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A Survey of the Current Status of
Marine Resource Management
in some Eastern Caribbean Islands:
Antigua, Barbados, Dominica, Grenada,
Montserrat, Nevis, St. Kitts, and St. Lucia

Prepared for

The Rockefeller Brothers Fund
and
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by

Melvin H. Goodwin
Sandra E. Taylor
Environmental Research Projects
212 East Broadway (G1704)
New York, NY 10002

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Summary

1. Nine major problems relating to marine resource management in the Eastern Caribbean have been identified:

- a. High cost of gear and fuel for fishing
- b. Shortage of fish in local markets
- c. Lack of local marine resource management expertise
- d. Poor public awareness of the importance of marine resource management
- e. Lack of information required for effective marine resource management
- f. Inadequate fishing gear
- g. Suspicion among fishermen of cooperatives
- h. Lack of interest among youth in fishing or marine resource management as a career
- i. Overfishing of spiny lobster and sea turtle resources

2. In response to these needs, it is suggested that:

- a. A marine management advisory service be designed for the Eastern Caribbean to provide for (1) rapid response to specific management needs on a local scale, (2) technical support to local management, education, and research projects, (3) better use of existing human and institutional resources within the region.

It is anticipated that the principal elements of the advisory service can be provided by existing institutions and that creation of a new agency is unnecessary. Once organized the service could be expanded to include other parts of the Caribbean region (cf. page 6).

- b. Educational programs and services be supported and expanded. Specific projects suggested for support are: (1) programs in environmental awareness for school children organized by Antigua teachers; (2) a training program for future fishermen suggested by fishermen and government officials in Nevis; (3) environmental education programs being

developed by Caribbean Conservation Association and Island Resources Foundation. Additional educational projects are expected to emerge in other islands, and will benefit from experience and media derived from the activities listed above (cf. page 7).

- c. Short-term consulting services be provided to assist the establishment of local statistical programs in Grenada, St. Lucia, Dominica and Montserrat. A workshop should be held to teach management techniques suitable for application by local fisheries officials, and to provide the basis for the collaboration needed between individuals concerned with marine resource management in the region (see page 10).
- d. Support be provided to existing self-help groups in Dominica, Nevis, and Carriacou for projects to improve fishing gear and local marketing. As well as addressing current needs in these islands, these projects will be examples of the advantages of self-help and will assist in promoting the same approach in other countries (see page 11).
- e. An experimental technology transfer project be initiated to subsidize fishermen from Nevis to train fishermen of Montserrat in selected artisanal techniques (see page 13).
- f. That support be given to small mariculture projects concerning spiny lobster, sea urchins, and artificial reefs in St. Kitts, Grenada, St. Lucia, and Montserrat (see page 14).
- g. A review be made of attempts to manage various marine resources in order to identify elements of successful management programs as well as approaches which are not successful. Marine resource management has not been described in operational terms which have been practically validated. This review would provide valuable guidance to the development of marine resource management programs throughout the region. Island Resources Foundation is best equipped to undertake this activity (cf page 4).

3. Suggested points for project evaluation are presented.
4. Cautionary comments are presented for programs to provide larger fishing vessels and for university-level scholarship projects.

I. Introduction and Methods

This study was undertaken to determine (1) current problems and needs relevant to marine resource management in the Eastern Caribbean, 2. existing programs and activities pertinent to these problems, and 3. possibilities for constructive activity by private aid sources toward solution of these problems.

Four methods were used to make these determinations:

1. direct observations and interviews in seven Eastern Caribbean countries, 2. consultation from individuals experienced in countries not visited, 3. review of published reports and other pertinent literature, and 4. interviews with organizations concerned with providing various types of assistance to Eastern Caribbean countries.

Several important points emerged in the course of this study. First, there are common and critical problems which hamper marine resource management throughout the Caribbean. Second, these problems can be addressed on a regional basis, but effective solutions require a concentration of effort at the local level. Third, the specific activities which are needed locally vary and must be evaluated on a country-by-country basis. Fourth, in each of the countries selected for site visits there are important opportunities for projects related to marine resource management which should begin as soon as possible. Finally, while the recommendations of this study are regional in scope, they must first be applied on a local basis as pilot projects to develop and refine techniques for regional implementation.

For these reasons, we have elected to present this report without complete information on all of the Eastern Caribbean countries in order to encourage initiation of needed pilot projects as soon as possible. Moreover, Guadeloupe, Martinique and the Netherlands Antilles are very different from the independent or soon-to-be independent islands covered in this report. These latter countries face marine resource management problems which are quite distinct from those besetting other islands. Realizing these circumstances we have chosen to confine this report to a subset of the Eastern Caribbean countries which offers particular challenges to effective management of living marine resources. A key feature of the recommended activities is

(1) Management in this report is understood to include elements of use (= exploitation, = fishing, = harvesting) as well as protection (= conservation). Neither element is exclusive of the other. The goal of effective management is understood to be optimum use on a sustainable basis. "Use" may be active (e.g., fishing) or passive (such as the use of mangroves as nursery areas for commercially important species)

provision for effective and rapid response to local needs as the latter are identified. Resource management needs at the local level change in response to peripheral factors, and programs to meet these needs must have an element of flexibility. Continuing surveys are being undertaken in collaboration with the Undersea Resources Coordination Center. As specific local marine resource management needs are identified, additional projects can be included in the program recommended here.

II. Observations

A. Literature Review. A wide variety of material has been published pertaining to Caribbean marine resource management. We based our review on publication lists and indexing services of UNIPUB (which provides for distribution of publications produced throughout the United Nations system), National Technical Information Service (which covers all publications produced or supported by the U.S. government), consultants at the University of Rhode Island and Island Resources Foundation (which maintain extensive files of publications pertaining to marine resources in developing countries, and direct contact with agencies active in the Caribbean region. The documents studied were of five types:

- statements of program prepared by various agencies active in the region (CIDA, 1980; Hopper, 1973; IOCARIBE, 1978)
- workshop and meeting reports (Beller, 1979; IOCARIBE; Lockwood and Ruddle, 1977)
- reports of previous surveys (Alexander, 1977; Klima, 1976; Palacio, 1979; Villegas, 1978)
- contract and special study reports (Powles, 1975; Ray, 1979)
- manuscript reports and discussion papers (IUCN; Slessor, 1980).

(references are representative of the documents described and do not constitute a complete list of the materials surveyed).

Most of these documents described problems and needs relevant to marine resource management. Reports and discussion of remedial activities (with the exception of reports on workshops) were virtually absent. Discussions based on non-governmental information sources were also rare. We found a general agreement on problem areas (training,

conservation, research needs, etc.), but very few recommendations for solutions which could be translated into discrete tasks to be undertaken by specified groups or individuals. The literature in this field is voluminous and contains a great deal of useful background and conceptual information. There is an absence of published materials from local sources within the Eastern Caribbean which necessitates site visits of the sort undertaken in this study. We hasten to add, however, that there is no need to enlarge the stream of experts and fact-finders flowing through the Eastern Caribbean islands. The problems and needs are well-documented; the current need is for concerted attempts to translate these into locally applicable activities leading to solutions.

B. Problems relating to marine resource management in the Eastern Caribbean are summarized in Figure 1. This matrix includes problems identified within the countries surveyed as well as by aid agencies. For the former, the source of information is coded (G = government, P = private sector, F = fishermen). When a problem was recognized by the survey team but was not mentioned in local interviews an S was entered in the matrix. If a problem was discussed, but no solution or need was suggested, the source codes are entered in the "NONE" row. When needs or means to solution were suggested the source codes are in descriptively titled rows.

One of the most obvious features of Figure 1 is the difference between problems as identified by countries and problems identified by various organizations. This is inevitable to some extent, since it would be extremely difficult for a single agency to address the entire spectrum of problems concerning marine resources in the Eastern Caribbean. We do not wish to imply that the agencies included do not recognize the problems listed below, or that the agencies would dispute the importance of solving these problems. The data presented in Figure 1 do, however, suggest that many program priorities do not regularly coincide with the majority of locally perceived needs.

The most frequently mentioned problems were:

1. High cost of gear and fuel for fishing
2. Shortage of fish in local markets
3. Lack of local marine resource management expertise
4. Poor public awareness of the importance for marine resource management
5. Lack of information required for effective local marine resource management
6. Inadequate fishing gear

7. Suspicion among fishermen of cooperatives
8. Disinterest among youth in fishing or marine resource management as a career
9. Overfishing of spiny lobster stocks
10. Depletion of sea turtle populations

In addition to these, a variety of other problems was identified. Most of the latter would be ameliorated by the recommended activities, or could be addressed as site-specific projects within the overall program. Two additional comments are in order:

The majority of the fishermen in the islands are middle-aged or older, and there is an obviously declining interest in fishing due to low social status and income relative to other vocations. The implications of this have not been acknowledged by existing aid programs which focus almost exclusively on current fishermen. In the next decade the Eastern Caribbean may well be found with a critical shortage of fishermen in addition to problems with marine resources themselves.

The implications of overfishing in some cases extend beyond the obvious shortage of the species being exploited. Current efforts to increase the yield of spiny lobsters include the use of steel mesh trawls, a truly disastrous technology which destroys deep water coral formations important to many species besides the lobster. In the words of a Nevis fisherman: "They are cleaning the whole area out and wrecking the entire ecological balance". The fact that this technology is being advocated by at least one agency concerned with increased production illustrates the need for a management orientation instead of an exclusively use-oriented approach.

C. Current Activities relating to marine resource management are indexed in Figure 2. The status of these activities is indicated as A = active projects currently in progress, X = projects underway but not fully operational, or P = programs which are expected to become active within 12 months or which should be considered in planning future activities. Under the "Agency" heading are listed the implementing organizations; funding sources are in parentheses.

In this matrix no attempt has been made to include all agencies and programs with potential involvement in this field. Our primary interest and objective was to identify operational programs with activities actually taking place "on the ground". The planned/potential activities are listed where there is an imminent possibility of implementation or where it seemed particularly important to separate aspiration from activity.

Figure 1

Matrix of Needs and Suggestions for
Marine Resource Management X
Countries and Agencies Interviewed

ANU	=	Antigua
BGI	=	Barbados
DOM	=	Dominica
GND	=	Grenada
MNI	=	Montserrat
NEV	=	Nevis
SKB	=	St. Kitts
SLU	=	St. Lucia
WIAS	=	West Indies Associated States
IRF	=	Island Resources Foundation
WECAF	=	Western Central Atlantic Fisheries Commission
CIDA/NGO	=	Canadian International Development Agency (NGO Division)
NSF	=	National Science Foundation, Science & Technology Program
SEA GRANT	=	U.S. Sea Grant International Program
UNEP	=	United Nations Environmental Program
IDRC	=	International Development Research Centre
G	=	Government source of information
P	=	Private sector source of information
F	=	Fishermen as source of information
S	=	Problems identified by surveyors alone
X	=	Agency-identified problems

We were unable to identify any active programs (in the sense of on-the-ground activities) directed toward overall improvement of marine resource management in the Eastern Caribbean, although several organizations have such improvement as a general goal. Lewis Alexander (University of Rhode Island) has prepared a review of Caribbean regional marine arrangements under contract to the U.S. Office of Naval Research. Well over 100 agencies are listed which are involved in some way with marine resource management. Few of these were mentioned in local interviews (those which were mentioned are included in Figure 2), and we found very few program statements which included specific activities or tasks at the local level.

Many of the most active and promising organizations are in a "survival mode": in order to remain in existence, these organizations broaden their base of support by undertaking a range of activities considerably beyond their actual capacity. There is, in fact, very little overlap in capabilities among these agencies, and real needs exist for the particular talents to be found within each group. The collective experience with actual field projects is substantial. We wish to emphasize that currently active organizations represent an important potential for improved marine resource management, and that their capabilities can and should be strengthened in the context of the advisory services and specific projects discussed in the following section.

III. Discussion and Recommendations

A. The technique of local interview and matrix summary is a relatively simple means of identifying program priorities based on points of agreement concerning problems and means to solution. We caution against attempting an overly detailed analysis, however; the sampling techniques would have to be much more elaborate and extensive to generate data which are statistically representative of governments, fishermen, and other members of the private sector. Despite this reservation, the overall picture is clear. The fact that previous attempts to define management and development needs have yielded similar results suggests that the problems described here are valid. The 1979 Conference on Environmental Management and Economic Growth in the Smaller Caribbean Islands, for example, defined projects and areas of interest and concern which include local training, mariculture, turtle protection, short-term workshops, regional talent pool for sharing experience, information retrieval, environmental awareness, and development of environmental management plans. The point is, the problems are well-defined, and further surveys to describe them are decidedly unnecessary. The current challenge is to translate broad statements of need into specific tasks and activities for local implementation.

Figure 2

Matrix of Agencies and Programs X
Geographical Areas of Activity

ANG = Anguilla

BAH = Bahamas

BEL = Belize

JAM = Jamaica

TKC = Turks and Caicos

Other Country codes are provided in the legend to Figure 1.

Agency codes are provided in Appendix I.

A = Active programs

X = Partially active programs

P = Programs which are promised or have reasonable potential, but which are not currently active.

Throughout this survey, government officials, fishermen, and other members of the private sector repeatedly voiced frustration with "fact-finding missions" and "teams of experts". Some verbatim comments:

"Lots of plans have been prepared without subsequent action; fisheries have been left behind."

"Too much money is wasted on studies without work actually being done. Too many people talk around the problems, and not enough are committed to solving them."

"All sorts of people come through here to find out what the problems are. They write their book and send us a copy, but nothing comes of it."

It is difficult to overemphasize the importance of prompt response to realistic requests for assistance. Many requests, in fact, involve modest financing; frequently the human and technical resources to meet the needs already exist within the region. Provision of support to local individuals and agencies with a view toward strengthening local capabilities will stimulate further initiative and establish a foundation for continuing self-help projects.

Seven activities are suggested in response to the needs presented in the preceding section. These activities require relatively modest funding, and offer significant opportunities for organizations which can provide this type of support. Results of these activities will be visible in a short space of time, while simultaneously providing a basis for effective long-term management. Potential sites for specific activities are noted. Detailed project documents for these activities have not been developed, although some are in preparation in response to requests from various local agencies and as part of artisanal fisheries projects being developed by the Eastern Caribbean Natural Area Management Program of the Caribbean Conservation Association (CCA/ECNAMP) and the U.S. Agency for International Development. These documents should be available by the end of August, 1980.

It should be emphasized that these activities are applicable to most countries in the Eastern Caribbean, and site-specific projects should be viewed as pilot projects for the region as a whole.

1. Marine management advisory services for the Eastern Caribbean -- A need for consulting services was identified in six of the seven countries surveyed. Governments and private sectors repeatedly stressed the need for improved access to published information, potential sources of technical and financial assistance, and to agencies actively involved in marine resource management in the region. Many of the

required services seem to be already in existence. The fact that a widespread need still exists suggests that accessibility is the problem. The present need is for a framework within which individuals and agencies requiring assistance can be more readily placed in touch with various independent service organizations.

The marine advisory services provided by several universities under the U.S. Sea Grant Program offer excellent models for the type of service required, although some adaptation would certainly be necessary to the situation in the Eastern Caribbean. It is neither necessary nor desirable to create another organization for this purpose. A suitable advisory service can probably be provided by selective support to existing programs. This type of service will not only provide the means for rapid response to requests for technical information and assistance; it will also strengthen the capabilities of currently active assistance programs by making their services more accessible and providing a basis for collaboration which does not exist at present.

What is needed:

- a. A design for a marine management advisory service suited to the Eastern Caribbean.
- b. Identification of programs, organizations, and individuals currently active and experienced in the region to provide the essential elements of such a service.

A more detailed proposal for the development of an Eastern Caribbean marine management advisory service is being prepared by Environmental Research Projects. Potential participants in such a service include Caribbean Conservation Association, CCA/ECNAMP, Environmental Research Projects, Intergovernmental Oceanographic Commission (IOCARIBE), International Development Research Centre, Island Resources Foundation, National Technical Information Service, University of the West Indies, and Western Central Atlantic Fisheries Commission.

2. Educational programs - Marine management in the Eastern Caribbean is seriously hampered by a general lack of appreciation of the importance of marine resources, their potential if effectively managed, and of the means through which optimum use and protection can be achieved. As in other parts of the world, a great deal of attention is directed toward short-term gains and little thought is given to continuing benefits (or losses). These facts are recognized in all of the countries we visited, and the need for widespread educational programs is clearly appreciated and repeatedly stressed.

Needs for educational programs appear to fall into three categories:

- a. programs directed toward the general public (including school children)
- b. programs in which government decision makers are the target group
- c. curricula designed for future fishermen

In the first two categories, visual aids were most frequently mentioned as being important but unavailable. Slides, filmstrips, or (in a few cases) single-concept (super-8 cassette) films are needed to illustrate common natural history features of the marine environment (e.g., ecology of mangroves, life on coral reefs, life history of conchs, spiny lobsters, turtles, and commercially important fishes) and management activities in the Eastern Caribbean, especially successful ones. It was frequently stated that if the residents on an island could see their neighbors participating in such activities this would be a powerful incentive to greater interest and activity.

There is at present some divergence of opinion concerning the usefulness of visual aids in education programs, the primary concern being that the filmstrips, etc. become an end in themselves so that no new activity or participation results from the show. In most instances encountered in this survey, it would seem that visual aids are properly considered an adjunct to a more complete program. A key element of any instructional program on marine resource management should be "What you can do". Support to educational programs should emphasize the need for (a) active participation by the target group (field trips, conservation projects, etc.), and (b) the essential element of integration between use of natural resources and protection of these resources.

Programs for future fishermen have been successfully operated on an experimental basis in Nevis secondary schools. A similar program is being developed by the Grenada government with Cuban assistance, but has been in operation for less than a year and is difficult to evaluate.

Any successful educational program in the Eastern Caribbean will depend heavily upon local initiative and participation. Key local participants have not been identified in all of the islands surveyed, but are expected to emerge as other management projects are implemented. In Nevis and Antigua there has been considerable interest and initiative in developing school programs for fisheries and environmental awareness respectively. Human resources required to initiate and conduct these programs are present in both islands and the individuals involved are

unusually perceptive in their assessment of needs and realistic means to solution. Both programs offer exceptional opportunities for low-cost pilot projects in which techniques and materials can be developed for use throughout the region.

The following programs are recommended for immediate support:

a. Consultation and provision of materials needed to develop and expand the Nevis future fisherman training program. Current local objectives are to develop a 2-year curriculum requiring 2-4 class periods per week for 40 weeks per year. The program of instruction would include improved artisanal technology, natural history of commercially important marine species, boat operation and maintenance, navigation, safety, business management for artisanal fishermen, and extensive field experience. Upon graduation, provision would be made for loans to purchase equipment needed for full-time fishing (the supervisors of such a program will be in an excellent position to assess the reliability of the prospective fishermen and the probability of loan repayment).

b. Environmental awareness for school children in Antigua -- This program has been developed by a group of Antiguan school teachers, and involves the re-formation of a local ecology club for young people (12-18 years old). Activities to be undertaken would include collecting trips, preparation of collections of local marine life, and educational tours. Instruction in various ecological concepts would be integrated with these activities. Special interest groups and projects would also be encouraged, such as publication of articles in the local press, educational programs for radio and television, panel discussions, and exhibitions.

Primary support is needed for a coordinator's salary, books, local transportation, and miscellaneous supplies. A brief proposal for the Antigua program has been received and is available from the authors of this report.

External support from the programs listed below and the advisory service described above would be of benefit in continuing and extending the Nevis and Antigua programs, but are not essential to their immediate implementation.

c. Support is needed for the design of suitable video and filmstrip packages on important marine resources in the Eastern Caribbean and their management, and for the production of high quality slides and video recordings from which the packages can be made. The Caribbean Conservation Association has the potential (through grants from the U.S. Agency for International Development and the World Wildlife Fund) to prepare and distribute film strips on topics concerning conservation and the environment. Difficulty has been encountered

in obtaining suitable color slides from which the strips could be made. Island Resources Foundation has the equipment needed to produce professional quality video tapes in the field. This medium has increasing importance as more islands gain access to television programming. In particular, the more affluent members of island societies (including government officials) are susceptible to TV programming, and this potential mode of contact should not be overlooked.

Expertise for this undertaking may be pooled from St. Lucia (Fisheries Division), Nevis (local fishermen), Antigua (school teachers) and from certain aid personnel (Peace Corps volunteers in Dominica, St. Lucia, Barbados, and Montserrat; Island Resources Foundation; Environmental Research Projects).

3. Support to locally based management activities --

Throughout the Eastern Caribbean increasing emphasis is being placed on the development of marine food resources. The primary, overriding concern is with a rapid increase in the harvest of commercially important species. Management of stocks and safeguards against overexploitation are distinctly secondary (if they are considered at all). Even where the need for management is acknowledged, management activities are given low priority:

"Lots of things, including management, are important in Government's view, but not all have priority ... our main objective is to increase the availability of fish." (Grenada)

"Primary priority must be given to basic training for fishermen." (St. Kitts)

"Our primary objective is to increase production by artisanal fishermen." (WECAF)

It is quite understandable that there should be a preoccupation with increased production as a means to improved nutrition and income. There is, however, no reason why management and production cannot be improved simultaneously; the goals are much the same.

There is considerable interest in better marine resource management, particularly among younger fisheries officers. We were frequently told that governments lacked the funds to pay salaries of additional fisheries personnel. An effective public education program may alter priorities so that management activities receive more government support, but in the meantime it is vital that existing local interest and current efforts be encouraged.

WECAF conducted a two-week workshop on fishing statistics in St. Lucia during November 1979. Participants were provided with small

calculators and a manual of methods. This workshop has stimulated interest in collection of statistical data in several islands. These data are critical to the formulation of workable management plans and information of this sort does not exist anywhere in the region. Participants in the 1979 workshop are hampered at present by an absence of continuing technical consultation and support in their own countries.

Horace Walters (St. Lucia fisheries officer) has suggested that a meeting be held of persons concerned with fisheries in the Eastern Caribbean to discuss common problems and collaborative means of solving them. Such a meeting might have an even greater benefit if it were held as part of a workshop in which additional management techniques (such as stock assessment) were presented and practiced for application in the participants' countries. The St. Lucia fisheries division, CCA/ECNAMP, Environmental Research Projects, Island Resources Foundation, and WECAF should be involved in planning such a workshop. This type of activity will contribute significantly toward developing local capabilities and better collaboration within the region in addition to providing basic information needed for realistic marine resource management.

The following activities are recommended:

a. Short-term (2 - 4 day) consultation in Grenada, St. Lucia, Dominica, and Montserrat for data collection projects which are struggling to get off the ground.

b. A workshop to train local fishery officials in practical techniques related to marine resource management. Such a workshop must have provision for follow-up assistance (consultations and modest amounts of equipment where required) to insure implementation of the techniques at the local level.

Of the countries surveyed, St. Lucia would appear to be best suited for a regional center concerned with marine resource management. We suggest that the workshop discussed above could be a first step toward the development of local management expertise and regional collaboration on the use and protection of natural resources.

4. Self-Help Activities - - The effectiveness of self-help projects has been stressed in recent years, and cooperatives are seen by planners as the answer to many problems in Eastern Caribbean fisheries. There is, however, widespread distrust of cooperatives throughout the region, based on previous histories of poor management

(and occasional outright embezzlement). Government participation in fisheries co-ops is also suspect because many fishermen feel that if government has intimate knowledge of their activities they will be subjected to increased taxation or regulation. The most successful cooperatives we encountered were those which had been organized on the members' initiative and which had little or no direct involvement with government.

Much of the present resistance to cooperatives can be overcome with concrete demonstrations of advantages. Most of the non-governmental groups interviewed were able to identify self-help projects involving management of marine resources. These groups are generally appreciative of the need for proper management of resources; many have experienced direct effects of improper management. The potential of self-help programs in promoting effective marine resource management at the "grass roots" level has not been widely appreciated. Yet, small locally organized and managed groups are most promising vehicles to introduce and develop public awareness activities, educational services, and mariculture projects, in addition to use-oriented programs (fishing, marketing, etc.) which are normally considered in the context of cooperative ventures.

Support is needed to develop self-help groups which can play an active part in management of local marine resources. Individual groups must have ready access to external technical support and financing services (most of the groups we interviewed were unaware of many opportunities for assistance) but must be locally managed and directed toward locally perceived needs. These needs are frequently modest. Meeting them reinforces local confidence in the self-help approach and provides a foundation for more extensive programs to address major management problems.

Three projects have been identified which can be addressed immediately through local self-help groups:

a. Fishing communities in Dominica require temporary storage for fish and reliable transport to markets in Roseau. A small scale project would involve:

- (1) provision of a small chip-ice maker,
- (2) one or two trucks for transportation of ice to cold storage boxes in fishing communities and of fish to market,
- (3) repairs to existing cold storage facilities in Roseau.

Support has also been requested to cover the costs of training a Dominican in outboard engine repair at the Vieux Fort cooperative in St. Lucia.

b. Fishermen in St. Kitts and Nevis have frequent difficulty obtaining fishing gear and repair parts for outboard engines. Equipment which is locally available is unnecessarily expensive. The cooperative approach is regarded with suspicion by Kittitian fishermen. In Nevis, fishermen have worked on a cooperative basis, and consider this approach to be feasible. Establishment of a demonstration engine repair and fishing gear facility in Nevis would directly address problems which the fishermen believe to be critical, and simultaneously provide a stimulus to similar self-help activities in St. Kitts.

c. Residents of fishing communities in Carriacou have formed an organization to promote fleet safety and better use of marine resources. While most of the member boats have been equipped with basic safety equipment over the last three years, the group lacks the finances to establish a stock of basic fishing gear to alleviate the problems of overpriced gear and unreliable availability. A detailed project document has been prepared for this activity and is available from the authors of this report.

In addition to the projects described above, an active cooperative development program is currently underway in Montserrat with particular emphasis on consumer and fishermen's cooperatives. In view of Government's commitment to management of their resources and appropriate technology, these cooperatives may be expected to provide additional opportunities for innovative self-help projects.

5. Extension services based on local expertise - -

Not all fishermen who use traditional methods can be classified as "artisanal." In many areas, substantially improved local landings can be achieved without major modifications to the fishing fleet or quantum jumps in technology. WECAF has suggested that transfer of technology within the wider Caribbean region (i. e. demonstrations by Caribbean artisanal fishermen) is preferable to continued dependence upon extra-regional master fishermen.

Many of the projects currently under consideration involve larger fishing vessels. We have serious reservations about this approach (cf. section C., below) and suggest that a transfer of techniques which can be used by existing fleets would be more effective in dealing with the needs of present-day fishermen. In addition to a greater probability of acceptance by the fishermen, the latter approach has important implications to management in the broader sense. As noted above, the current emphasis in fisheries development is on increased landings and

exploitation of marine resources without concern for sustained long-term yields. Moderate changes in fishing technology can be integrated with simple local programs to acquire data needed for effective management (for example, there are techniques for estimating stock parameters given information on catch and fishing effort). The results of the two programs can serve as a guide to training programs for future fishermen to attain the dual management goals of increased landings and long-term sustained yield.

Among the techniques which have been requested in various countries are shark fishing and processing, care of gill nets, and improved techniques for bottom fishing. We suggest that artisanal technology transfer be attempted on a pilot basis between Nevis (which has considerable fishing expertise) and Montserrat (where concerted efforts are being made to improve the local fishery landings on an "appropriate technology" scale).

6. Mariculture and innovative projects - - Many of the management problems identified in this survey are virtual classics: depletion of luxury food species for lucrative foreign markets; exploitation of sea turtles to the point of endangering the species; overfishing of traditional fishing grounds because local stocks are truly limited in size. Despite repeated assertions that the Caribbean as a whole is underfished (which it is) it is also true that natural production is relatively small in the Eastern Caribbean and there are limits to the quantity of living material that can be harvested on a continuing basis.

On the other hand, only a small fraction of the total organic production is actually in the form of food organisms. Theoretically, this fraction can be increased without damage to the marine environment through mariculture (1). In addition, various forms of mariculture may well be the only workable means to solution of some problems of over-exploitation. A variety of mariculture activities are being undertaken in the region as noted in the preceding section, but several potentially promising areas are presently neglected. We wish to emphasize three points concerning mariculture projects in the Eastern Caribbean:

(1) Mariculture, as used in this report, includes any manipulation of the natural history of a species for the purpose of increasing the production of that species. It is not exclusively culture through the entire life cycle, but may include predator exclusion, "head starting", nursery rearing of larvae, or intensive rearing of juvenile stages.

a. While mariculture can be a potent management tool, it is mandatory that the level of technology involved be appropriate to the region. In all cases, the target groups should be active partners in all phases of developmental research and field trials.

b. In view of the number of promising candidates for mariculture, initial efforts should be directed toward increased production of native species. The hazards of introducing exotic species are well-known and documented. Our knowledge of Caribbean marine systems is too fragmented at present to offer reasonable insurance against potential disasters from such introductions.

c. Mariculture is truly in its infancy in the Caribbean. Projects should be thoroughly and frequently reviewed, and well-conceived pilot projects should precede any major capital investment.

There are three immediate prospects for small scale mariculture in the survey area which are not supported at present:

a. Nursery rearing of spiny lobster post larvae - - It is widely agreed that total culture (all stages of the life cycle) is probably impractical for spiny lobster. Protection of juvenile lobster from normal predation, however, is a much simpler and more promising proposition. In view of the disastrous techniques being introduced to harvest this species (see section II) alternative means of producing spiny lobster are a critical management need and deserve high priority. St. Kitts and Grenada are promising sites for a pilot nursery project. A more detailed description of this project has been prepared and is available from the authors of this report.

b. Harvest of sea urchins (sea eggs) - - Sea urchin (*Tripneustes ventricosus*) roe is a widespread delicacy in the Eastern Caribbean, and some export trade to Japan has been reported. Productivity of wild stocks, processing techniques, and market potential have not been evaluated in any of the islands surveyed, although this species is a common inhabitant of turtle grass beds throughout the region. Preliminary work could be undertaken on any of the islands, but Grenada, St. Lucia, and St. Kitts would be most convenient from the standpoint of accessibility of the resource and land-based support.

c. Artificial reefs - - There is some controversy over the merits of artificial underwater structures as fish attractants, although there has been considerable documentation of their effectiveness. The primary concern is one of aesthetics, but artificial reefs may be of real benefit in areas devoid of shallow water coral formations or where

massive coral destruction has occurred. In particular, islands without extensive shallow banks or reef formations (e.g., Montserrat and Dominica) may be able to substantially increase local landings through the use of man-made fish shelters. Certainly the potential benefits vs. the small investment required to construct and monitor small artificial reefs warrants a pilot project.

We recommend that assistance be provided to St. Lucia and Montserrat for artificial reef projects now in progress. The St. Lucia project has experienced difficulty with suitable anchors and availability of diving equipment. The government of Montserrat has commissioned a feasibility study of an artificial reef pilot project (copy available from the authors of this report) and is awaiting assistance for actual construction and monitoring of the proposed structures.

7. A practical definition of marine resource management - "Management" is a term used rather glibly in many reports, but it is an unfortunate fact that there are few examples of effective marine management programs, and the means to create such programs are not well-established.

A relatively simple approach to this problem has been suggested by the Island Resources Foundation: A review of case histories of attempts to manage marine resources could be prepared using readily accessible information. At present, communication and collaboration between marine resource projects is virtually absent in the Caribbean, despite the fact that many mistakes can be avoided and lessons learned through such contacts. The proposed study would be a valuable asset to agencies concerned with regional planning, and especially to workshop groups directed toward local officials (as described above). Island Resources Foundation is particularly well-suited to undertake such a study, and has extensive in-house files on many marine management programs in the region.

B Suggested Points for Project Evaluation

Based on the needs presented in section II, comments received during survey interviews, and common inadequacies of previous projects, we suggest the following points for consideration of future projects:

1. Projects should have definite plans for improving local capabilities. Demonstration projects should train local teachers, research projects should develop local research skills, etc.

2. Local counterparts should be identified for foreign personnel in every project. This was the most frequent criticism of aid programs.

3. Funding agencies should promote the integration of management and development. Directly exploitative projects should include a means of assessing the impact of the project on the resources concerned. In one interview it was suggested that when activities are being undertaken that are clearly ill-advised (dredging was the case in point) such activities should be questioned by potential funding agencies, even though there may be no direct connection with project under consideration.

4. Projects which depend upon external technical or financial support should have a well-defined and realistic means for continuation when such support is terminated.

5. Project proposals should include a clear statement of the expected outputs, i. e., what constitutes successful completion.

6. There is a proliferation of meetings, conferences, seminars, etc., concerning marine resource management in the Caribbean region. In view of the expense of organizing and participating in such meetings, supporting funds should be contingent upon definition of specific activities to be undertaken which will address specific needs and will contribute in a demonstrable way to marine resource management.

C Caveats

Two project categories have not been included and require additional comment:

1. Larger, more sophisticated fishing vessels are frequently regarded as a potential boon to fisheries production in the Eastern Caribbean. Well-equipped boats in the 50 - 60 foot range, it is believed, would allow fishermen to make better use of migratory pelagic species as well as the extensive off-shore banks in some parts of the region (southwest coast of Grenada, the Grenadine

Antigua-Barbuda bank, Saba Bank). The sustainable yields of migratory pelagic fishes (dolphin, tuna, etc.) are not known and are difficult to determine. While there is no evidence of overfishing at present, these waters are known to be relatively poor in fishery resources as a whole, and a substantial increase in fishing effort could result in depletion of the migratory species. Moreover, it is not true that bigger boats are needed to participate in this fishery. Using artisanal methods, fishermen in Grenada, the Grenadines, and St. Lucia regularly glut local markets with large pelagic fishes.

Promotion of more sophisticated offshore fishing may result in other problems as well. The Saba Bank is already closed to foreign fishing vessels, and fishermen from St. Kitts have had their vessels seized for violations. Antigua plans to create a 15-boat offshore fleet with CDB funding, and it is conceivable that similar restrictions could be imposed on the Antigua-Barbuda banks. Grenada is reviewing the possibility of limited or exclusive entry to their offshore fisheries. It is significant to note that the inactivity of the Barbados shrimping fleet is due to the virtual exclusion of foreign vessels from the South American waters containing the shrimp resources.

The majority of islands we visited have had prior exposure to the sort of larger boat currently under discussion. Large boats given to St. Kitts were eventually sold due to high operating costs; vessels furnished to Antigua were diverted to smuggling and trading; of five boats supplied to Montserrat only one is presently employed in fishing. Fishermen who currently use larger vessels sell most or all of their catch to Guadeloupe and Martinique because the price is several times higher than in local markets.

In sum, provision of substantially larger fishing vessels seems a risky proposition at present due to the unknown (and generally unconsidered) impact on the fishery resources, potential law of the sea problems, previous history of poor performance, and the dubious benefits to local nutrition and artisanal fishermen as a whole. We suggest that improvements to gear in existing fleets and transfer of effective artisanal technology within the region are more viable alternatives, along with development of a management infrastructure to deal with current problems of over-exploitation and inadequate supply of fish to local markets. Introduction of alternative fishing vessels to provide greater flexibility in harvesting local resources (which tend to be of several kinds, requiring different catch methodologies) and more fuel-efficient operation (through increased use of sail) are promising components of training programs directed toward future fisher

Such introduction however, should be tested on a pilot basis, with full review of the final results before embarking on a regional program.

2. University level educational programs were not identified as an urgent need. Because of current interest in establishing "international scholarships" and "regional educational centers" it is important to note that without adequate local projects and support these programs can do very little to improve resource management in the Eastern Caribbean. Most graduates of the University of the West Indies biology programs enter teaching professions, and those who enter government service remain for a short period of time. The elements of government interest and commitment, viable local management programs, and adequate technical support are critical to effective use of highly trained individuals. Scholarships and university-level programs can be an important adjunct to the development of the other elements, but do not presently constitute an urgent need in themselves.

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Appendix I

Abbreviations and Notes on Agencies Referenced

- BDD -- British Development Division: A regional office of the Overseas Development Administration, BDD advises the governments concerned, and British High Commissioners in independent countries on the planning and execution of aid programs. (Contact: BDD, Carlisle House, Hincks St., Bridgetown, Barbados)
- CADEC -- Christian Action for Development in the Caribbean: A non-profit church-sponsored organization headquartered in Barbados with branches throughout the Eastern Caribbean which provides small-scale assistance to local development on an artisanal level. (Contact: Lawson Nurse, CADEC, Bridgetown, Barbados)
- CCA -- Caribbean Conservation Association: A regional organization based in Barbados concerned primarily with preservation and development of the environment and the conservation of cultural heritage. Objectives include collection of information on environmental projects completed, in progress, and planned; the coordination of activities designed to satisfy the needs of the area; the obtaining of technical and financial assistance for members; and the creating of a greater awareness of the natural and cultural resources of the Caribbean. (Contact: Jill Sheppard, Executive Director, CCA, Savannan Lodge, The Garrison, St. Michael, Barbados)
- CDB -- Caribbean Development Bank: A multilateral financial institution which provides loans for technical assistance and development in Caribbean countries (Contact: Lewis Campbell, Director of Projects Division, CDB, POB 408 Wildley, St. Michael, Barbados)
- CIDA -- Bilateral -- Canadian International Development Agency, Bilateral Division: administers Canada's programs of assistance to developing countries on a government basis (Contact: Bilateral Programs, CIDA, Place du Centre, 200 Promenade du Portage, Hull, Quebec K1A 0G4)

- CIDA-NGO--Canadian International Development Agency, Non-governmental Organizations Division: provides assistance to developing countries through non-governmental channels (Contact: NGO Division, CIDA, as above)
- CIST -- Canadian Institute for Science and Technology: provides bibliographic assistance to improve the access of developing countries to technical literature.
- ECNAMP -- Eastern Caribbean Natural Areas Management Program of the Caribbean Conservation Association: is in the process of developing a strategy for the management of natural areas, terrestrial and marine, in the Eastern Caribbean (Contact: Allen Putney, Principal Investigator, ECNAMP, c/o West Indies Lab, PO Annex Box 4010, Christiansted, St. Croix, USVI 00820)
- ERP -- Environmental Research Projects: A non-profit research company involved in the management of living marine resources including a pilot mariculture project for conch, sea turtle conservation, response of reef corals to environmental change, spiny lobster fisheries, and management of marine food resources (Contact: Melvin Goodwin, Projects Director, ERP, 212 E. Broadway (G1704), New York, NY 10002)
- FAO -- Food and Agriculture Organization of the United Nations: In addition to regional fisheries projects, operates an information retrieval system (AGRIS) for agricultural sciences, including fisheries.
- IAF -- Inter American Foundation: provides assistance to non-governmental organizations within the Caribbean region for self-help projects (Contact: Jim Cotter, IAF, 1515 Wilson Blvd., Roslyn, VA 22209)
- IDRC -- International Development Research Centre: initiates, encourages, supports and conducts research into the problems of developing regions of the world, and into the means for applying and adapting scientific, technical and other knowledge to the economic and social advancement of those regions (Contact: IDRC, Box 8500, Ottawa, Ontario K1G 3H9)

- IOCARIBE -- Intergovernmental Oceanographic Commission Association for the Caribbean and Adjacent Regions: has sponsored a number of workshps on marine research and management needs in the Caribbean; an active research program under IOCARIBE depends upon greater expertise and support from within the region.
- IRF -- Island Resources Foundation: provides information and consulting services on management of human and natural resources in the Caribbean; the primary objective is to examine current models for planning and development, and where these are not directed toward an appropriate scale, to correct them (Contact: Edward Towle, IRF, POB 4187, St. Thomas, USVI 00801)
- NSF-SDC -- National Science Foundation, Science in Developing Countries Program: supports cooperative research projects involving U. S. and developing country scientists working together on problems of common interest (Contact: SDC, Division of International Programs, NSF, Washington, DC 20550)
- NTIS -- National Technical Information Service: has created, with support from USAID, an international network which offers technological information services as well as training workshops in how to use these services to its members (Contact: Vietta Dowd, Information Systems Consultants, NTIS, 425 13th St. NW, Suite 620, Washington, DC 20004)
- OAS -- Organization of American States: is currently developing a Marine Resources Development program which is to enhance through research and analysis information that will help decision makers in Latin American regions anticipate problems in, plan for, and manage marine resource development in the coastal zone (Contact: Alfredo Fontes, Assistant Deputy Director, Dept. of Scientific and Technological Affairs, OAS, 1289 F Street NW, Washington, DC 20006)
- OSB -- Overseas Book Centre: supplies new and nearly-new books, journals and magazines (which are reviewed for content) to requesting organizations in developing countries (Contact: Robert Dick, Executive Director, OSB, 321 Chapel St., Ottawa, Ontario)

- PRIDE -- Foundation for the Protection of Reefs and Islands from Degradation and Exploitation: is developing a natural resource management and utilization program beginning in the Turk and Caicos Islands which includes marine habitat appraisals, conch research for mariculture, alternative energy techniques, and environmental education (Contact: Chuck Hesse, Director, PRIDE, POB 52329, Miami, FL 33143)
- RBF -- Rockefeller Brothers Fund: current programs concentrate on economic development, employment generation and management of natural resources in the smaller islands of the Eastern Caribbean (Contact: William Moody, Director of International Programs, RBF, Suite 3450, 1290 Avenue of the Americas, New York, NY 10019)
- UNDP -- United Nations Development Program: is involved in the provision of preinvestment work and technical assistance in response to requests from governments and regional institutions (Contact: Trevor Gordon-Somers, Regional Representative, UNDP, POB 726, Georgetown, Guyana)
- UNEP -- United Nations Environment Program: is in the process of developing projects to implement the Draft Action Plan for marine resource management in the Caribbean.
- UMIA -- University of Miami: plans to begin a project on laboratory rearing of queen conch with sponsorship from the Groves Foundation in June, 1980 (Contact: Ed Iversen, Rosenstiel School, UMIA, Rickenbacker Causeway, Miami, FL)
- UNLOS -- United Nations Law of the Sea Secretariat: has sponsored a workshop for representatives of the Windward Islands to discuss law of the sea proceedings; other conferences of a similar nature may be organized in the near future (Contact: Dolliver Nelson, UNLOS, Rm. 2727H, United Nations Secretariat Bldg., 1 UN Plaza, New York, NY 10017)
- USAID -- United States Agency for International Development: provides technical and financial assistance to developing countries to enable them to better manage their environment and natural resources; a program for assistance to artisanal fisheries in the Eastern Caribbean is being developed (Contact: Gale Rozell, Agricultural Division, USAID, Trident House, Bridgetown, Barbados)

- USSG -- United States Sea Grant Program: goals are to enhance research and development capabilities of developing countries with respect to ocean and coastal resources and to promote the international exchange of information and data with respect to assessment, development, use and conservation of such resources (Contact: Tom Murray, Office of Sea Grant, 6010 Executive Boulevard, Rockville, MD 20852)
- WECAF -- International Project for Development of Fisheries in the Western Central Atlantic: objectives are to assist in full rational utilization of fisheries resources through development of fisheries on under-exploited stocks and the provision of appropriate management actions for stocks that are overfished (Contact: David Lintern, UNDP/FAO WECAF Project, Apartado 6.4392 El Dorado, Panama)
- WWF -- World Wildlife Fund (U. S.): a private international organization involved in the preservation of endangered wildlife and habitats throughout the world and the protection of the biological resources upon which human well-being depends (Contact: Michael Wright, Vice President, WWF, 1601 Connecticut Ave. NW, Washington, DC 20008)

Appendix II

List of Persons Interviewed

Dr. Lewis Alexander
Professor of Geography
University of Rhode Island
Kingston, RI

Dr. Bert Allsop
International Development
Research Centre
5990 Iona Drive
University of British Columbia
Vancouver, B. C. V6T 1L4

Arthur "Brother" Anslyn
Chapel Street
Charlestown, Nevis

Mr. A. Antoine
Planning Officer
Ministry of Agriculture
Tourism, Forestry & Fisheries
St. George's, Grenada

Delmer Bjorklund
Project Officer
CIDA-NGO Division
200 Rue Principale
Hull, Quebec K1A 0G4

Mr. George Bradley
Permanent Secretary
Ministry of Agriculture, Lands,
Housing & Employment
Basseterre, St. Kitts

Dr. Noel Brown
UNEP
Room LX 1290
U. N. Secretariat
U. N. Plaza
New York, NY

Mr. Epal Chacko
U. N. Ocean Economics &
Technology Office, 1 U. N. Plaza
New York, NY 10017

Mr. Benson Charles
Fisheries Assistant
Ministry of Agriculture, Tourism,
Forestry and Fisheries
St. George's, Grenada

Mr. Neville Christian
Fisheries Officer
Fisheries Division
St. John's, Antigua

Mr. Augustus Compton
West Indies Associated States
Secretariat
P. O. B. 179
Castries, St. Lucia

Mr. James Cotter
Inter American Foundation
1515 Wilson Boulevard
Roslyn, VA 22209

Mr. Andy Davis
Peace Corps Volunteer
Fisheries Division
Roseau, Dominica

Mr. Robert Devaux
Chairman, National Trust
P. O. B. 525
Castries, St. Lucia

Mr. Bob Dick
Executive Director
Overseas Book Centre
321 Chapel Street
Ottawa, Ontario

Mrs. Vietta Dowd
Information Systems Consultant
National Technical Information Se
425 13th Street, NW, Suite 620
Washington, DC 20004

Mr. Edwards
Assistant Secretary of
Agriculture
St. John's, Antigua

Ms. Sonia Edwards
Information Officer
Ministry of Agriculture,
Trade, Lands & Housing
Plymouth, Montserrat

Dr. Eduardo Feller
National Science Foundation
International Program
1800 G. Street NW
Washington, DC

Mr. Charles Francis
Environmental Officer
Ministry of Agriculture
Tourism, Forestry and Fisheries
St. George's, Grenada

Mr. A. I. George
C.F.T.C. Fisheries Advisor
Government Headquarters
Basseterre, St. Kitts

Mrs. Ute Gerbrandt
CIDA-NGO Division
200 Rue Principale
Hull, Quebec K1A 0G4

Mr. Marcel Giudicelli
UNDP/FAO WECAP Project
Apartado 6-4392
El Dorado, Panama

Ms. Terri Harris
Program Officer
Information Sciences Division
IDRC
P. O. B. 8500
Ottawa, Ontario K1G 3H4

Mr. Bob Hastings
Fisheries Officer
Fisheries Division
Bridgetown, Barbados

Mr. Hector George
Fisherman
Woburn, Grenada

Mr. Charles Hummel
Peace Corps Volunteer
Fisheries Division
Roseau, Dominica

Mr. Berimus Jean-Baptiste
Registrar of Cooperatives
Castries, St. Lucia

Mr. John Jeffers
Fisheries Assistant
Fisheries Division
Plymouth, Montserrat

Mr. Sidney John
Ministry of Agriculture, Trade
Lands & Housing
Plymouth, Montserrat

Mr. Mark Joseph
Fisherman
Seaside Fountain
Harvey Vale, Carriacou

Mr. Archie King
Parliamentary Secretary
Ministry of Education
St. John's, Antigua

Dr. Clarence Lloyd
Fort Street
Basseterre, St. Kitts

Mr. Earl Long
Schistosomiasis Research Project
P. O. B. 93
Castries, St. Lucia

Mr. Sam MacChesney
President, National Trust
Old Town, Montserrat

Hon. F. A. L. Margetson
Minister of Agriculture, Trade
Lands & Housing
Plymouth, Montserrat

Dr. Nelson Marshall
Professor of Oceanography
University of Rhode Island
Narragansett, RI

Ms. Yvonne Matthew
Planning Unit
Basseterre, St. Kitts

Mr. Nymphas Mead
Director of Agriculture
Plymouth, Montserrat

Ms. Giselle Morin-Labatout
Information Services Division
IDRC
P. O. B. 8500
Ottawa, Ontario K1G 3H4

Mr. Tom Murray
Sea Grant International
Program
6010 Executive Boulevard
Rockville, MD 20852

Dr. Dolliver Nelson
U. N. Law of the Sea
Secretariat
Secretariat Bldg., Rm 2727H
United Nations Plaza
New York, NY

Mr. Dennis Noel
Chief Technical Officer
Ministry of Agriculture, Tourism,
Forestry and Fisheries
St. George's, Grenada

Dr. Francisco Palacio
Director, Tinker Center
University of Miami
4600 Rickenbacker Causeway
Miami FL 33143

Mr. J. W. Parry
Permanent Secretary
Nevis Affairs
Charlestown, Nevis

Mr. Algernon Philbert
Fisheries Division
Roseau, Dominica

Mr. Albert Philip
Bioche Multipurpose Cooperative
Society Ltd.
Bioche, Dominica

Mr. Allen Putney
Principal Investigator
ECNAMP
c/o West Indies Lab
P. O. Annex Box 4010
Christiansted, St. Croix USVI 00820

Dr. S. J. Rickards
Chairman, St. Lucia Naturalists'
Society
P. O. B. 783
Castries, St. Lucia

Ms. Diana Rivington
Project Officer
CIDA-NGO Division
200 Rue Principale
Hull, Quebec K1A 0G4

Mr. Radcliffe Robbins
School Teacher
St. John's, Antigua

Dr. Gale Rozell
Agricultural Division
U. S. Agency for International
Development
Trident House
Bridgetown, Barbados

Ms. Cynthia Ryan
Acting Permanent Secretary
Ministry of Agriculture, Trade,
Lands & Housing
Plymouth, Montserrat

Mr. John Ryan
Permanent Secretary
Ministry of Agriculture, Trade,
Lands & Housing
Plymouth, Montserrat

Mr. Selwye
Fisheries Division
Roseau, Dominica

Ms. Jill Sheppard
Executive Director
Caribbean Conservation Assoc.
Savannah Lodge, The Garrison
St. Michael, Barbados

Dr. Edward Towle
President
Island Resources Foundation
P. O. B. 4187
St. Thomas, USVI 00801

Mr. Russell Train
President
World Wildlife Fund - U. S.
1601 Connecticut Avenue NW
Washington, DC 20008

Ms. Stella Villejo
U. N. Ocean Economics &
Technology Office
1 U. N. Plaza
New York, NY 10017

Mrs. Wade
Cooperatives Officer
Ministry of Agriculture, Lands,
Trade & Housing
Plymouth, Montserrat

Mr. Horace Walters
Fisheries Officer
Castries, St. Lucia

Mr. Welch
Fisheries Coordinator
Ministry of Agriculture, Tourism,
Forestry and Fisheries
St. George's, Grenada

Mr. Victor Williams
Planning Unit
Basseterre, St. Kitts

Mr. Rudolf Wilkin
Acting Superintendent of
Agriculture
Charlestown, Nevis

Mr. Dorsey Worthey
Peace Corps Volunteer
Fisheries Division
Castries, St. Lucia

Mr. Michael Wright
Vice President
World Wildlife Fund - U. S.
1601 Connecticut Avenue NW
Washington, DC 20008

* * * * *

Plus unidentified fishermen in
St. Kitts, St. Lucia, Dominica,
Antigua, Montserrat, and Grenada

Appendix III

Notes on Countries Included in Survey

Antigua

Surface area: 170 square miles
Shelf area: 978 square miles
Population: 78,000
Estimated number of fishermen: 2,000

The Antiguan government's chief concern in regard to marine resources is with increased production. Fisheries officials stated categorically that there are no conservation/overexploitation problems. Government provides inexpensive ice to fishermen. The Fisheries Division stocks gear, but the Crown Agents (suppliers) haven't delivered for several years, forcing fishermen to buy from local merchants at high prices. The previous government built a fish market, but it has not opened for political reasons. Current government plans for fisheries include the purchase of 15 boats (45' - 50') over the next five years to be operated by a government company. This project will be supported by Caribbean Development Bank and will include the construction of a processing plant.

Past projects have been unsuccessful for a variety of reasons: 1) the U. S. offer of a boat for fishermen rescue was refused by government as they wanted it to be controlled by the police; 2) the introduction of the concept of marine parks failed due to a lack of counterparts; 3) hydraulic trap haulers were provided without clutches, control valves, or proper instructions. WECAF assistance has been requested for demonstration of new techniques.

Problems identified by the private sector include: 1) local availability of fish (most of the best quality fish is sold to Guadeloupe), 2) the control of fish prices while there is no control on gear or fuel prices, 3) pot theft, 4) overfishing of lobster, conch and turtles which are sold to Puerto Rico, Guadeloupe, and Martinique (Barbadans are fishing undersized lobster which they claim is a different species: "chicken lobster"), 5) destruction of mangroves for charcoal and to clear more beaches for tourism, 6) sand mining in Barbuda for export to other islands, 7) lack of local counterparts in aid programs, 8) lack of a formal statistical program, 9) fleet safety.

Suggestions made include: 1) marine resource education for the general public, school children, and government officials, 2) basic research on the biology of stocks in Antigua's waters, 3) marine parks as a means of controlling losses due to tourism, and 4) youth ecology projects. The most promising vehicle for projects at this time would appear to be via the school system. Several local teachers have maintained an interest in environmental education, but have been frustrated by a lack of official support.

Barbados

Surface area:	168 square miles
Shelf area:	125 square miles
Population:	251,373
Estimated number of fishermen:	2,000 full-time 1,000 part-time

The major concern of the Barbados Fisheries Division is the imbalance between the cost of fishing and the value of the catch. It was felt that the combination of two suggestions might alleviate the problem: 1) an increase in the amount of time spent actually fishing over the time spent in transit and 2) a reduced dependence on high-cost fuel through the use of sail. There are no programs underway at present to implement either suggestion.

The Fisheries Division has no data on stock sizes or sustainable yields. There are no plans to gather such information as it is considered unnecessary in light of plans for expansion of the range of the fishing fleet. Most of the trawlers are presently inactive subsequent to enactment of 200 mile EEZ's which exclude foreign fleets from South American shrimp fishing grounds.

Construction of a new landing center and port development is underway at Oistin's, the largest fishing village. Project support has come from the European Development Fund and the Canadian International Development Agency.

There are no reported problems with overexploitation of marine resources. Some concern has been expressed over potential difficulties resulting from the effluent of various proposed industrial development projects and with respect to the impact of tourism on the marine environment.

Dominica

Surface area: 300 square miles
Shelf area: 142 square miles
Population: 70,302
Estimated number of fishermen: 2,000

The relatively small shelf area and traditional fishing methods restrict the amount of fish available in Dominica. Prior to Hurricane David, there was no fisheries program. It was felt that with an increase in the availability of fish, more emphasis might be placed on a fisheries program.

Major needs expressed include 1) boat-building to replace those lost or damaged by the hurricane, 2) replacement and increased availability of fishing gear, 3) facilities for ice-making, storage, and transport and 4) a statistics program.

While no conservation problems were reported, we were advised by St. Lucians that approximately 100 lbs. per week of hawksbill turtle shell was being exported from Dominica via St. Lucia on British Airways.

Relief funds for the fishing sector have been received from UNDP and OAS; some of this support has been applied towards equipping the defense force with outboard engines. Funds were also offered for the purchase of inactive Barbadian shrimp trawlers. Dominica declined the offer and presented an alternative proposal to which no response has been received to date.

In the mid-1960's, the government established an outboard repair workshop. Government subsidizes the labor and the fishermen pay for the parts. Plans for an underwater park developed by a local Peace Corps Volunteer were destroyed in the hurricane.

We spoke with members of the Bioche Multipurpose Cooperative Society, Ltd., which was founded at local initiative. They have built a night club which serves as a meeting place as well as for fund-raising functions. A generator and a small freezer have been purchased and soft loans for boats and gear have been received from CADEC. The coop has been in touch with Inter-American Foundation. The needs they expressed include a small van for the transport of fish and funds for the living expenses of a trainee to be sent to St. Lucia for an outboard repair program.

Grenada

Surface area: 134 square miles
Shelf area: 781 square miles
Population: 110,000
Estimated number of fishermen: 1,800

General government objectives include: 1) improving nutrition by improving the availability of fish, 2) increasing employment, 3) providing a base for foreign exchange and earnings, and 4) improving the quality of life for rural people.

The major management problem is a lack of qualified personnel in the Fisheries Division. Government expressed interest in a training program to improve personnel and research capabilities to support the development of commercial fishing, as well as in the provision of continuing support for post-trainees with a gradual increase in government support.

Other fisheries problems identified include 1) availability and cost of fishing gear, 2) marketing and storage of catch, 3) size of boats, and 4) participation of fishermen in programs.

Projects which are being developed include: 1) a fishermen training program with Cuban assistance, 2) the demonstration of new fishing techniques by WECAF, and 3) an alternative tourism project being conducted by ECNAMP with WWF support. CIDA-bilateral is reviewing plans to repair the Grenville ice plant originally built with CIDA support in the mid-1970's.

ERP is actively engaged in a conch mariculture pilot project (supported by RBF through CCA), a hawksbill turtle conservation project (supported by WWF), a spiny lobster trap-fishing project (supported by CIDA-NGO), all of which involve local participation and training. Difficulty has been experienced in securing government participation in identification of trainees and counterparts. ERP is also providing assistance in developing a statistics program and is conducting research on coral reef environments.

There appears to be a problem with a considerable amount of ad hoc aid. A recent mission from IFAD has reviewed possibilities for support to the fisheries sector; the Salvation Army is reportedly planning to provide a cold storage facility to one of the local villages; a fiberglass lobster boat was recently purchased at considerable cost for the Fisheries Division without provision for equipping the vessel. Government is aware of this problem and has appointed a Fisheries Coordinator to oversee administration of fisheries activities.

Considerable initiative has been displayed by various groups of individual fishermen in Grenada and Carriacou, and interest exists in education and management as well as in improvements to the fishing fleet. There has been no direct external assistance to these groups to date. Possible projects are described in detailed proposals available from the authors of this report.

Montserrat

Surface area: 39 square miles (98 km²)
Shelf area: 54 square miles (140 km²)
Population: 12,000
Estimated number of fishermen: 200 part-time

The main priority of the government is to increase the availability of fish on Montserrat. Unlike some of the other countries surveyed, management of marine resources will be the critical element of any program adopted. Mr. A. I. George, CFTC Regional Fisheries Advisor, will begin a one-year assignment to Montserrat in August 1980. He has written a preliminary proposal for the development of Montserrat's fishing industry. Government's priorities include: 1) development of fisheries administration and training of a fisheries officer, 2) provision and improvements to landing, berthing and gear storage facilities, 3) organization of fisheries cooperatives, and 4) the implementation of a statistics program.

One project which the government would like to see done in the near future is the construction of an artificial reef. The shelf area around Montserrat is relatively small and fishing grounds are further limited by rough seas and winds off the north coast. The artificial reef would provide shelter for fish, lobsters, etc. It would be monitored to determine whether or not it would be beneficial to construct more reefs to increase productivity in other areas. The government is also interested in the possibility of constructing rafts as fish and small lobster attractors.

British Development Division has provided Montserrat with some gear (gill nets, a winch, shark hooks, etc.) for demonstration purposes. Demonstrations will be conducted by WECAF in June 1980.

The Fisheries Officer conducted a survey of fishermen's needs which include 1) ice boxes (for storage of fish) and an ice maker, 2) hire/purchase of gill nets, 3) subsidy for equipment purchase, 4) training to teach fishermen to repair nets (this project is now underway), 5) larger boats with inboard engines, 6) duty-free gasoline, 7) a fishermen's shed at Kinsale, 8) insurance for fisher-

men and boats, 9) government guaranteed marketing of fish, and 10) a slipway for boat repair.

Other problems indicated are 1) theft of fish pots, 2) enforcement of turtle legislation, and 3) disinterest in fishing as a career due to low income and low social standing. Another point that was raised was that big boat programs on Montserrat have not worked.

St. Kitts - Nevis

Surface area: 101 square miles
Shelf area: 344 square miles
Population: 42,000
Estimated number of fishermen: 900

There is a shortage of fish in St. Kitts/Nevis due to: 1) relatively few fishermen, 2) poor landings, 3) poor distribution of fishing effort, 4) depletion of traditional fishing grounds, and 5) limited fishing grounds due to the threat of ciguatera. Outboard parts, engines, and fishing gear are extremely expensive and frequently in short supply. Fuel prices raise the cost of fishing still further. There is no Fisheries Officer as there is no program, personnel, or available funding.

Conch and lobster fisheries are reportedly declining due to heavy exports to Puerto Rico and St. Maartens. The export of lobster stopped about 6 months ago as the government enacted regulation restricting export to 1/3 of the catch.

Mr. A. I. George, CFTC Fisheries Development and Export Promotion Advisor, has been assigned to the St. Kitts - Nevis - Anguilla government since August 1976. He has prepared a report on his recommendations for the development of the fishing industry which includes: 1) the establishment of a fisheries administration, 2) the formation of fisheries cooperatives, 3) the establishment of a fishermen training center, 4) a mechanization program for the fleet, 5) a shark fishing program, 6) a pilot project for brackish water fish-farming, 7) a survey of pelagic resources, 8) the provision of landing and berthing facilities, and 9) a lobster fishery and conservation program.

While a few people espoused the concept of larger boats, most remembered previous experience with two government-owned 35-foot boats. Little fish was landed locally as most of the catch was sold to Martiniquans while at sea. The boats were eventually sold as they were considered economically infeasible.

Education was stressed by all those interviewed as a priority. Suggestions were made for a formal program in schools targeting future fishermen; for programs to increase public awareness of marine resources; for informal "coffee sippings" to discuss ideas and new techniques with fishermen.

Present programs include: 1) small loans (maximum EC \$500) to fishermen by Barclay's Bank, 2) loan/grants to fishermen for gear purchase by the Local Development Fund and CADEC (weekly financial statements are required) and 3) a resource survey of the undeveloped Southern Peninsula with the assistance of ECNAMP.

The Government expressed interest in prospects for various types of mariculture and is particularly emphatic that development of marine resources should conform to sound management principles. There are a number of salt ponds on St. Kitts which have been looked at as potential sites for mariculture. IDRC funding for a mussel mariculture project is awaiting government identification of a local counterpart.

St. Lucia

Surface area: 240 square miles (616 km²)
Shelf area: 203 square miles (522 km²)
Population: 120,000
Estimated number of fishermen

Both the government and the private sectors expressed concern over 1) the lack of fisheries personnel and the resulting heavy reliance on Peace Corps Volunteers, 2) the extensive practice of dynamite fishing and consequent destruction of coral reefs, 3) the threat of oil pollution resulting from construction of a storage/trans-shipping facility for Hess Oil on St. Lucia and 4) the potential long-term effects of sand mining (for construction purposes) and dredging (for "beach nourishment").

Needs identified by interviewees include: 1) educational programs to promote the conservation of marine resources (a school program was reportedly very effective in the parrot conservation effort), 2) small-scale upgrading of cold storage and processing facilities, 3) a safety training program for fishermen, 4) management programs for lobster, conch, turtles and mangroves, 5) protective legislation, 6) rehabilitation of destroyed reef areas, 7) stock surveys to direct the expansion of St. Lucia's fisheries, and 8) a fisheries research center.

The government is presently working with a consultant from Florida International University to evaluate the hazards and plans of the

Hess Oil Facility. A St. Lucian is being trained in Fisheries Management at Memorial University, Newfoundland, with CIDA funding, and is expected to improve the technical ability within the Fisheries Division. CIDA funding has been secured for cold storage units and work is reportedly about to begin. A sea moss culture project is in the final stages of approval by IDRC, and funding for an oyster culture project may be forthcoming depending on IDRC's results in Jamaica. Some cooperatives have been started and the collective purchase of gear has recently begun with CDB support. WECAF has provided assistance in the collection and compilation of statistical data and has offered to assist in the equipping and demonstration of new boats. Farmers interested in aquaculture can obtain Tilapia fingerlings from the government. An artificial reef, constructed with old tires, was damaged by a heavy storm due to inadequate anchoring.

Present plans include: 1) an underwater park which is awaiting legislation and 2) the assignment of a cooperative official to the Ministry of Education to begin instructing teachers about the benefits of cooperatives. A request has been submitted to WECAF for assistance with the development of a fisheries research station.

Problem	Means to Solution (= Need)	Countries										Organizations					
		NGI	SRW/ NEV	GND	SLU	DOM	ANU	MNI	WIAS	IRF	WFCAF	CIDA	NSF	SEA GRANT	UNEP	IDRC	
Inadequate Fleet Safety	Fishermen Training		F	G	G												
	Provision of Safety Gear		G	G													
	Insurance for Men & Boats							GF									
Hazards to Fishermen Using SCUBA Gear	Training		F														
	Alternative Fishing Methods			S													
Low Priority Given to Marine Resources by Government	NONE		G				P		X								
	Increased Personnel		G														
	Education of Government		G						X								
	Increased Fish- eries Productivity					G										X	
Inattention to Resource Management vs Production	Public Education			S			S			X							
Lack of Contact Between Government and Private Sector	NONE				P		S				X						
Poor Public Awareness of Marine Resources	Materials for Schools		G	G	G		G	G	X	X							
	Visual Aids for General Public	P	P	G	GP				X	X							

Program	Agency	BGI	SKB	GND	SLU	DOM	ANU	MNI	ANG	JAM	BEL	BAH	TKC	BVI
Cold Storage/Market Facilities	CIDA -Bilat CDB			A	P				P					
Loans for Fishing Gear	Barclay's Bank CADEC IAF		A A A					A A						
Assistance for Hurricane Damage	USAID OAS UNDP								A A					
Demonstration of Fishing Gear	WECAF BDD	←-----X-----→ A												
Support for Vessel Purchase	CDB								P					
Research on Critical Stocks	IOCARIBE ERP	←-----P-----→ A												
Underwater Parks	local gov't ECNAMP	A			X	P					A			A
Mariculture														
a. Mussel	IDRC		P											
b. Conch	IDRC UMIA (Groves) PRIDE (RBF/CCA) ERP (RBF/CCA)										P		P	A
c. Turtles	ERP (WWF/RBF/CCA)				A									
d. Spiny Lobster	ERP (CIDA/NGO)				A									
e. Sea Moss	IDRC					P								
f. Oysters	IDRC					P				A				
g. Unspecific	CDB	←-----P-----→												
Artificial Reefs	local gov't				X				P					

