgin Islands and this Amendment does not consider establishing MCD in areas outside the EEZ. However, their recommendation considered *in toto* is valuable and most effective.

At the 93rd Council Meeting (February 1998), Dr. Joshua Nowlis (at the time with the Northeast Fisheries Science Center) suggested that an MCD off the Southwest coast of St. Thomas (Management Measure 1 (Option A)) may be superior to an MCD off the South coast of St. John (rejected Option C) if a portion of the Territorial waters off St. Thomas is also closed. Without the additional closure the performance of Management Measure 1 (Option A) and rejected Option B might not be superior to rejected Option C. However, in lieu of all the changes in the Magnuson-Stevens Act, most importantly those involving essential fish habitat (EFH), Management Measure 1 (Option A) and rejected Option B might be superior (to rejected Option C) since they would be also affording protection to already identified spawning aggregations (e.g., red hind, yellowfin grouper), allowing for restoration of economically extinct spawning aggregations (Nassau grouper), and protecting unique structures of the coral *Montastrea annularis* which have been reported as seemingly essential for the aggregations to occur.

This area known as the “Hind Bank” is about 16 square miles and has been closed for three months (December through February) every year since 1990. The best estimate of total shelf area in the U.S. Virgin Islands approximates 1,100 square miles but it is not known how much of the total shelf area are coral reefs or viable fishing grounds. The proposed MCD represents about 1.5% of the total shelf area. The area known as TSW in the catch reports includes the territorial waters and the federal waters (that is, includes the “Hind Bank” area) and has accounted for between 9 and 38 % of the total potfish landings (1989-1995) and 8 to 43 % of the total lobster harvested by pots in the St. Thomas/St. John area.

The potential displacement of fishing effort can not be easily assessed. Comments from the commercial fishers of the area suggest that they will continue fishing the periphery of the MCD, as they are doing at present during the seasonal closure of the “Hind Bank”. Table 2 of Appendix I shows the monthly fishing activities in Federal waters Southwest of St. Thomas which indicates that there is no significant decrease in the number of trips or in the revenues per trip from the federal waters during the months of the closure. Neither the USCG, nor NMFS have presented any reports to the Council which would indicate that there is poaching in the area.

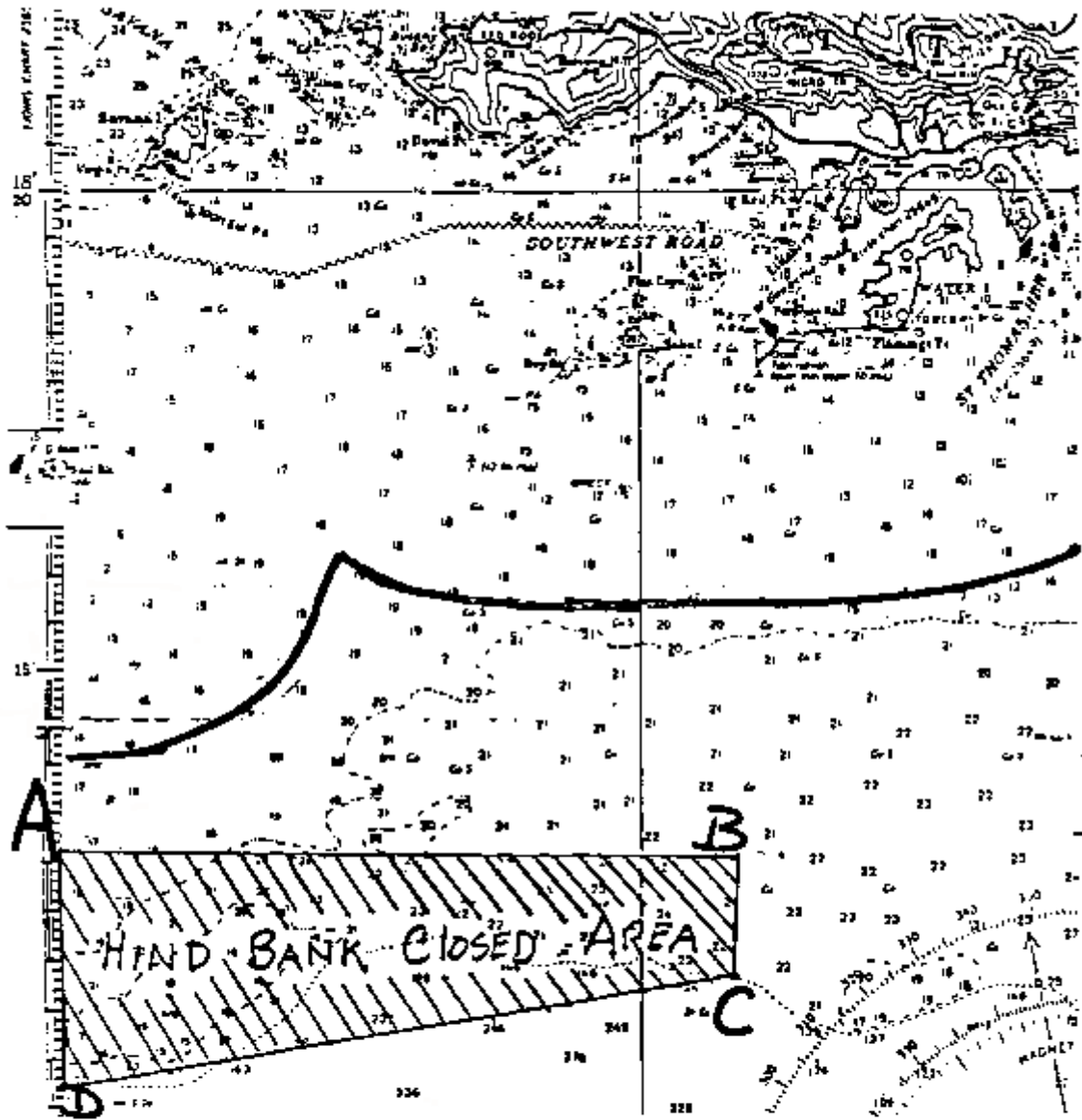
The data available from the area (including rejected Option B) have been presented in detail and have been presented alongside the data available for the originally proposed rejected Option C in Section II, 2 for the years 1989 through 1996. None of the landings data (catch reports or trip tickets) can be analyzed any further hence only general comments can be made about the Federal waters within which these Options are enclosed. The fishery-independent data available is much more detailed for the areas of the “Hind Bank” (including rejected Option B). That is, the information on the red hind spawning aggregation (for

the years 1984 through 1997) is more specific and has shown the success of the seasonal closure, more so when looked at in conjunction with data shown in Table 2 of Appendix I.

It is the intent of the Council to prohibit anchoring by fishing vessels in the proposed areas for an MCD. Also, harvesting any organism under management or removing them for restoration, educational or scientific purposes is also prohibited in the proposed no-take MCDs. The Coral FMP prohibits all harvest of corals, live-rock and species in the FMU. Scientific removal of organisms under the Coral FMP is allowed under permit. Monitoring of the MCD is possible through observation but scientific removal could be considered in the regulation on a case by case basis. Non-damaging techniques for removal of corals for ageing or identification are available and these techniques must be considered (e.g., video assessment of live coral cover, relationship between size and age from photographs and in situ observation, etc.) before considering removal of species from the area. The permitting procedure must be strict and supervised.

The potential for compliance with the establishment of a no-take MCD might be higher for the the area proposed under Management Measure 1 (Option A) than for any other since the proposal came from the Fisheries Advisory Committee.

Figure 9: Option A establishes a no-take MCD at the "Hind Bank" southwest of St. Thomas, U. S. V. I.



Option 1A: No Action

Discussion - Coral reef areas of special significance and particularly stressed or vulnerable areas may need protection in addition to measures already provided in the Coral FMP. MCDs are designed to direct protective regulations to only those specific areas requiring this protection. The establishment of MCDs 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. However, long-term benefits of preserving habitats as well as species would be forgone.

Since they provide the Nation with substantial economic benefits unrelated to direct harvest, there appears to be little doubt that their greatest value lies in non-consumptive uses. Moreover, it is not clear whether typical fishery management approaches directly apply to reef resources and such standard measures have yet to be evaluated. In the meantime, given the current rates of degradation of coral reefs, their limited distribution and the consequent potential for their overexploitation, and the growing demand for reef-associated invertebrates, a decidedly conservative management approach must be applied. Scarcity of biological, and harvest data is no excuse for lack of management in protecting the corals, coral reefs and associated fisheries.

The principal value of reefs (including live-rock) and sea grass beds is considered to be non-consumptive and they are essentially viewed as non-renewable resources. They should be protected from all consumptive uses which would include protection from anchoring damage within reserve boundaries. To this end, mooring buoys are recommended, as has already been done in a number of areas in state waters of both Puerto Rico and the U. S. Virgin Islands.

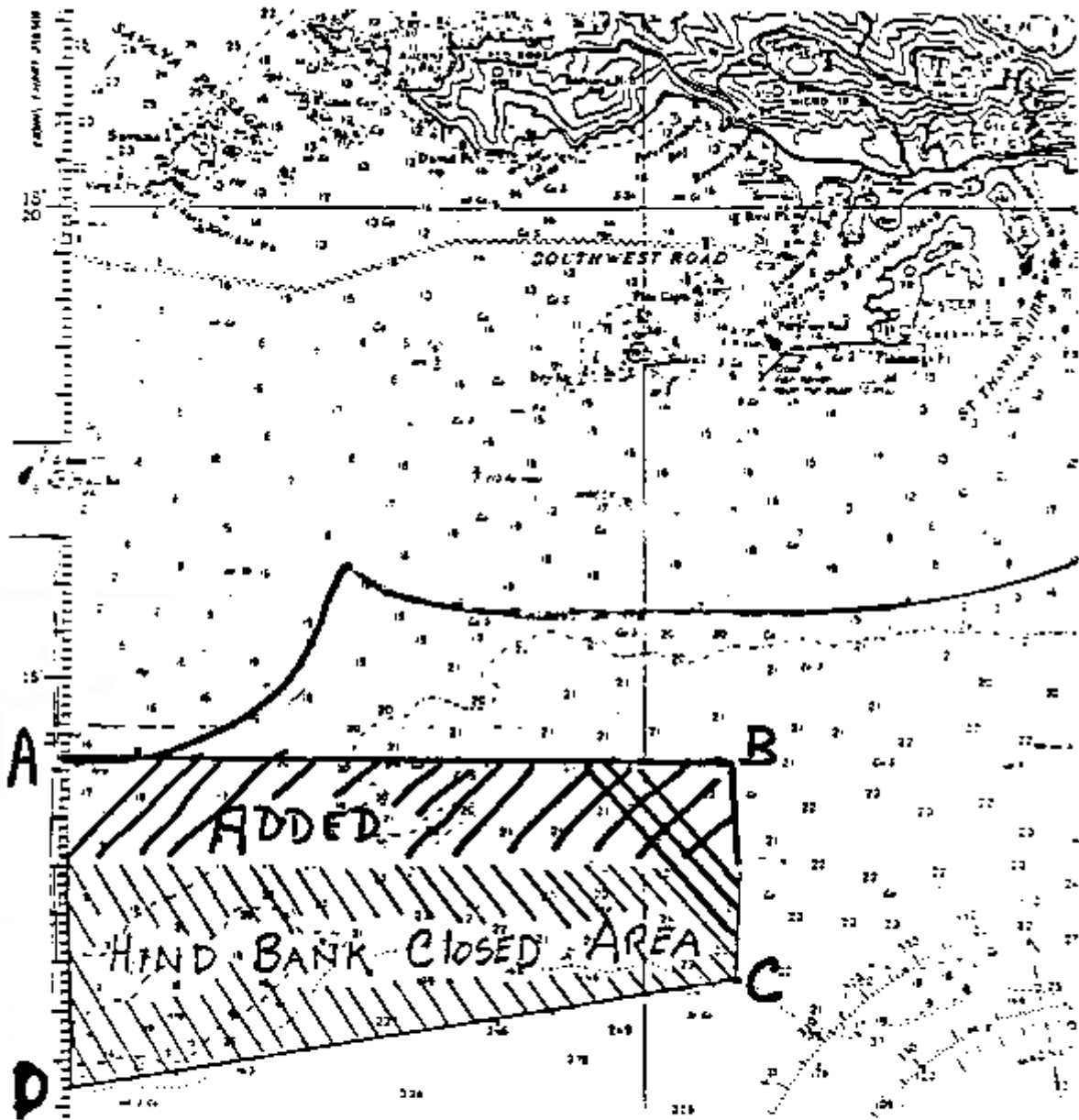
Other options considered and rejected for the establishment of an MCD in the EEZ

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 10:

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

Figure 10 Option B establishes a no-take MCD including the "Hind Bank" and exiting the area 1 nm north of present boundary on the southwest of St. Thomas, U. S. V. I.



Discussion: The discussion presented under Section II, 2 and under Management Measure 1 (Option A) apply to rejected Option B since no detailed information for the area, other than catch reports for TSW and Federal versus state waters is available.

The one meaningful difference between Option A (Management Measure 1) and rejected Option B would be the “buffer” zone that the additional nautical mile in rejected Option B offers to the spawning fish leaving the aggregation, that is if they move north rather than south, east or west. Commercial fishers might experience a short-term decrease in income from this added buffer zone since their catches might be reduced by the increased distance from the periphery of the “Hind Bank”. The total area encompassed by rejected Option B is approximately 23 square miles while the area of rejected Option C is approximately 20 square miles and Option A (Management Measure 1) is approximately 16 square miles. 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.

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 of establishing a no-take MCD, therefore not allowing any fishing gear in the area, will accrue, for both fishers and the fishery, since there will be no negative impacts on habitat and corals from fishing gear or anchors.

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 11 :

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 11: Rejected Option C, MCD south of St. John



Discussion: 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 (NMFS), the Department of Natural Resources (DNER) of Puerto Rico, the Department of Planning and Natural Resources (DPNR) of the U.S. Virgin Islands, and the Sea Grant College Program. The MRZC had originally selected this area and had determined that this rejected option (MCD South of St. John) met the criteria for an MCD (see page 4 of this document). The area within the MCD encloses relatively healthy ecosystems which are representative of the wider Caribbean region. The coral reefs within this area are of high quality, are in good condition and are unique since there is an area identified by divers and known as the pinnacles within the area. These pinnacles are very tall columns of corals most likely *Montastrea* or *Dendrogyra* spp. Healthy populations of fish and invertebrates are reported for the area. The MCD would potentially provide "spawning products" to replenish downstream areas off south St. Thomas, a major fishing area. This could be the case since information from coral studies by Kojis (1997) suggest that larval dispersal outside the MCD South of St. John will likely be in the direction of St. Thomas. However, there are no reported spawning aggregations of finfish (groupers, snappers, etc.) in the area south of St. John. This does not mean that they do not occur.

Originally, the designation of the area enclosed within the above mentioned coordinates as an MCD seemed appropriate since the local government (U.S.V.I. Department of Planning and Natural Resources) had shown interest in developing compatible regulations for the areas inshore of the EEZ in St. John; and the Department of the Interior (National Parks Service) already has established a national park in the shoreline between Bovocoap and Ram Head. Regulations within the Park waters do not prohibit fishing and Garrison (1997) among others has reported dramatic changes in species composition and declines in the number of larger predators (i.e., groupers and snappers) from the commercial catch within the Park's waters. Thus, if this option were to be approved, and the above mentioned agencies develop compatible regulations in the areas under their jurisdiction (i.e., prohibit fishing), parallel to the proposed MCD south of St. John, the closed area would encompass marine ecosystems from the shoreline to the pelagic realm.

The southern boundary of this rejected option has been set to follow the 100 fathom depth line because the Council proposed to allow trolling for pelagic species which mostly takes place outside the 100 fathom depth contour. However, commercial fishers complained that 'planners' used by sports fishers could damage the reef. The Council notes that a fisher dragged into the MCD by a fish hooked outside the area will be given the opportunity to present his or her case of innocent take to the appropriate authorities.

The Scientific and Statistical Committee of the CFMC (March 25, 1996) have endorsed this proposal which established an MCD in the federal waters demarcated by the coordinates given above. The reasons for supporting this alternative are: (1) the critical size of the MCD is sufficient and habitats present are adequate to potentially protect reef species; (2) this area South of St. John is still protected from urban pollution, coastal run-off, and development through the protection afforded to the area because of its designation as a National Park; (3) the MCD is where the public can "see it" (Ballantine's criteria); (4) enforcement can be achieved through a cooperative agreement (VINP/NMFS/USVIDPNR/USCG); (5) effort is diluted since fishing can be done north, east and west of the MCD; (6) more benefits to the fisheries

are accrued by fish crossing the boundaries (export of fish outside the MCD). (See Section II part 4 of this amendment).

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. Most of those present at the Public Hearings have opposed the establishment of a no-take MCD south of St. John. And, 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).

The following are some of the possible outcomes if an MCD is established, users will: (1) move farther away to better areas; (2) move to nearby areas and experience crowding; (3) concentrate effort on other species/gear; (4) stop fishing; (5) fish illegally in the area. The consequences of establishing an MCD could be: (1) short-term increase in cost to the fishers moving to more distant areas; (2) loss due to increased effort over an area (decrease in catch per unit effort if the areas are already exploited); (3) overexploitation of other species; (4) loss of income and livelihood. The potential loss is unknown since there are almost no data available to quantify the loss. The limitations of the data include: (1) the high percentage of non-reporting/misreporting; and (2) no long-term database.

THE “NO-TAKE” MCD (this discussion applies to all Options)

The MCD may be defined as a discreet geographical area within a region where more restrictive gear and other fishing regulations may be needed for conservation purposes. The type of MCD envisioned would have no anchoring by fishing vessels, no fishing of any kind (including no bottom fishing and no spear fishing), and no removal of any organism in the MCD (including, but not limited to, those organisms listed in the FMUs of the Coral FMP, Reef Fish FMP, Queen Conch FMP, Spiny Lobster FMP). It has been shown that the most beneficial utilization of coral, coral reefs and associated plants and invertebrates is as non-consumptive resources, including as habitat for fishery stocks. The best available scientific information shows that the harvest of any organism would upset the balance of the coral reef ecosystem (which includes the surrounding habitats such as seagrass, algal plains, etc.) and thereby diminish its ability to provide healthy habitat for a variety of fish species, including fishery resources. The purpose of a “no-take” MCD is to maintain and enhance fishery resources by protecting the coral reef ecosystem and the habitat it provides. Thus MCD’s are areas of non-consumptive usage which are designed to ensure persistence of reef fish stocks and habitat. As reviewed in both the Coral FMP and the Reef Fish FMP the aquarium trade is increasing worldwide. The demand for marine species has been rapidly increasing and there is still not much information on the industry. In no harvest areas these sought after species (e.g., coral in general, live-rock, juveniles of mutton snapper and red hind, and colorful fish such as wrasses and butterflyfish) are afforded protection from the aquarists and hobbyists.

In addition, other activities which will be prohibited in the MCDs include: removal of organisms for restoration, educational or scientific purposes. MCDs by virtue of their special value and for what is hoped to be accomplished by their establishment will be subject to these very restrictive regulations. This will not

disallow scientific sampling such as visual census, videotaping/photographic collections, and other such sampling techniques which are not harmful to the reef and associated resources.

Addressing safety at sea, the Council's intent is not to jeopardize or endanger any lives and recognizes the possibility of innocent passage through the MCD.

Possible alternatives to activities within the MCD:

The following alternatives were considered by the Council but have now been rejected in favor of a no-take MCD.

Alternative 1: Prohibit all fishing except by hand lines and floating within the MCD established through the management measure above.

Discussion: Coral reef areas of special significance and particularly stressed or vulnerable areas may need protection in addition to measures already provided in the FMP. MCDs are designed to direct protective regulations to only those specific areas requiring this protection. The establishment of MCDs 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. However, long-term benefits of preserving habitats as well as species would be forgone.

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 chain. At the end of this food chain are the fishery resources managed under other FMPs. 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. 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 fisheries are dependent on the well being of the habitat and thus wise management is needed in the form of MCDs.

During the public comment period, some of the arguments presented to the Council included allowing commercial fishing for certain species and using certain gear. The Council, having considered this alternative has opted for a no-take MCD. The fishing gear that would be allowed under this alternative may not have a direct harmful effect on corals but would have an indirect harmful and long term effect on corals. That is, by removing fish species the balance of the coral reef would be altered and changes in species composition would ensue (e.g., coral displaced by algae or sponges).

Allowing any kind of fishing within an MCD increases the probability of poaching using prohibited gear (e.g., traps). Allowing fishing within an MCD also increases the effort and costs of enforcement since the enforcement agents would have to interview each vessel in the area to determine which gear has been deployed. The Council's intention is to prohibit anchoring of all fishing vessels and handlines or floating for fish would have to be done a drift.

Alternative 2 - Prohibit all gear except trolling within the MCD established through the management measure above.

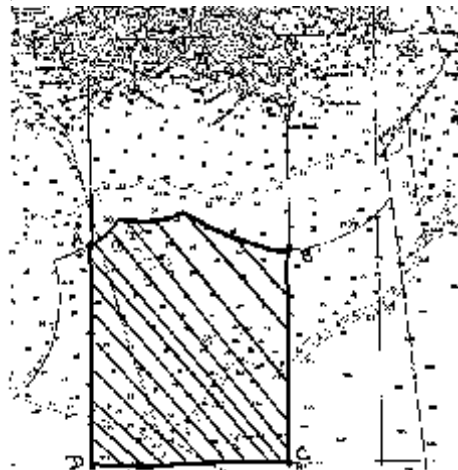
Discussion - Although MCDs are usually refuge or non-consumptive-use zones, trolling may be allowed since these activities are unlikely to directly affect the coral reef ecosystem. Specifically proposed prohibitions in the MCD include any bottom fishing (hook and line, traps, long lines, nets), spearfishing, harvesting by hand, and netting. All other harvesting methods are also prohibited. However, trolling has been known to harvest yellowtail and other snappers, which are species under management. The removal of these species could alter the balance of the coral reef ecosystem and, therefore, have an indirect, harmful effect on coral and other fish. The use of planers should be prohibited since these artifacts do hit the bottom and coral reef formations of high relief as they are pulled through the water column.

Rejected Option D: Establish a Marine Conservation District (MCD) in the EEZ due South of St. John, U.S.V.I., within the coordinates specified below (Figure 12):

The area is bound by rhumb lines connecting the following points:

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	18E10.0' N	64E42.2' W
D	SW corner	18E10.0' N	64E46.9' W

Figure 12: Rejected Option E for the proposed MCD south of St. John, U.S.V.I.



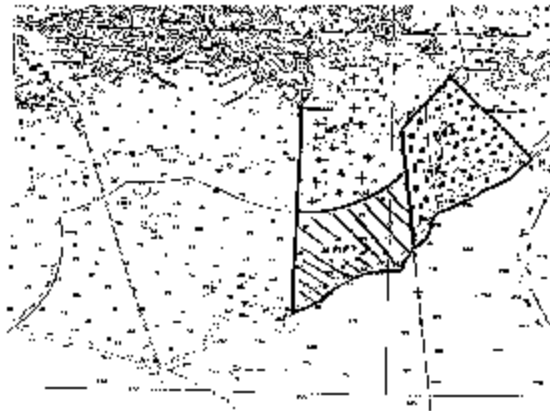
Discussion: This rejected option is practically the same as rejected Option C except that the southern most boundary is extended beyond the 100 fathoms contour line to the 18°10.0'N latitude. This rejected Option does not allow for trolling along the shelf edge outside the MCD. The advantage of this option over Option C is the fact that it is easier to enforce.

Rejected Option E: Establish a Marine Conservation District (MCD) in the EEZ due South of St. John, U.S.V.I., within the coordinates specified below (Figure 13):

The area is bound by rhumb lines connecting the following points:

Point	Description	Latitude	Longitude
A	Ram Head, St. John	18E18.0' N	64E41.5' W
C	SW corner at St. John	18E12.3' N	64E41.5' W
H	SE corner at BVI	18E16.8' N	64E36.3' W
G	NE corner at BVI	18E18.8' N	64E38.6' W

Figure 13: Shared MCD including federal waters, local U.S.V.I. waters and the British Virgin Islands .



Discussion: Throughout the history of the development of this rejected Option, the B.V.I. government participated actively in the orientation and discussion meetings, the Workshop and the Council meetings. The government of the B.V.I. also participated in meetings with representatives from the U.S. Department of State. However, no agreement has been reached to allow the Council to pursue this rejected Option.

B.V.I. contribution to the MCD is unlikely although their interest is great. Also, any fish migrating to the east would only benefit B.V.I. fishers and not U.S.V.I. fishers unless they had access to permits to fish in the B.V.I. waters beyond the MCD.

There is concern that the area might be too small if only the federal waters were to be closed. The area shoreward of the territorial sea does not have the protection of the National Park Service. Thus, these shoreward habitats are vulnerable to pollution, coastal development and unrestricted fishing and boating activities.

There would most likely be a concentration of effort on the western boundary of the MCD while the Management Measure 1 (Option A) provides for the dilution of effort over a broader area.

Rejected Option F: Establish a Marine Conservation District (MCD) in the EEZ due South of St. John, U.S.V.I., within the coordinates specified below (Figure 14):

The area is bound by rhumb lines connecting the following points:

Point	Description	Latitude	Longitude
A	South of Ram Head	18E18.0' N	64E41.5 W
B	NE corner at International Boundary line	18E18.8' N	64E38.6' W
C	SE corner at International Boundary line	18E14.0' N	64E39.3' W
D	SW corner	18E12.1' N	64E42.2' W

Figure 14: Shared MCD including federal and local U.S.V.I. waters.



Discussion: International conflict is a primary concern if the MCD is established without the cooperation of the B.V.I. government. The area in the EEZ is considerably diminished. The total area of the MCD will also be diminished if the local government of the U.S.V.I. does not establish an MCD shoreward of the territorial sea boundary (See discussion of rejected Options C and E).

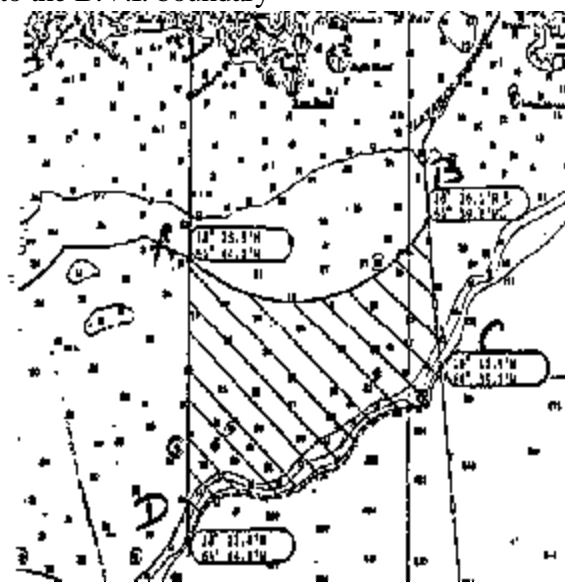
One of the advantages of an MCD is that emigration of fish is expected from the MCD. It has been shown that fishing is enhanced at the boundaries of an MCD. This rejected Option only provides this advantage on the western side of the MCD since fish emigrating to the east will benefit the B.V.I. fishers.

Rejected Option G: Establish a Marine Conservation District (MCD) in the EEZ due South of St. John, U.S.V.I., within the coordinates specified below (Figure 15):

The area is bound by rhumb lines connecting the following points:

Point	Description	Latitude	Longitude
A	South of White Cliffs at Boundary with Territorial Sea	18E15.5' N	64E44.2' W
B	NE corner at International Boundary line	18E16.1' N	64E39.6' W
C	SE corner	18E13.9' N	64E39.3' W
D	SW corner	18E11.4' N	64E44.1' W

Figure 15: MCD for federal waters only from White Cliffs to the B.V.I. boundary



Discussion: Although the area enclosed in the MCD is larger than in Options G and H, the disadvantages are the same. That is, fish emigrating to the east will not benefit U.S.V.I. fishers.

Other Alternatives Considered and Rejected

* Establish shipping lanes: Comments received at the Public Hearings included the establishment of shipping lanes for the cruise ships. There is no information on the results that could be expected if shipping lanes were established as no-take marine conservation districts. 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.

* Limited Entry: Comments received at the Public Hearings indicate that there is interest in the establishment of a limited entry system in the MCD. That is, it was proposed that a grandfather clause be included such that anyone fishing in the area for a pre-determined number of years would have access to 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.

V. RECOMMENDATIONS TO THE LOCAL GOVERNMENTS

The Coral FMP (Section 7.5.1) provides a set of recommendations to the local governments. Among others are to:

- * develop a comprehensive mapping of coral and rock reef areas over the insular platform;
- * protect areas of critical habitat for juveniles as well as adults;
- * establish compatible regulation shoreward of the MCD;
- * enforce existing laws and regulations which already protect critical habitat and the marine ecosystem.

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