

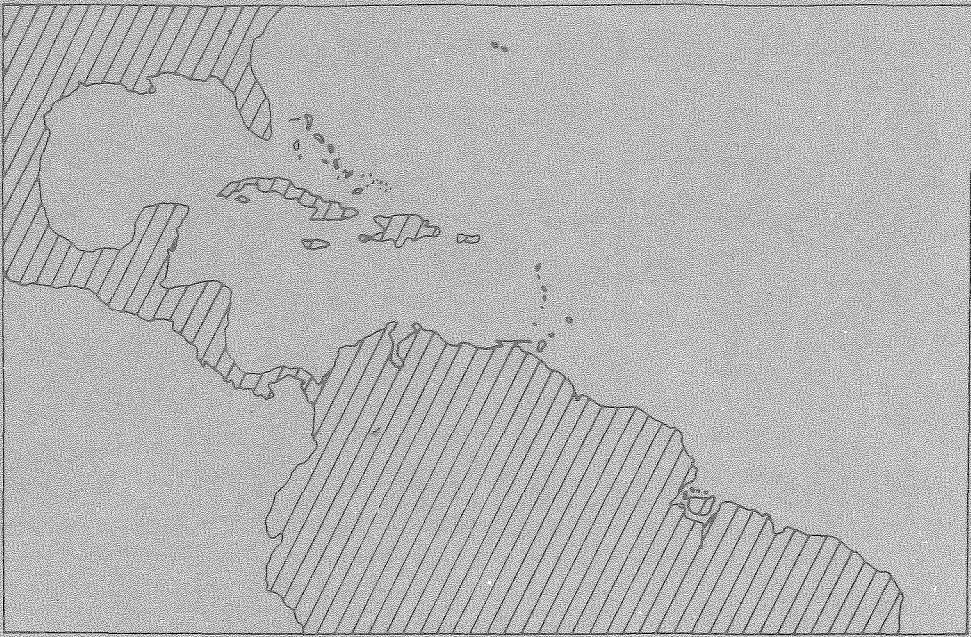
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FISHERIES

WECAF REPORTS No. 37 (En)
western central atlantic fishery commission

INTERREGIONAL FISHERIES DEVELOPMENT AND MANAGEMENT PROGRAMME
(WECAF Component)

INTERIM REPORT



UNITED NATIONS DEVELOPMENT PROGRAMME



FOOD AND AGRICULTURE ORGANIZATION OF
THE UNITED NATIONS

WECAF REPORTS No. 37* (En)

Interregional Fisheries Development and Management Programme

(WECAF COMPONENT)

Interim Report

by

WECAF Project

Panama

October 1980

* WECAF Rep. 37

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INTERREGIONAL FISHERIES DEVELOPMENT AND MANAGEMENT PROGRAMME

The Interregional Fisheries Development and Management Programme began its activities on 1 January 1980. It has three components (Headquarters, CEECAF and WECAF) and the WECAF component is the successor of the Interregional Project for the Development of Fisheries in the Western Central Atlantic (WECAF) which was initiated in March 1975 and terminated its second phase on 31 December 1979. Its objectives are to assist developing coastal countries in assessing development opportunities offered by their available fishery resources and to formulate appropriate actions, to promote the rational utilization of fishery resources, to promote the development of technical and economic cooperation among countries of the region and to assist in the upgrading of their human resources. Its activities are coordinated by the Western Central Atlantic Fishery Commission (WECAFC) established by the Food and Agriculture Organization of the United Nations (FAO) in 1973. The Project is supported by the United Nations Development Programme (UNDP) and FAO as the Executing Agency.

As with the previous project, two series of documents will be prepared to provide information on activities and/or studies carried out. This document is the thirty seventh of the series WECAF Reports. The other series of documents is entitled WECAF Studies.

D.A. Lintern
Acting Project Director

Table of Contents

	<u>Page</u>
INTRODUCTION	1
1.1 Project Background	1
1.2 Objectives of the Project	2
1.2.1 Long-Range Objectives	2
1.2.2 Immediate Objectives	2
1.3 Activities Undertaken for the Realization of Project Objectives	4
1.3.1 Fishery Development	6
1.3.2 Fishery Statistics	7
1.3.3 Resource Evaluation and Management	9
1.3.4 Fishing Technology	11
1.3.5 Fish Processing and Marketing	12
1.3.6 Training	14
1.3.7 Fisheries Administration and Legislation	16
1.3.8 Cooperation with Other Bodies	16
1.4 Activities Not Yet Implemented	16
1.5 Arrangements for Reporting	18
PROJECT RESULTS AND CONCLUSIONS	18
2.1 General	18
2.2 Fishery Development	19
2.3 Fishery Statistics	21
2.4 Fishery Resource Evaluation and Management	22
2.4.1 Shallow Water Shrimps	23
2.4.2 Spiny Lobster	23
2.4.3 Conch	24
2.4.4 Soft-bottom Demersal Species	24
2.4.5 Demersal Species on Hard and Coraline Grounds on the Continental Shelf	24
2.4.6 Shark Species on the Continental Shelf	24
2.4.7 Demersal Cephalopods on the Continental Shelf	25
2.4.8 Snappers and Related Species on the Drop-off of the Continental Shelf	25
2.4.9 Species on Continental Slopes - Shrimps, Norway Lobsters, Hakes, Dogfish, Rays, and Perhaps Molluscs	25
2.4.10 Small Coastal Pelagics such as Thread Herring, Spanish and Scaled Sardines, Menhaden and Anchovy	25
2.4.11 Small Coastal and Oceanic Pelagics such as Mackerel Horse Mackerel and Flying Fish	26
2.4.12 Medium-size Coastal and Oceanic Species such as Dolphin Fish, King Mackerel, Bonito, Small Tuna, Frigate Mackerel, Jacks and Barracudas	26

	<u>Page</u>
2.4.13 Large Oceanic Pelagics - Wahoos, Yellow Fin and Black Fin Tunas, and Skipjacks	26
2.4.14 Oceanic Cephalopods	27
2.4.15 Other Crustaceans and Molluscs	27
2.5 Fishing Technology	28
2.5.1 Artisanal Fisheries	28
2.5.2 Industrial Fisheries	31
2.6 Fish Processing and Marketing	32
2.7 Training and Extension Work	34
3. RECOMMENDATIONS	35
3.1 General	35
3.2 Statistics	36
3.3 Resource Evaluation	36
3.4 Technology	38
3.5 Fish Processing and Marketing	38
<u>Appendix 1</u> REPORTS	41
<u>Appendix 2</u> PROJECT STAFF	48
<u>Appendix 3</u> INSERVICE TRAINING CARRIED OUT	50
<u>Appendix 4</u> LIST OF MAJOR ITEMS OF EQUIPMENT PROVIDED BY THE UNDP	51
<u>Appendix 5</u> MAP OF PROJECT AREA	52
<u>Appendix 6</u> ORGANIZATIONS CONNECTED DIRECTLY OR INDIRECTLY WITH FISHERIES DEVELOPMENT IN THE WECAF REGION	53

1. INTRODUCTION

1.1 PROJECT BACKGROUND

In November 1973 FAO established a Commission to provide an intergovernmental machinery to foster and promote international cooperation for the development, utilization and conservation of the fishery resources of the western central Atlantic. The Commission is entitled the Western Central Atlantic Fishery Commission (WECAFC). Its area encompasses the marine waters of the Gulf of Mexico, the Caribbean and the Atlantic within a line drawn as follows:

"A line on the coast of North America at 35°0' North Latitude drawn eastward along 35°0' North Latitude to 42°0' West Longitude thence due North to 36°0' North Latitude thence due East to 40°0' West Longitude thence due South to 5°0' North Latitude thence due East to 30°0' West Longitude thence due South to the Equator thence due East to 20°0' West Longitude thence due South to 10°0'^{1/} South Latitude thence due West to the Atlantic coast of South America then in north-easterly direction along the coast of South America, Central America and North America to the original point on the Atlantic coast of North America at 35°0' North Latitude" (see map, Appendix 5).

Its membership consists of 22 member countries of FAO concerned with the fisheries of the area^{2/}.

Shortly after the establishment of this Commission, FAO entered into negotiation with the UNDP to obtain funds to assist the Commission in its given task of maximizing the utilization of the living marine resources of the western central Atlantic area. A development proposal was prepared, endorsed by Commission members and subsequently approved by the UNDP as Project INT/74/016. The Project consisted of a programme of a preparatory nature for a period of 18 months, which began in January 1975 and terminated in June 1976. Its main purpose was twofold: (1) to prepare a number of basic studies^{3/} to throw light on some of the major issues to which the Commission needed to address itself; (2) to formulate a longer term project/programme encompassing the various activities to be carried out for the realization of the Commission's objectives. The project proposal which emerged (revised somewhat subsequently) was what became INT/77/016, a three-year Project beginning in January 1977 with a UNDP contribution of US\$ 1 155 360, which is the subject of this

^{1/} Originally 5°0' S but changed to 10°0' S at the Second Session of the Commission, May 1978.

^{2/} Bahamas, Barbados, Brazil, Colombia, Cuba, France, Guatemala, Guyana, Haiti, Italy, Jamaica, Japan, Rep. of Korea, Mexico, Netherlands, Nicaragua, Panama, Spain, Trinidad & Tobago, United Kingdom, United States of America and Venezuela.

^{3/} WECAF Studies Nos. 2, 3 and 5.

Interim Report. Initially, 22 countries joined the Project but, at the end of 1979, there were 27 members^{1/}.

1.2 OBJECTIVES OF THE PROJECT

The objectives of the Project were:

1.2.1 Long-Range Objectives

To assist in ensuring the full rational utilization of the fishery resources of the western central Atlantic through:

- i. the development of fisheries of under-exploited stocks, particularly those accessible to small-scale fishermen;
- ii. the promotion of the better use of existing catches, and of appropriate management actions for stocks that are heavily exploited.

1.2.2 Immediate Objectives

For the shorter run, to advise on the development of appropriate fishery policies and their harmonization at the national, subregional, regional and interregional levels, and to facilitate the attainment of international assistance to further project ends. In particular the objectives were:

1.2.2.1 "Resource Utilization"

- i. Resource exploitation
 - a. to assist in the identification and formulation of national or regional projects for the development of fisheries on under-exploited stocks. Particular attention will be given to the identification of stocks that can support increased catches by small-scale fisheries and measures to develop these fisheries;
 - b. to assist small-scale fishermen by increasing and improving the quality of their catches through the introduction and demonstration of improved or new fishing methods, vessels, gears and operations, insofar as the resources allow increased catches to be achieved, and improved post-harvesting techniques on board and ashore;
 - c. to assist governments and the private sector in identifying opportunities for the improvement and development of all sectors of the industry, and sources of assistance for feasibility studies and investment. Particular items which

^{1/} Antigua, Bahamas, Barbados, Belize, Bermuda, Brazil, British Virgin Islands, Cayman Islands, Colombia, Cuba, Dominica, Dominican Republic, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Montserrat, Netherlands Antilles, Nicaragua, Panama, St. Lucia, Suriname, Trinidad & Tobago, Turks and Caicos Islands and Venezuela.

will receive attention include the development of new or improved fishing vessels and gear, planning better harbour and shore facilities, assistance in processing and marketing;

- d. to assist in the identification and formulation of coastal aquaculture projects;
 - e. to provide assistance to countries to obtain improved statistics of fish processing, exports, imports, domestic distribution, prices, consumption, as well as costs and earnings data on fishing and aquaculture operations.
- ii. Resource management and identification of development opportunities
 - a. to assist countries in formulating plans for the development and management of fisheries that take into account the constraints set by the magnitude of the sustainable yields from the resources, with special reference to the coordination of plans concerned with the exploitation of the same resource by more than one country;
 - b. to assist in the development of principles and techniques for the management of shrimp fisheries, which take into account biological, social and economic factors, and which can be implemented under appropriate national and multi-lateral arrangements.

1.2.2.2 Resource Monitoring

- i. Statistics and biological data
 - a. to provide assistance to the coastal countries concerned with improving their supply of data, e.g., by training biologists and statisticians, and in introducing appropriate techniques for data collection and compilation;
 - b. to collaborate with the non-coastal countries fishing in the area, and with the intergovernmental bodies, such as the International Commission for the Conservation of Atlantic Tunas (ICCAT), in assembling the data necessary for the evaluation of the state of the stocks;
 - c. to ensure the regional compilation, analysis and publication of the data referred to in (a) and (b).
- ii. Research

To assist in the promotion and coordination of regional research activities, specially regarding:

- a. survey and appraisal of demersal and pelagic stocks, to identify possibilities for development;
- b. assessment of shrimp and other heavily fished stocks.

1.2.2.3 Fishery Administration and Legislation

- a. To assist in the strengthening of fishery administration in general and, in particular, national fishery research and development institutions;
- b. to assist in the formulation of fishery legislation.

1.2.2.4 Training

- a. To support directly, or through bilateral or other funds, training at all levels in all fishery sectors".

1.3 ACTIVITIES UNDERTAKEN FOR THE REALIZATION OF PROJECT OBJECTIVES

As referred to in Section 1.1 above, and shown in the map in Appendix 5, the geographical area covered by the Project extends from Cape Hatteras (U.S.A.) to Maceio in Northern Brazil, an area with 36 countries^{1/} and over 200 million inhabitants. It is characterized by its great diversity. Within it, four of the world's most common languages are spoken; republics that have been independent for many decades coexist with states that have recently obtained their independence or that will soon do so; many different political administrative and educational systems prevail; some countries have great human and material resources, with favourable potential for future development, while others, by size, natural resources, population and infrastructure for modern living are more comparable to poorly endowed communities with many constraints to development. Disparities in per caput income levels are most striking, ranging from under US\$ 100 to over US\$ 4 000 per year.

The diversities and characteristics just described are fully reflected in the size, structure, organization and operation of the fishing industry. Activities range from the use of sail boats and unmotorized canoes to the operation of modern shrimp trawlers and tuna clippers, with the former type of operation predominating. Similarly, the importance of fishing in the economy varies greatly: in a number of countries, particularly the Caribbean islands, per caput fish consumption is high, in certain instances more than twice the world average of 12 kg, and accounts for perhaps 15 percent of the total protein intake; by contrast, fish consumption in other countries, especially Central American countries, is low, not exceeding 5 kg per caput per annum. Moreover, in some countries, fish is an important source of foreign exchange, in others a drain on the balance of payments; and for the area as a whole, about half of the fish

^{1/} Twenty seven of them are members of the WECAF Project.

which is consumed is imported - only in Mexico and in Central and South American countries is local fish demand largely met from locally produced supplies.

It must also be stressed in this preface that the concept of regional cooperation in the area is rather low. No regional body has yet been established and supported by governments to contain all the countries of the region. Some attempts have been made to create governmental organizations of a subregional nature following lines of cultural affinities, such as the Caribbean Free Trade Association (CARIFTA), the West Indies States Association (WISA), the Caribbean Development Bank (CDB), the Caribbean Common Market (CARICOM), the Central American Common Market and the Economic Community for Latin America (ECLA). While some progress has certainly been made toward integration which outweighs the failures, the road ahead is still obscured by the vexing problems of poverty, unemployment and racial and ethnic tensions which constitute a threat to the political stability of the region.

It is in this context that the Project INT/77/016 initiated its activities in the western central Atlantic.

Although the Project became operative on 1 January 1977, at that time its professional staff consisted only of the Programme Leader and it was not until 1 September 1977 when its Headquarters was established in the region, in Panama City, Republic of Panama that it could begin to work effectively. The core staff provided for in the project document were recruited at irregular intervals. The Development Officer/Economist arrived in September 1977, the Resource Evaluation Specialist in October 1977, the Fishing Technologist in February 1978 and the Fish Processing Technologist in December 1978. Although the original budget did not include a Statistician, the need to improve fishery statistics in the region was so evident that consultant man-months were used to create a full-time post and the Statistician arrived in Panama in January 1979. It is clear from the above that a number of the planned Project activities could not be satisfactorily undertaken until a fairly late stage in its life. In an attempt to overcome these difficulties, considerable use was made of consultants. Altogether a total of 27 consultant man-months were utilized in a variety of disciplines. Full details are given in Appendix 2. Three Associate Experts also worked in the Project, though one did not arrive until November 1979, by which time one of the others had left.

Project activities are described for convenience in this report under the following principal headings:

- Fishery Development Planning and Project Formulation
- Fishery Statistics
- Fishery Resource Evaluation and Management
- Fishing Technology
- Fish Processing and Marketing

In addition, training was recognized as an essential element of the Project's work and the staff devoted a good deal of their time to this field, both directly and indirectly.

The grouping of activities in this way should not be interpreted as indicating the work carried out by particular individuals. Some activities such as statistics and resource evaluation and fish processing and marketing are very closely related and, indeed, until the arrival of the Statistician, the Resource Evaluation Specialist had to deal with matters relating to fishery statistics. Also quite often two or three of the Project staff would act as a team. In Dominica, for instance, the Fishing Technologist and Development Officer worked together in the preparation of a comprehensive development programme; in Nicaragua they were joined by the Fish Processing Specialist in identifying and formulating project proposals. In each case, they consulted before and after with the Resource Evaluation Officer so as to be sure that their recommendations were also in accord with the latest information about the resources of the area. These are just two examples of the teamwork employed by the Project staff in carrying out its appointed tasks.

Full reports were prepared on almost all Project activities and many of them were published and distributed to member countries. It is not the intention, therefore, to describe these activities in great detail in the following section. Instead, the main ones are briefly mentioned and, where applicable, reference is made to the appropriate report or project proposal, complete lists of which are given in Appendix 1.

1.3.1 Fishery Development (Development Planning and Project Formulation)

Activities in this field consisted essentially of giving advice to governments, where requested or possible, on fishery development problems and opportunities, assisting them in the formulation of development plans and, where appropriate, preparing development project proposals.

As an essential background to this work and in order to increase awareness of the region's needs and problems, fishery economic profiles were prepared for many of the countries of the area. These described the vital elements and economic determinants of the countries' fishery situations but their preparation often emphasized the very real lack of information essential for adequate planning.

1.3.1.1 Specific Activities

- a. Preparation of comprehensive development programme for Dominica. This was carried out in conjunction with the UNTCD Project on Socioeconomic Planning. The programme was accepted by the Government in its entirety as the fisheries sector of the country's national development plan (5 k).

- b. Identification and formulation of fishery projects in Nicaragua, as part of an FAO multi-sectoral mission. A number of specific projects were identified, ranging from emergency measures to reconstruct the industrial fisheries to exploratory and experimental fishing and artisanal fisheries development (5 x).
- c. A report was prepared for Bermuda which recommended various actions that should be taken in the fields of product development, fishery economics, experimental fishing and shore infrastructure (5 a).
- d. Consultations regarding fisheries development were held with Government officials in the British Virgin Islands and a project was prepared for the provision of a Fisheries Adviser there (5 d and 6 l). A detailed evaluation was made of a feasibility study for the establishment of a medium-sized fishery industry.
- e. In the Cayman Islands, development possibilities were discussed and project proposals were prepared for long- and short-term assistance in fisheries administration (5 c and 6 m). Similar action was taken in the Turks and Caicos Islands (5 b and 6 b and c).
- f. In Honduras, a study was made of the possibilities of developing artisanal fisheries in the Gulf of Fonseca and recommendations were made based on improved fishing techniques and the development of marketing and distribution facilities through the establishment of fishery cooperatives (4 z).
- g. Project staff participated in a Venezuelan project on fishery development policies. A good deal of time had to be spent collecting basic data to give orientation to recommendations on policy guidelines.

1.3.2 Fishery Statistics

The services of a full-time Statistician became available to the Project in January 1979. Before that, a survey was carried out by the Resource Evaluation Specialist to assess the status of fishery statistics in the WECAF area as regards collection and compilation (4 b) and a consultant was employed for a period of three months, during which time he visited the Bahamas, Barbados, Jamaica and Panama, carried out a detailed study of the situation and made recommendations for improving the statistical systems (5 e).

Subsequently, surveys were carried out in a further five countries (Brazil, Guyana, St. Lucia, Suriname and Trinidad & Tobago). In all nine countries programmes were prepared for the improvement of data collection and classification procedures. The need to apply sampling techniques and initiate sample surveys

was pointed out in all cases and a sample survey was carried out in St. Lucia.

It should be noted that these countries were selected because there existed national interest and financial/organizational ability and it was felt that they offered good possibilities for the introduction of standard statistical practices.

The first meeting of the WECAFC Working Party on Fishery Statistics was held in Panama from 16 to 17 May 1978. Participants recognized the need to develop standards for reporting fishery statistics by all countries in the region and a certain amount of progress has been achieved toward this goal.

1.3.2.1 Standards for Species and Species Groups

- a. With Project support, FAO prepared a six-volume publication entitled "Species Identification Sheets for Fishery Purposes", a taxonomic work of excellence, giving the characteristics of most of the species of commercial significance in the WECAF area. Copies of this work have been widely distributed. In addition, a start was made in the preparation of a working manual to be used by personnel collecting and compiling fishery statistics.
- b. The Working Party on Fishery Statistics prepared a list of families and species of major and minor commercial importance. With this as a base and utilizing documentation available at the country level, the Project prepared a comprehensive list of species items for the Caribbean in accordance with the categories of the International Statistical Classification of Aquatic Animals and Plants (ISSCAAP) which will serve as the basis for the collection of field data, a task which is often carried out by people with very little training. It is believed that the use of this list, in conjunction with the field manual mentioned earlier, will greatly reduce the non-sampling errors of fishery statistics collection.

1.3.2.2 Standards for Fishing Vessels

The suggestions of the WECAFC Working Party regarding these standards are being applied. That is, to classify large vessels (over 5 tons) according to the International Standard Classification of Fishing Vessels (SSCCFV), i.e., by gross registered tonnage (GRT) and horse power (hp) categories; to classify small vessels of 5 tons or less - the size predominating in the WECAF area - by length instead of by tonnage, indicating the hp when

vessels are motorized. In addition, new statistical forms for reporting data on fishing vessels, designed by FAO, have been introduced in the area.

1.3.2.3 Standards for Fishing Gear

The information available on fishing gear used by fishermen, especially in artisanal fisheries is very meagre. Generally, whatever data are being collected are reported according to local names which, in many instances, are not identifiable elsewhere. Efforts are being made, therefore, to standardize gear reporting.

1.3.2.4 Training Course in Fishery Statistics

This course was attended by participants from 11 English-speaking countries from the region in St. Lucia in November/December 1979. This activity is described more fully in the Section on Training.

1.3.3 Resource Evaluation and Management

Important activities carried out under this heading include:

- a. Organization of and participation in a Working Party for the Assessment of the Shrimp Fisheries of the Guianas/Brazil Region. A meeting was held in April 1979 with participants from Brazil, Cuba, Venezuela, Guyana, French Guiana and the U.S.A. at which the latest data on the fishery were analysed. Papers were presented by the national participants and contributions were also received from invited people. Recommendations were made for future work to be carried out on a cooperative basis. A preparatory meeting for the proposed shrimp tagging programme was held in Belem in November 1979 (4 i and ii).
- b. Reviews were carried out on the existing information on the clupeoids, carangids and sharks of the region. These were important in that they complemented the work done on fish and crustacea resources during the preparatory phase of the project (4 a and c).
- c. A number of countries were assisted in the planning of exploratory fishing surveys. For Nicaragua and Honduras these related to snapper (4 l and w); in Jamaica and Venezuela deep-water demersal species were considered (4 g and v); in Dominican Republic the pelagic species were dealt with (4 e); and in Trinidad and Tobago exploratory fishing for shark was planned (6 a). In the event, only Nicaragua - where the Project located a suitable masterfisherman to carry out the work - was able

to implement the programme and the Project assisted in the analysis of the data collected.

- d. The Project assisted in the computerization of the exploratory fishing data collected by the National Marine Fisheries Services over the last 25 years and the UNDP/FAO Fishery Development Project based in Barbados during the period 1965-1971. The data was placed on tape at the data bank at Pascagoula, Mississippi, and a copy has been provided to FAO, Rome.
- e. A review was carried out of the fishery research capabilities in 23 countries of the WECAF area. It examined on-going fishery research and the facilities existing for carrying out resource research. Information was also presented on fishery administration and related matters affecting the development of fisheries (4 b).
- f. As mentioned in the previous Section, a publication was prepared giving the characteristics of most of the species of commercial significance in the WECAF area and this will be of tremendous use to marine biologists and resource evaluation specialists, as well as to statisticians.
- g. The Project collaborated in the preparatory phase of activities sponsored by other regional organizations, especially the ICCAT Skipjack Research Programme - for which a chart describing the distribution of skipjack in the area was prepared and exploratory areas suggested - and the IOCARIBE Symposium on Sea Turtles in the Western Central Atlantic, for which two meetings of the Steering Committee were attended. The skipjack field programme began in 1980 and the turtle symposium is now planned for 1982.
- h. Project staff attended two meetings of the WECAF Commission Working Parties on Stock Assessment of Fish and Shrimp and Lobster Resources, one in Cartagena in November 1977 and the other in Mexico City in November 1979. These working parties were established by FAO, Rome and the WECAF Project is responsible for trying to ensure through visits and correspondence that recommendations made and work planned for the intersession periods are actually carried out.
- i. Perhaps the most important part of the Project's work in resource evaluation has been the estimation of the potential yields of the main species groups of the WECAF area and the identification of development opportunities. These estimates are shown in detail in the Section on "Project Results and Conclusions". Whilst they must, of course, be continually revised as more information becomes

available, these estimates are essential for any practical fisheries development in the region.

- j. A consultant from the Aquaculture Development Coordination Programme carried out a two-month survey of potentials for development in Panama, Nicaragua, Suriname and Trinidad and Tobago. In addition, a study was made by Project staff of the technical and economic aspects of a programme initiated in Panama for the development of aquaculture at the family/community level (5 r). A report was prepared on the status of the conch fisheries and related research in selected countries (5 i) and, as a follow-up, a project proposal was prepared for the rehabilitation and management of the conch (Strombus gigas), a resource which is overexploited in a large part of the Caribbean (6 f). Training in aquaculture is very necessary in many of the countries of the WECAF area and a draft project proposal was prepared for the organization of a regional training course (6 h).

1.3.4 Fishing Technology

From the time he joined the Project in February 1978, the Fishing Technologist visited many of the WECAF member countries, often more than once. His services were in great demand. His activities covered the identification of the fisheries situations, development needs and opportunities; the formulation and, where possible, the implementation of specific programmes; and the training of fishermen at sea. The latter activities are discussed in the Section on Training (1.3.6). He was assisted by a consultant for 2 1/2 months at the end of 1979.

The countries visited included:

- a. Nicaragua. Exploratory fishing programmes were carried out for snapper in the Caribbean and for shrimp and demersal species in the Laguna de Perlas (4 l). An artisanal fisheries development programme was prepared for the Caribbean coast.
- b. Colombia. In an initial visit, the technical status and needs of the artisanal fisheries sector were studied (4 h). Subsequently, preliminary proposals were prepared for the establishment of pilot centres for fisheries development on the Caribbean coast and for inland fisheries. An outline programme for fisheries development in the islands of San Andres and Providencia was also completed (4 y). Comments and advice on a Japanese bilateral aid programme for the artisanal sector on the Caribbean coast were given.

- c. Netherlands Antilles. Initially two fishery programmes were prepared; a short-term one for coastal fisheries and a long-term one for offshore fisheries (5 p). The coastal programme was carried out with the assistance of the consultant and, subsequently, individual development programmes were prepared for the three islands of Aruba, Bonaire and Curaçao (5 y).
- d. Honduras. An exploratory programme for shark and fin fish in the Caribbean was prepared at the request of CONADI (Corporación Nacional de Inversiones). Subsequently, a programme was prepared for artisanal fisheries development on the Caribbean coast. Preliminary proposals were made for deep-water demersal resources and snapper in the Caribbean and for distant-water tuna fishing (4 w and z and 5 u).
- e. A comprehensive technical assistance programme was prepared for Belize.
- f. In Trinidad preliminary programmes for artisanal trawling, small-scale purse-seining and the development of artisanal fisheries on the continental shelf were prepared (5 v), as well as a project proposal for the development of an artisanal shark fishery (6 a).
- g. Studies of the technical status and needs of the artisanal fishery sector were carried out in the Dominican Republic (4 e), Grenada (4 t), and the Bahamas (4 m).
- h. Provisional programme of fisheries development and diversification in Jamaica was prepared (4 g).
- i. In Barbados advice was given on the possible introduction of larger boats into the fishery.
- j. In Venezuela a programme was presented for the development and diversification of the trawling industry.
- k. A short-term assistance programme was prepared for St. Lucia.

The Fishing Technologist visited almost all of the 26 member countries of the Project and was able, therefore, to gather a wealth of experience about the nature of the fisheries and how to develop them. Based on his experience, a project proposal entitled "Development and Direct Transfer of Fishing Technology" was prepared and submitted, unsuccessfully so far, for funding by various international agencies (6 e).

1.3.5 Fish Processing and Marketing

Though the services of a full-time Fish Processing Technologist were not available to the Project until December 1978, a number of

important activities were carried out before that date through the use of consultants.

Altogether 11 countries were visited to review fish handling, processing and marketing practices and to proffer advice and give recommendations where needed or requested. In Jamaica, after a general visit had been made in 1978, a follow-up visit took place in 1979 when specific advice regarding the quality of the salt used and temperature and humidity control during curing was given to Jamaican Frozen Foods Ltd., which was experiencing problems with the keeping qualities of its salted/dried pickled products (4 f and 5 z). Nicaragua was also the subject of two visits; the first to look into marketing and distribution problems and the second to examine hygiene and techniques in fish handling and processing and to make recommendations about quality control procedures (5 g and 4 n). A project proposal was prepared for assistance in planning a fish marketing programme (6 p). The Dominican Republic was the subject of a report on fish handling (4 p). A consultant visited the Turks and Caicos Islands, the British Virgin Islands and the Cayman Islands and prepared programmes for improvements in fish marketing and processing (5 b, d and i), all of which were followed up with draft project proposals covering specific areas of the programmes (6 b, c, d, l, m and n). A visit was made to Bermuda, where a UNDP/FAO project for fish processing was already in operation and a draft proposal for a follow-up project was prepared (5 a and 6 o). Detailed marketing studies were carried out in St. Lucia (5 w) and Grenada (4 x). In Colombia an examination was made of fish handling and marketing practices. A report was prepared and discussed with the Government which expressed its interest in a course to the industry in fish handling and selling (5 q).

One topic which received special attention in the WECAF Project Document, and subsequently at meetings of the WECAF Commission and Executive Committee, was the utilization of shrimp by-catch and Project staff and consultants devoted a significant amount of time to consideration of this problem. The Development Officer/Economist attended a seminar organized by IDRC of Canada in Guyana in October 1977 and also a meeting set up by the SELA Action Committee for Marine and Freshwater Fish Products in Mexico City in October 1978. Subsequently, a consultant was employed to make a survey of existing practices in the utilization of the shrimp by-catch in some of the countries of the WECAF region (5 n) and a further study was made by a Headquarters consultant (5 m). The Fish Processing Specialist also did some work at sea in Panama to analyze catch composition and external market possibilities, for certain of the species caught (5 s). The study involved seven sea trips of three/four days each. Arrangements were made with Government fisheries personnel in Colombia and Nicaragua to carry out the same programme.

1.3.6 Training

Although the Project had no expert on training, as such, it was considered as an essential part of the work and was provided to the extent possible in view of the limited staff and funds. Training activities consisted of the following:

- a. Inservice Training at the Project Site. Two biologists - one from INDERENA (Colombia) and the other from INFONAC (Nicaragua) received training and assistance in data analysis. The Fishery Officer from St. Lucia also received training in development planning and in the preparation of fishery development projects for external financing.
- b. Seminar of Project Liaison Officers from English-speaking Member Countries. This was held in Panama in September 1979 and was attended by representatives of ten countries. Although a certain training element was involved, its main purpose was to review the administrative, logistical and financial problems affecting their fisheries so that the Project might address itself more realistically to country needs.
- c. Training Course in Fishery Statistics. This was held in St. Lucia for two weeks in November/December 1979. Participants attended from Antigua, Barbados, Belize, Bermuda, Cayman Islands, Grenada, Guyana, Jamaica and Montserrat, as well as from the host country. Apart from providing training in basic statistical procedures, the objectives of the course were also to indicate the essential data required for the assessment of fishery resources and for fishery development and to demonstrate the use of these data in development planning. Funding for this course was provided by the Government of Norway and all the tuition was provided by Project staff.
- d. Mission to Cuba. At the Second Session of the WECAF Commission Meeting in Panama in May 1978, the Cuban Government offered the use of its existing facilities to establish a regional fisheries training centre. Such a centre would provide courses for fishermen and extension workers, combining practical work with theoretical training. Instruction could be given in both English and Spanish. The WECAF Project participated in a mission to Cuba in February/March 1979 which recommended that a pilot course be organized and implemented for which external financing would be required. A project proposal was prepared for possible UNDP funding.
- e. At the request of the Government, a consultant visited Suriname and prepared a training programme for industrial fisheries in that country (4 i).

- f. A seminar lasting one week was given in Panama on the techniques of fish handling, packaging and selling. This was attended by 26 participants representing retailers, supermarkets, fishermen's cooperatives and government officials involved in fish quality. The Fish Processing Specialist prepared a simple manual for the future guidance of participants in the course.
- g. In Belize the Specialist participated in a workshop on fish handling at the Caribeña Cooperative in San Pedro.
- h. In Colombia he assisted in the preparation of a course on the handling and retail sale of fish which took place in Cartagena in October/November 1979.
- i. Both the Resource Evaluation Specialist and the Fishing Technologist gave lectures at a seminar on the *Rational Utilization of the Natural Resources in the Caribbean Region*, sponsored by COLCIENCIAS/SIFCA and held in Cartagena, Colombia in December 1979. The resource Evaluation Specialist also lectured at a seminar on the methodology for the evaluation of fishery resources, sponsored by SELA and held at Guayaquil, Ecuador, in June 1979.
- j. The important area of fisheries extension was not overlooked and a consultant was employed for a total of 4 1/2 months reviewing the needs for extension services. He visited the Dominican Republic, Belize, Brazil and a number of the Lesser Antilles (4 p, r and s and 5 ii).
- k. The Programme Leader participated in a joint FAO/IMCO mission to examine the training requirements for fisheries and maritime services in the CARICOM area and to explore the possibilities of combining facilities to meet these training needs in one central training entity. The Regional Caribbean Fisheries Development Institute situated at Chaguaramas, Trinidad, seemed the obvious location for such a centre.
- l. The Programme Leader participated in a mission to the La Salle Institute in Venezuela and assisted in the reformulation of a project proposal for fishery training at the Instituto Universitario de Tecnología del Mar at Punta Piedra on Margarita Island.
- m. As mentioned in Section 1.3.4, one of the main activities of the Fishing Technologist was to assist in the training of fishermen at sea. Specifically these related to red snapper fishing in Belize (4 u) and Nicaragua (4 l), fish

trawling in Colombia (4 q), trolling and shark fishing in Guatemala, purse seining in Montserrat (4 o), gill netting and long lining in Panama (5 o), trolling in the Netherlands Antilles (5 p and y), and shrimp trawling with small boats and live-bait fishing in Trinidad and Tobago (5 v). In addition, training programmes were prepared in Colombia for SENA, INDERENA and CNPC (5 t).

1.3.7 Fisheries Administration and Legislation

Advice and assistance on the establishment or improvement of public institutions concerned with fisheries administration featured in most of the fishery development plans and projects prepared by the Project staff. It never was, nor could be, treated as a separate isolated activity.

Fisheries legislation assumed special significance and importance with the widespread acceptance of extended fishing zones. In the absence of a legal adviser little could be done to help countries but provision has now been made, with funds obtained from the Government of Norway, for the services of a legal adviser for one year from December 1979. The Project was able to obtain a consultant's services for one month during which time he assisted the Cayman Islands and Dominica but the important work to be executed in this priority area had just begun at the end of 1979.

1.3.8 Cooperation with Other Bodies^{1/}

At the outset of field activities, steps were taken to ensure adequate collaboration and cooperation with other institutions and agencies concerned with fisheries development in the region and the foregoing sections will have indicated various ways in which this was achieved. In addition to organization such as IOCARIBE, SELA, IDRC, ICCAT, IMCO and UNTCD, which have already been mentioned, the Project staff maintained good working relationships with other organizations such as NMFS, USAID, GCFI (participating in the annual meetings), CDB, CARE, IDB, CARICOM, OAS, the BDD and the various EEC delegates.

1.4 ACTIVITIES NOT YET IMPLEMENTED

A number of activities specified in the Project Document have not yet been implemented. Chief among these were:

- a. Sub-project, "Development and Demonstration of Advanced Small-scale Fishing". This sub-project was presented to CIDA (Canada) for financing in 1977, following a mission to the Leeward and Windward Islands (the countries to which assistance was to be given) to obtain country support for its implementation. This was followed by three meetings/

1/ See Appendix

consultations with CIDA officials in 1978-1979 to revise the project proposal according to CIDA development guidelines and to ensure its acceptance. However, cutbacks in the CIDA budget meant a delay in consideration of the project and it is still by no means certain that it will be recommended for approval.

- b. Acoustic surveys of the northeastern coast of South America and the southern waters of the Gulf of Mexico. Contacts were made with government officials of countries having research vessels appropriate for such surveys, especially Mexico, Cuba and Venezuela. Visits were also made to Guyana and Suriname to assess the interest of these Governments in such work and to investigate their willingness to contribute to its execution. No live interest could be generated, especially because in most cases decisions had already been taken to carry out such research either as part of national programmes or through bilateral assistance. Once the results of on-going or planned surveys are known, a decision can be taken on the possible needs for additional research.
- c. Development of a regional cooperative programme for applied research in fish processing technology. A Fish Processing Technologist was assigned to the Project for only one year, and in view of the requirements of the countries of the area for his services, this programme which, in any event, could not be developed in such a short time, was left for implementation at a later date.
- d. Preparation and distribution of a Newsletter. In view of other demands on the experts of the Project, and in the absence of an information officer who could devote his time to the preparation of a newsletter in the three languages required, this mechanism of information dissemination and exchange was not utilized. The alternative, which has not been too unsatisfactory, has been to keep close personal contacts with country liaison officers, and circulate all technical documents and other information relating to Project activities as they become available. At the same time, it is recognized that a newsletter, although not of the highest priority, can serve a useful purpose provided funds are available to permit its preparation in three languages and that it can be prepared at regular intervals. However, it requires the services of a competent expert, which could be considered for the future.
- e. Seminars, workshops or training courses on a variety of subjects. Proposals were prepared by the Project for seminars/working groups/training courses on a number of subjects, including fishery management and administration,

fishery statistics, aquaculture, shrimp stock assessment, stock evaluation surveys and stock assessment, but funds could only be found for a seminar on fishery statistics and a working group on shrimp stock assessment. Efforts are continuing to secure the required financial assistance.

The Interregional Project for the Development of Fisheries in the Western Central Atlantic terminated on 31 December 1979 and a new project - the Interregional Fishery Development and Management Programme - commenced on 1 January 1980. There is a WECAF component of this Programme and a number of the activities of the old project are being carried on, at least for 1980 and 1981. Though some of the core posts are not being funded - there will be no Fish Processing Technologist from 1 January 1980 and no Development Officer/Economist from 1 July 1980 - some of the tasks remaining incomplete or not done at the end of the period covered by this report will be tackled during the life of the new project.

1.5 ARRANGEMENTS FOR REPORTING

All experts prepared quarterly reports on their activities and semi-annual progress reports were prepared for submission to the UNDP. In addition, a total of 54 technical and mission reports were prepared.

2. PROJECT RESULTS AND CONCLUSIONS

2.1 GENERAL

Before dealing with the specific results and conclusions of the Project's activities, it would seem appropriate to make a few comments of a general nature.

First, it has to be accepted that for most, if not all, of the less privileged nations, development is a gradual, long-term process which cannot be achieved by piecemeal injections of short-term programmes. In an area as diverse as the WECAF region, one can expect this process to be even slower and more arduous. In this context, it is considered that short-term programmes of a regional or interregional nature are very optimistic in their conception since the obstacles which confront the implementation of regional activities are substantial. Moreover, even when positive results are achieved, they may be difficult to detect, let alone measure, in the short run. The clear implication of this is that such programmes have to be planned for longer periods than are normal for UNDP/FAO projects to ensure that regional activities such as resource assessment, the development of statistical systems, training, the transfer of technology, etc., are not given rigid and unrealistic time tables.

It must also be emphasized that activities could only be undertaken to the extent that funds were available. In the Project Document

a number of activities were indicated to be carried out through trust fund arrangements, without any real knowledge of where such funds might be obtained. When, in the event, in spite of all the efforts of Project and FAO Headquarters staff, such funds did not materialize and the planned activities could not be implemented, member countries naturally became frustrated and disappointed. The conclusion from this must surely be that, in the future, projects should be more definitive and planned in the first instance on the basis of available funds, to be modified, revised and expanded as new financial resources become available.

It must also be stressed that although the WECAF Project was conceived to assist countries in solving problems of regional interest and consequence - a point which was emphasized by the Executive Committee for the Execution of the WECAF Project at its two sessions in 1978 and 1979 - at the same time hardly any of the member countries had their own national fisheries project and so exerted great pressure on the Project to attend to the problems and concerns of their own fisheries. The experience of the Project has shown that, so far, the countries of the region are primarily interested in their national fisheries and are only starting to appreciate the importance of regional or subregional programmes. It will still need more time to persuade and convince them.

Of course, it is also pertinent to point out that the WECAF area does encompass groups of countries that have relatively little in common. To merge the countries of South America, Central America, the Greater and Lesser Antilles and the Gulf of Mexico is really to combine very mixed elements whose fisheries have substantial differences. Since regional or subregional programmes probably have greater chances of success if they are composed of countries having a common heritage and relatively similar economic circumstances, it is felt that the advantages and disadvantages of breaking down the WECAF area into subareas should be seriously considered in the planning of future FAO/UNDP involvement in the fisheries of the region. One obvious subarea would be the Lesser Antilles, which are clustered together, with limited reef fisheries and ill-equipped for offshore fishing, and where management measures are essential if rational use is to be made of the resources.

2.2 FISHERY DEVELOPMENT

The results of the Project's activities in this field must so far be considered rather disappointing. Almost the only concrete result might be said to have occurred in the British Virgin Islands where the project proposals prepared was approved by UNDP and a Fisheries Adviser was appointed for one year, with a Marketing Adviser for a further two years.

Even in Dominica and Nicaragua, where very comprehensive programmes consisting of a number of self-contained but related projects were prepared and where circumstances were considered to be propitious, there is no indication that financing has been obtained that would enable any of the projects to be implemented.

A number of reasons can be advanced for this situation. Apart from specific situations, such as in Dominica where a devastating hurricane meant that a completely new approach was needed, in general it can be said that:

- i. the funds and staff allocated to fisheries are quite inadequate to provide for an efficient fisheries administration. As a result, the needs of the fishery sector are often poorly presented to the policy and decision making elements of the government. In addition, by tradition, the fisheries sector itself has not been in a position to exert strong pressure on national governments. Generally it employs only a small part of the working population and it has seldom been able to present a united voice to press for the assistance it needs for development. Efforts to develop cooperatives have so far not been very successful in the region, the only exception really being Belize, where the cooperatives have a monopoly of producing, processing and marketing valuable export products. Because of this and the lack of other forms of group action, artisanal fishermen are seldom taken very serious by the politicians;
- ii. In a number of cases it has to be said that governments were either not sufficiently interested in fisheries to take steps to follow up development plans and programmes that had been prepared by the Project or did not know how to approach bilateral or multilateral agencies other than UNDP for possible financing;
- iii. many of the proposals prepared were for technical assistance which did not involve significant opportunities for heavy investment of new capital. Whilst it is believed that the proposals correctly reflected the real needs of the area, they were not, therefore, of outstanding interest to donor agencies most of whom, anyway, do not treat the WECAF region as an area of great priority;
- iv. connected with "i" and "ii" above, it can be said that financial restraints often prevented the smaller countries from being represented at international fora and from participating in meetings and seminars dealing with fisheries, so that their needs and aspirations were often

forgotten and they did not make the contacts that might have permitted them to follow up and obtain financing for some of the proposals prepared.

Whilst the foregoing presents a rather pessimistic picture, it must be emphasized that many of the governments of the region are now becoming more interested in the possibilities of fisheries development. Factors which are influencing this situation are the security of control over resources acquired through the extension of their exclusive economic zones, the impelling need to provide food for the expanding populations and the possibility of attractive export markets for some of their production. This growing interest in fisheries is shown by the creation of new posts for fisheries staff and by the reorganization of administrations in some cases, giving fisheries a stronger voice in the national decision making process. It has also resulted in an increasing number of requests to the Project for assistance in preparing development plans and programmes, and participating in their execution as countries realize that they do not have the necessary expertise to assess alternative policy options, to determine and to plan and implement realistic programmes.

Whilst accepting that progress in fishery development planning has been slow and, in many ways disappointing in view of the efforts made by the Project staff, at the same time it must be repeated that the time span has been short. The growing awareness of the possibilities of fishery development is gathering increasing momentum and must be encouraged.

2.3 FISHERY STATISTICS

The conclusions reached as a result of the activities carried out in this field are hardly surprising. It was already known that data, especially those derived from the artisanal fisheries and from most of the smaller countries, were lacking in coverage and reliability. There are various reasons for this. First, there is the lack of funds. Often governments have small budgets which simply do not permit the employment of many field staff to collect fishery statistics which relate to a sector which, after all, is not contributing substantially to the general economy of the country; secondly, the personnel responsible for their collection have, by and large, no special training in the discipline. Thirdly, there is a lack of contact between the collectors and the end users of the statistics. On the whole, statistics relating to the industrialized fisheries, such as shrimp, are relatively good, perhaps reflecting the greater interest of the government in an activity which is often generating substantial foreign exchange earnings.

Obviously improvements have to be made in the design and implementation of statistical systems, both at the national and the regional level and the Project Statistician has been working toward this end. The need for training in this field was evident and the

training course held in St. Lucia was felt to be extremely useful. All participants increased their knowledge of sampling techniques and of their application in the collection of data. They were also encouraged to apply scientific methods and use direct observation and measurement techniques, instead of mere interviews, in their data collection programmes. The sequential phases needed for positive results have to be followed up by the Project Statistician.

Of course, this short training course was just the beginning of a long-term programme to build up a core of fishery statistics experts in the WECAF region. One way in which this can be done is through the holding of similar training courses. Another way, which has certain attractions since it brings in a possible element of TCDC, is to select one country in each of three subareas of the region where a model statistical system would be developed. Statisticians and fishery officers from other countries in the subarea would come to observe and be trained. They would then introduce the "model" system in their own countries, with WECAF support and assistance if necessary. It is felt that this could be a speedier system than the one actually used which involves visits from the Project Statistician to each country, on a piecemeal basis. Ultimately this might lead to the selection of one country in the region where training and dissemination of experience could be given in all facets of fishery statistics.

Whichever approach is adopted, and for maximum effects there is no reason why both should not be utilized, funds will be required if a system for reporting statistics on a regional basis according to standardized classification procedures is to be developed and established. A logical and necessary outgrowth of this process would be the establishment of a regional data centre in a selected country.

Other steps which have been taken, such as the publication and dissemination of the "Species Identification Sheets", the preparation of the comprehensive lists of species items and application of agreed standard classifications for fishing vessels and gear will also be of great use in improving the quality and reliability of the statistics of the region. The manual for field workers, which is in the final stages of completion, will be an additional useful tool.

2.4 FISHERY RESOURCE EVALUATION AND MANAGEMENT

Experience has shown that resource evaluation can often be best approached on a collaborative basis and the WECAF Project has worked

and work together on common problems, and the Project's Resource Evaluation Specialist continued to give them assistance in the intersessionary periods. Unfortunately, however, these Working Parties have been less effective than they could have been because there have been no funds to pay for the attendance of national staff, particularly as regards the smaller countries and island states.

One of the main shared stocks of the region is the shrimp resource of the Guianas/Brazil area and the Working Party organized by the Project is an important first step toward the eventual management of this resource on a cooperative basis. The analysis and review of the data presented indicated that there are signs of overfishing in the area but no conclusive evidence. The shrimp stocks appear to be fully utilized but with good management the biological stability and economic viability of the resource can be maintained. The Working Party drew up a number of management goals and regulatory options for consideration by the countries exploiting the resource. Good scientific evidence on management will require an improvement in the data presently available and one of the recommendations was that an international cooperative tagging programme be initiated. Some organizational work on this has been begun.

The gradual improvement of statistical data in the future will assist fishery scientists in the work of evaluating the resource and identifying development opportunities. In the meantime, however, the review that has been carried out indicates the following situation in relation to the main species groups of the WECAF area. Though the information used has been the best obtainable, the analysis must be treated with some reservations.

2.4.1 Shallow Water Shrimps

Generally, these stocks seem to be exploited nearly to the full, as indicated by the fairly constant level of production of the last few years which has fluctuated but slightly around 170 000 t. The total potential, which is estimated at around 190 000 t, suggests that only small gains can be expected from any increase in industrialized fishing operations. It is probable that inshore catches by artisanal fishermen could be increased somewhat although it is just as likely that such increases would be at the expense of catches by the industrial fleet and could even result in an overall reduction of the revenue derived from the industry.

2.4.2 Spiny Lobster

In many countries these stocks are fully exploited. In the Bahamas, and to a lesser degree in Colombia and Venezuela, it is likely that industrial type fishing would be productive. Where lobster concentrations are scattered, it would appear that artisanal fishermen could increase their catches - likely in Panama, Venezuela, Colombia, Grenada and St. Vincent.

2.4.3 Conch

In general, this species is either fully or overexploited. The recorded catch is in the vicinity of 5 000 t, and this comes mainly from Belize and the Bahamas, and to a lesser extent, from some of the small Caribbean islands. Any increase in production would seem to require a successful restocking programme.

2.4.4 Soft-bottom Demersal Species

These species are already exploited incidentally by shrimp trawlers although being little utilized, it being estimated that 800 000 to 1 million t are being discarded at sea annually in the WECAF area. Some of the countries that utilize part of the catch are Colombia, Cuba, Guyana, Mexico and Panama. Estimates of the size and species composition of the shrimp by-catch vary greatly but there is probably a considerable potential in the Gulf of Mexico and off the Guianas/Brazil shelf - perhaps up to 1 million t in the former and around 300 000 t in the latter. However, processing and marketing could present problems.

Another potential is the development of this demersal fishery at the artisanal level in areas where there is no shrimp trawling such as in lagoons and river estuaries, especially in Brazil, Colombia, Trinidad and Tobago and Venezuela.

2.4.5 Demersal Species on Hard and Coraline Grounds on the Continental Shelf

These species account for the bulk of the catch by artisanal fishermen in the Caribbean region and include snappers, groupers, porgies, grunts, parrot fishes, etc. Recorded landings amount to some 70 000-80 000 t annually. The resource is considered fully exploited in most countries and islands having narrow continental shelves, but there are indications that catches could be increased in countries having wider shelves, such as the Bahamas, Colombia, Honduras, Nicaragua, Trinidad and Tobago, and Venezuela.

2.4.6 Shark Species on the Continental Shelf

These species are currently little exploited, according to official statistics, which indicate landings of about 12 000-14 000 t annually. This is attributed principally to the type of gear used by artisanal fishermen which, though effective for other species, is incapable of holding big sharks.

It is believed that possibilities for conducting shark fishing operations on a moderate commercial scale exist on the Nicaragua-Costa Rica border, the Guajira Peninsula (Colombia-Venezuela) and in the Guianas (WECAF Reports No. 3). However, caution should be

exercised in expanding fishing operations because high catches during exploratory fishing trials or in the early stages of the fishery do not reflect the real potential of sustaining power of the resource. Sharks, because of their special biological characteristics, are very vulnerable and can easily be over-exploited. It is therefore concluded that shark fishing might best be pursued as an activity complementary to other fishing operations.

2.4.7 Demersal Cephalopods on the Continental Shelf

Little is known about the potential of these species. Currently, a few thousand tons of squid and octopus are caught incidentally in Mexico and Venezuela. Probably the resource is scattered throughout the WECAP area, but it is doubtful that an economic operation would result from a fishery based solely on these species.

2.4.8 Snappers and Related Species on the Drop-off of the Continental Shelf

These species are important in Cuba, Mexico, U.S.A., Venezuela and some small Caribbean islands. In general, the stocks are known to be underexploited, even in countries with narrow shelves where the drop-off is within the reach of artisanal fishermen, mainly because of the technical difficulties involved.

Calculations on the basis of assessment of the potential yield per hectare on the Jamaican shelf indicate that present catches could certainly be increased. It would appear that a potential for increased catches exists even in countries with narrow shelves, if alternative methods for fishing are employed. In most of the Central and South American countries having relatively wide shelves, the present level of exploitation is seemingly low, except in Mexico and Venezuela, and increased production should result from the introduction of adequate boats and gears.

2.4.9 Species on Continental Slopes - Shrimps, Norway Lobsters, Hakes Dogfish, Rays, and Perhaps Molluscs

At present the continental slopes, which cover an area of some 200 000 km², are not exploited, but it is evident from the results of exploratory fishing surves that there is a potential for both artisanal and industrial fisheries, even though the density of the resource is not great.

2.4.10 Small Coastal Pelagics such as Thread Herring, Spanish and Scaled Sardines, Menhaden and Anchovy

Recorded landings of these species have fluctuated in recent years between 600 000 and 1 million t, 50 percent in the U.S.A.

(menhaden) and the remainder in Colombia, Mexico, Venezuela and some of the islands. Annual yield estimates based on eggs and larvae surveys for herring and sardines in the northeastern Gulf of Mexico of 210 000-580 000 t give evidence of the importance these species could have in the future. Although the main under-exploited stocks appear to be in the Gulf of Mexico, there is also a good potential in the southeastern part of the Caribbean where catches are made principally with beach seines, leaving the schools a short distance off shore untouched.

It is pertinent to point out that there are special problems surrounding the increased exploitation of some of the clupeoids, such as dwarf herring, scaled herring and anchovies (see WECAF Studies No. 6). These are: that the species are subject to great seasonal variations in abundance and availability and, furthermore, that the market demand for the species as presently utilized is rather low. Such factors should not escape the purview of would-be investors, as they could render the development of this resource rather risky.

2.4.11 Small Coastal and Oceanic Pelagics such as Mackerel, Horse Mackerel and Flying Fish

Recorded annual landings fluctuate around 4 000 t. The species differ from the previous group (2.4.10 above) in that they are usually found in clear water. Not much is known about mackerel and horse mackerel - probably occurring rather sparsely - but flying fish is an important species in the southeastern part of the Caribbean, especially off some of the islands such as Barbados and St. Lucia. It is believed that catches can be increased, although this might necessitate the introduction of new fishing techniques.

2.4.12 Medium-size Coastal and Oceanic Species such as Dolphin Fish, King Mackerel, Bonito, Small Tuna, Frigate Mackerel, Jacks and Barracudas

Recorded landings have been diminishing in recent years, for instance, from 39 000 t in 1973 to 32 000 t in 1978. Although little is known about their potential - they likely exist in considerable quantities - they are important in the eastern and southeastern parts of the WECAF area, and of course in Mexico and in the U.S.A., where nearly half of the total landings are registered. The species are mainly exploited by artisanal fishermen using trolling lines.

2.4.13 Large Oceanic Pelagics - Wahoos, Yellow Fin and Black Fin Tunas, and Skipjacks

Recorded catches have been increasing steadily during recent years to reach 31 000 t in 1978. The wahoos are quite scattered

in the area and can only be an activity complementing other fishing, using trolling lines and handlines. The other species are found in big schools and are exploited by Cuban, Korean, Japanese, Panamanian and Venezuelan flag vessels. They occur more frequently in the eastern and southeastern parts of the WECAF area. Although it is generally felt that it is possible to increase the landings of these species to some extent, notably skipjack, the lack of information on potential yields makes it imprudent to suggest a further extension of this fishery. However, artisanal fishermen should be encouraged to increase their share of the overall catch through the use of new fishing methods and gears, especially where the fish can be found fairly close to shore near the eastern Caribbean islands.

2.4.14 Oceanic Cephalopods

Recorded landings in recent years have been between 4 000 and 9 000 t, although availability has been estimated at least as high as 100 000 t. One difficulty in the way of development is to find the species in large concentrations; another is how to catch the species efficiently. More exploratory/experimental fishing is clearly indicated.

2.4.15 Other Crustaceans and Molluscs

Important, valuable fisheries for crabs, cupped oysters, clams and scallops exist in the U.S.A. and Mexico, with landings in 1978 amounting to nearly 300 000 t. Outside of these countries only Cuba and Venezuela report significant production. It is probable that most of the continental countries of the WECAF area could increase their landings of these species, but handling and marketing constitute development constraints.

Though the improvement of fishery statistics will lead to better assessment of exploited resources, it will do little to improve knowledge of resources that are either little fished or not exploited at all. Examples of these are the deep-water species of the continental slopes mentioned in 2.4.8 and 2.4.9. above. Because of the special conditions surrounding the habits and life cycle of these species, traditional methods of stock assessment are not likely to yield the desired results and, probably, intensive experimental fishing would be more fruitful which, at the same time, would make it possible to determine the best choice of catching, investigate the acceptability of the species caught to the local population and evaluate the economic feasibility of fishing operations. It would also facilitate the training of fishermen in the technology of exploiting the new resources.

The review that was made of on-going fishery research and of the facilities existing for carrying out resource research in the WECAF area indicated serious deficiencies in the number of persons qualified to carry out this type of work. The Project tackled this problem not only through the participation of national scientists in the working groups previously mentioned but also through the provision of assistance in data analysis and in planning exploratory fishing surveys. On-the-job training at the Project Headquarters was also undertaken. However, it is clear that further training must be provided and experience has shown that, even when a country has been able to finance an exploratory fishing programme, it is essential to give technical assistance in its implementation if the full benefits are to be achieved. The review mentioned above also indicated that, for some of the necessary stock assessment work, resource survey vessels are required which are not available to most countries of the region.

The only work that could be done in relation to coastal aquaculture suggested that in the Caribbean the best conditions for development occur in the mangrove areas, where the mangrove oyster (Crassostrea rhyzophorae) and the mullet (Mugil spp.) would be suitable species for cultivation. However, the ecological conditions, costs of production and consumer acceptance need careful study before any commercial development is considered. As the available mangrove areas are limited in some countries, particularly in some of the islands, freshwater culture should also be considered. In Panama, aquaculture development at the family and community level is proving quite successful but, although such a development is possible by using underutilized manpower and agricultural waste products, its success depends on government support in both human and financial resources and the farmers' understanding of the development being pursued.

Other possibilities for mariculture include the cage culture of species such as snappers and pompanos, the culture of medium or large penaeid shrimp in areas such as the Guianas and rehabilitation of the conch (Strombus gigas) through seeding under controlled conditions and under proper management.

2.5 FISHING TECHNOLOGY

2.5.1 Artisanal Fisheries

Project activities in this field concentrated most entirely on the artisanal fisheries, which predominate in most countries of the region. Perhaps half a million people earn their living from small-scale fishing operations in the area, with a wide variety of technical skills and levels of economic well-being. Whilst in a few cases they are relatively prosperous, to a large

extent artisanal fishermen are poor, receiving little practical assistance from governments and the industry is at a rather primitive stage of evolution, lacking most of the basic requirements of infrastructure and without the level of management necessary for effective operations.

At the same time, however, it is evident from the review of resource potentials earlier that few opportunities exist for new large-scale capital intensive fisheries and that the major emphasis for development should be directed toward small-scale, labour intensive operations.

Some of the factors inhibiting such development have already been identified. Few governments in the region have given a very high priority to fisheries and weak and ineffective fishery administrations are unable to find convincing arguments to change this situation. One area which has been almost entirely neglected is that of fishermen training and even when training has been attempted it has generally been unsuccessful.

Experience suggests that the training of artisanal fishermen calls for a special understanding and approach which has not yet been understood by many national and international bodies concerned with the subject in the past. By and large, artisanal fishermen constitute poor, isolated, minority groups, having particular life styles and influenced and fashioned by the challenges of the sea. Largely inexperienced in group activities and unaccustomed to help from others, they tend to be highly individualistic, sceptical of outside offers of assistance to improve their trade which, within the limits of their technical know-how, they generally know quite well. This often escapes the uninitiated or inexperienced observer on shore.

2.5.1.1 Obstacles for Development

There can be no artisanal fishery development without the full participation of the fishermen themselves, and no training programme can succeed unless the fishermen endorse it. Training must be done by men who know the fishing game, who can work in the fisherman's environment, win his confidence by demonstrating their equal or superior knowledge and skill, and apply the best technologies appropriate to the milieu. The inability or unwillingness of governments and institutions to accept and do this is considered one of the serious obstacles to artisanal fishery development.

There are also two additional factors which are considered deterrent to development at the production level. The first is the inclination of some governments with small budgets for fishery purposes to allocate their scarce resources to administrative and/or scientific pursuits rather than to the establishment of extension

services for fishermen, or to pursue other more direct and immediate approaches to the increase of production. In the short run, this is of little avail to fishermen. The other obvious deterrent to development is the lack of loanable funds. Financial institutions both national and international are little attracted by invitations or requests to invest in artisanal fishing activities, because of the uncertainty surrounding the returns they can realize, and demand often securities and guarantees which the fishermen cannot meet. Also, bilateral aid agencies, although non-profit seekers, are often interested in generating business opportunities for their national industries, where possible, and so find little attraction in artisanal operations which, being labour rather than capital intensive, can do little to promote trade. The consequence of all this is that unless governments can or are willing to help the artisanal fisherman secure the financial aid he requires to acquire new or better gear, and whatever else he may need to increase his productive and earning capacity, he has little hope of improving his lot.

In the light of the experience and knowledge gained during his visits to most of the countries of the region, the Fishing Technologist prepared the regional project proposal entitled "Development and Direct Transfer of Fishing Technology". Its basic philosophy reflects the conclusions described above but also places a great deal of importance on the use of skilled fishermen, boatbuilders, gear makers and the like, from within the region, who would transfer their knowledge directly to the local fishermen. It is believed that this will often be more productive and more cost effective than bringing masterfishermen from outside the region, who often find difficulties in adapting to the local conditions.

2.5.1.2 Development Opportunities

It is considered that the best possibilities of increasing fish production from the artisanal sector are as follows:

- a. Exploitation of small- and medium-size coastal pelagic species, with 5-10 m traditional wooden boats using a combination of handlines, trolling lines, surface or mid-water gill nets, lampara-like nets and seines, with or without light attraction - both around the islands and off mainland countries.
- b. Exploitation of large-size pelagic species with traditional 5-10 m open wooden boats, or with decked 10-15 m wooden boats, using the same gear as for smaller pelagics plus longlines and poles and lines - off the islands and mainland countries.

- c. Exploitation of large sharks, mainly as a complementary activity, with the same 5-15 m boats using either short mid-water lines or longlines, depending on the power of the boats - both off the islands and the mainland.
- d. Exploitation of demersal species along the crest of the continental slopes (100-200 m), with the same 5-10 m boats, equipped with multiple handlines (with or without manual or powered reels), bottom longlines, traps and gill nets - off the islands and the mainland.
- e. Exploitation of demersal species along the upper margins of the continental slopes (200-1 000 m), with 10-15 m boats equipped with hydraulic or mechanical winches and using bottom longlines and traps - off the islands and the mainland.
- f. Exploitation of demersal species dispersed on the soft-bottom floors of the continental shelf, with the same 5-10 m boats, using bottom longlines, anchored or sweeping gill nets, pair trawls and seines - off mainland countries only,
- g. Exploitation of demersal species on the hard-bottom floors of the continental shelf, using the same 5-15 m boats, although with additional power, with handlines, bottom longlines, traps and gill nets - off mainland countries.
- h. Exploitation of crustaceans in near-shore waters (mainly shrimps), with the same 5-10 m boats, using gill nets, trammel nets, set nets, pair trawls and seines, if boats are equipped with inboard engines - off mainland countries.
- i. Exploitation of spiny lobsters in the Bahamas and off the wide continental shelves of Colombia, Venezuela and Trinidad and Tobago, with the same 5-10 m boats, using traps and tangle nets.

2.5.2 Industrial Fisheries

As indicated earlier, industrial fishery activities are rather limited in the WECAF region. Apart from multi-purpose fishing in North American waters, shrimp trawling and menhaden/sardine purse-seining are the main industrial types of fishing operations observed in all the waters of the continental shelf of mainland countries. To a lesser degree, the eastern and southeastern waters of the

region support a relatively small tuna fleet (of longliners, pole and line boats and a few purse seiners). The spiny lobster stocks which support scattered artisanal fishing operations, such as in Belize and the Bahamas, are also exploited industrially in Brazil, Cuba, Honduras and Nicaragua. All these activities give employment to an estimated 25 000 people, including those engaged in ancillary industries.

2.5.2.1 Development Opportunities

For the most part of the continental shelves of the region do not offer further development opportunities for industrial fisheries. There are exceptions, of course, especially in the southeastern part of the region where wide shelves and some hard-bottom areas have demersal species and small to large-size pelagics which are underexploited. Other possibilities for industrial fishery development are the fish and crustacea on the upper margins of the continental slopes, virtually untouched in the entire WECAF area and for which contour trawling would be an appropriate technique. Reservedly, one can also point to the stocks of oceanic cephalopods, the extent of which is unknown.

2.5.2.2 Obstacles to Development

The forces working against development are very different from those affecting artisanal fisheries. They are essentially of two kinds. The first is the lack of adequate information to assess the likely results from new investments, while the second is the lack of experienced personnel with the needed technologies to exploit existing potentials. For the future, the high cost of energy will also be a very negative force.

2.6 FISH PROCESSING AND MARKETING

Although activities in this field were necessarily rather limited because of the late recruitment of the Fish Processing Specialist, certain useful conclusions can be drawn from the work that was carried out.

In general, it can be said that, apart from the shrimp and some of the lobster processing plants which are oriented toward export and which have generally been established and are run by expatriate processing companies, the standards of handling and processing fish leave a great deal to be desired and there are few trained people. In certain cases, such as in Jamaica and Belize, it was possible to give specific advice to improve the quality of the products. Government regulations regarding quality control of fish and fish products are virtually non-existent. Of 16 countries visited, only one had fish inspection and quality control regulations, standards and services.

At the retailing end of the distribution chain, studies carried out in Colombia and Panama showed that the products were often being improperly stored and badly presented. Once made aware of the situation, however, governments often showed considerable interest in improving matters and the courses in Panama and Colombia for fish retailers were well attended and thought to be extremely useful. Perhaps coincidentally, some of the supermarkets in Panama now have fresh fish counters with attractive displays of good quality fish.

In a number of countries, the lack of adequate marketing and distribution arrangements was found to be an obstacle to the further development of the fisheries. Even in small islands such as St. Lucia and Grenada, where no part of the country is very far from the coast, fresh fish is difficult to obtain in the interior. Advice was given on possible distribution systems which might be established. In some of the islands, ciguatera poisoning was identified as a deterrent to the consumption of certain species and this is a problem which merits further attention.

Some useful results and conclusions were achieved in relation to underutilized species. As regards the shrimp by-catch, useful data was collected from most of the countries in the region as regards present practices. In Panama, the work at the sea indicated that a number of species presently discarded have great acceptability on the European market. It also showed that the sea bob, which occurs in good quantities but is not being utilized because of its colour and size could find acceptance in the export market if cooked. Essentially, little thought has so far been given to the marketing of some of these species as the whole interest has been centred on other species of shrimp, for which easy markets are known to exist. A good deal more investigation is needed on the shrimp by-catch question so that some of the obvious technical and economic problems can be overcome.

Apart from this, through the introduction of simple processing techniques, such as drying, salting, and smoking, much greater use could be made of some species which are caught in substantial quantities at certain times of the year, particularly around the Caribbean islands, and then wasted because of lack of an immediate demand. Other species are not presently fished on a commercial basis because they are not readily acceptable to the population. However, work in Bermuda, for instance, has shown that various acceptable products can be developed from these species, which can be adequate substitutes for some of the species which are now being imported at great cost to the countries' foreign exchange reserves. This type of activity needs to be developed and expanded on a regional basis.

2.7 TRAINING AND EXTENSION WORK

The Section in "Project Activities" gives an indication of the variety of training that was carried out. The results and conclusions pertinent to three of the main activities - the Statistics Training Course and the two Seminars for Fish Retailers - have been described previously under the appropriate headings. Apart from these, the inservice training at the Project site and the Seminar for Project Liaison Officers were considered to have had very positive results. In the first place, they permitted a much closer working relationship to be established with the trainees and their governments. Secondly, they gave the Project staff a better insight into the fishery situations and problems of the member countries. Thirdly, they made possible the analysis of fishery data and increased the knowledge of certain fisheries in a way, that for various reasons, could not otherwise have been achieved. Fourthly, the trainees received useful guidance and orientation for similar work in the future, even when other responsibilities meant that the experts could not devote as much time to the trainees as they would have liked.

As regards fisheries extension, the survey that was made of selected member countries, ranging from Belize to Brazil and taking in a cross-section of the Caribbean islands, to evaluate the needs for a fishery extension programme in the WECAF area showed that relatively few of the countries visited had extension services and that, where they did exist, their main function was to provide a liaison service between the fishermen and the fisheries administration. Extension services can be quite effective in this way, communicating fishermen's grievances to the appropriate authorities and interpreting government programmes, regulations and desires to the fishermen. In isolated cases, such as in St. Lucia and Brazil, they also help to establish and manage fishermen's groups (cooperatives or colonies) and motivate their members.

Of course, a viable extension service should consist of much more than this. Trained workers have to be available at the village level to assist the fishermen. Such people must inevitably be trained as generalists rather than as specialists in a particular field but they should also be able to identify the need for a particular kind of expertise and know where this can be found. They also have to have a thorough knowledge of all aspects of artisanal fisheries and be able to fit into the fishermen's environment. Whilst they should be able to help the fishermen improve their fishing gears and methods, they should also be able to advise on the proper handling, preservation and distribution of fish, since there is no point in increasing production without organizing suitable market outlets and ensuring acceptable quality of the fish produced.

Obviously training is an outstanding requirement in all aspects of fisheries development in the WECAF area, from that of the artisanal fisherman to the fishery technician, scientists and administrator and it will have to be approached in a variety of ways. These should range from on-the-job training to short-term workshops and seminars; from relatively long-term training courses within the region or outside, to practical work at sea or in processing plants ashore.

When considering alternative approaches to meeting these training needs, it will be important to take into account the physical facilities and experience already acquired in the area. For instance, Cuba has offered to make available facilities for training small-scale fishermen and fish processing technologists. Excellent facilities also exist at Chaguaramas, Trinidad, at the Caribbean Fishery Training and Development Institute. The La Salle Institute on Isla Margarita in Venezuela can also assist in the training of fishery workers and Colombia can offer fisherman training facilities at Cartagena. Perhaps the main problem will be to convince countries of the appropriateness of regional training centres since it is obvious that not all have agreed on this approach at present. One factor which must be considered is whether a country's basic training needs are sufficient to justify the establishment of purely national facilities.

3. RECOMMENDATIONS

3.1 GENERAL

Before proceeding with the specific recommendations that have been formulated as a result of the activities carried out and conclusions reached, it is considered appropriate to repeat a few observations of a general nature. The first is that experience has shown that the countries of the region are primarily interested in the development of their own fisheries and are generally not yet ready to take the initiative in developing group-country or regional programmes. At the same time, however, the Project attempts to stimulate a regional approach to management of the shrimp resources of the Guianas/Brazil have met with an encouraging response and it is believed, therefore, that this type of approach can succeed, given time and the right circumstances.

In this context, it should be pointed out that the variety of countries in the region is very great and the possibilities of developing a joint programme or action plan would certainly seem to be more encouraging in an area such as the Leeward and Windward Islands, where the states are grouped closely together, than in some of the larger mainland countries. Therefore, thought should

be given to the possibility of breaking down the WECAF region into subareas in the planning of future UNDP/FAO involvement in the fisheries of the region.

Whatever view may be taken on the above, it is clear that continued technical assistance of the type that has been provided by the WECAF Project in the past should be provided for some time to come. It is recommended, therefore, that every effort be made to obtain funding to continue the Project with at least the same level of core staff and consultant man/months as during 1979. "At least" is used advisedly since it is clear that this staff was the bare minimum that could realistically attend to the most urgent requests from the member countries for advice and assistance. Of course, adequate funds for duty travel and operating expenses would also be essential.

Whilst the continuation of the Project at the 1979 level is considered imperative, it is believed that the needs of the region for technical assistance in the various fields are so substantial that additional inputs are required. It is recommended, therefore, that a regional fishery technology unit be established which would be competent to provide advice and assistance to public and private companies, government services, national institutions, etc., on the different aspects of fishery technology, including boats and gear, processing and marketing, etc. Such a unit would, of course, work in close cooperation with the WECAF Project.

Recommendations of a more specific nature follow.

3.2 STATISTICS

Fundamental to any attempt at resource assessment is an improvement in the design and implementation of statistical systems, both at the national and regional level. This can be achieved in a number of ways. First, it is recommended that further training courses of the type held in St. Lucia in 1979 be organized. Secondly, it is recommended that particular attention be devoted to improving the national systems in certain key countries in three subareas which would then be used as training grounds for fishery statisticians from other countries of the subarea. Thirdly, it is recommended that a regional data centre be established for the collection, storage and dissemination of data on stocks and fisheries of regional importance. This could be initiated with data on the industrial fisheries of the region, since they are generally more accurate, with other data being incorporated as their authenticity warrants. Of course, the continued efforts of the WECAF Project Statisticians will still be required to aid the countries in solving their own particular problems.

3.3 RESOURCE EVALUATION

A clearer knowledge of the nature, location and potential

yield of the resources available in the area is essential, particularly where shared stocks are concerned. The Working Parties organized by FAO Headquarters have been extremely useful in developing national skills but could have been more effective still if additional fishery scientists from the individual countries had been able to attend. Often they were unable to do so because of lack of finance and it is recommended, therefore, that a travel fund be established which would enable fishery workers to attend seminars, working groups, workshops, etc. Such a fund would not be restricted to scientists but would be available for any fishery worker in the region, including economists, processors, fishery officers and administrators, etc.

The upgrading of resource assessment capabilities in the area can also be achieved through the organization of regional training courses and it is recommended that funds be sought for the holding of such courses. Similarly, it is believed that the development of these skills can also be promoted if national scientists are able to work closely with more experienced scientists from outside the area. It is recommended, therefore, that fishery research institutes and organizations in developed countries be approached and requested to make available experienced fishery scientists for relatively short periods of a month or two in fishery institutes in the region.

For some of the necessary stock assessment work, resource survey vessels are required which are not available to most countries of the region. Whilst it is very expensive for one country or one institute to make available a vessel and crew and pay all operating costs for a year, say, it is believed that institutes might be prepared to provide a boat for two or three months in a year, when it might not be required in its own country. If a comprehensive regional programme encompassing various types of research activity were prepared, an institute could undertake a specific element of that programme, which would be capable of being realized in a relatively short time. It is recommended, therefore, that fishery research institutions in developed countries be approached to see if they would be prepared to assist in this way. Apart from the collection of research data, such an arrangement would also provide excellent opportunities for the training of scientists from the region.

Little work was possible in aquaculture and it is considered essential that a survey be carried out to assess the aquaculture possibilities of the Leeward and Windward Islands, particularly in view of the limited possibilities of developing their marine fisheries. It is recommended, therefore, that the Aquaculture Development and Coordination Programme carry out this programme in 1980.

3.4 TECHNOLOGY

It is clear from this report that the main emphasis in the WECAF region has to be given to the artisanal sector. Experience has shown that institutionalized training is not very effective for small-scale fishermen and it is believed that more success will be achieved through methods that use the direct, on-the-job transfer of appropriate experience, skill and techniques. This approach can have the additional advantage of utilizing skills and experience already existing in the region - the TCDC approach. It is recommended, therefore, that funding be made available for the project proposal that has been prepared for this type of activity.

In addition, it is recommended that regional training courses in fishing technology be organized, which would supplement and support the project proposal mentioned above. Such courses would be held for fishery officers, extension workers, masterfishermen, etc., who would have the opportunity of transferring skills and knowledge acquired to fishermen in their own countries.

One of the specific development opportunities available to artisanal fishermen relates to the exploitation of the upper margins of the continental slopes and it is recommended that funding be sought for a project proposal to determine the most appropriate technology and train local fishermen in its use.

Other improvements which could prove very effective, relate to the use of rafts to attract pelagic species and the introduction of simple echo-sounding equipment into the small-scale fisheries. It is recommended that funding be sought for the project proposals that have been prepared to test out their effectiveness and facilitate their introduction.

Although relatively few opportunities have been identified for new industrial fisheries, it is believed that opportunities exist for contour trawling along the continental slopes and it is recommended that every effort be made to promote this type of activity. Exploratory and experimental fishing for squid is also recommended.

3.5 FISH PROCESSING AND MARKETING

Although there are many possibilities for improving processing and marketing practices in the WECAF region, it is believed that the main emphasis should be given to the utilization of presently under-exploited species, particularly those discarded during shrimp trawling operations.

The collection and analysis of data on the composition and quantity of the shrimp by-catch should form part of the developments in fishery statistics and resource evaluation that are

recommended earlier. In addition, however, it is recommended that the techno-economic evaluation be carried out of existing by-catch utilization in the area and that efforts be made to promote and develop additional activities through government institutions, research organizations and commercial companies, trying to combine as far as possible experiment and investigation with practical commercial activities.

Apart from the species featuring in the shrimp by-catch there are others which are presently under- or unexploited. This situation results from a combination of factors such as a lack of demand, ignorance of the appropriate techniques required to produce marketable products, lack of information about the economic feasibility of investing in the necessary plants, etc. Species included in this category are shark, mackerels, flying fishes, small jacks and various coastal pelagics. It is recommended that a pilot plant be established which would develop the necessary techniques, demonstrate their commercial feasibility, train fishery workers and show the socioeconomic benefits which could accrue to the fishermen and their families through such a development.

Although most of the industrial fisheries have been controlled by expatriate companies, this situation is now subject to significant changes. More and more, governments or parastatal organizations are being established to be responsible for commercial enterprises, particularly in the fields of processing and marketing. Often the management selected have very little experience of fisheries and the companies are not being well managed. It is recommended, therefore, that workshops be arranged that will provide training for administrators, managers of cooperatives, fishermen's associations and parastatal organizations in management techniques and problem solving, thereby assisting them to operate their enterprises more profitably.

Finally, it is important to try to develop and strengthen the fishery administrations of the region, who simply do not have the range of expertise necessary to formulate and implement appropriate fishery plans and policies. Apart from providing travel funds as suggested in Section 3.3, it is also recommended that a fund be established to provide fellowships for fishery workers, which would enable them to take suitable approved courses of study at training centres abroad.

In addition, workshops are required which will bring together senior economists, administrators, scientists and other persons with responsibilities in the fields of fishery management and development planning, which will improve their level of understanding of the needs, possibilities and objectives in these fields. It is recommended that funding be sought for such workshops.

To back up the work of the fishery administrators, adequate fishery extension services are required. Extension workers need

to be trained in a variety of disciplines so that they can subsequently work with the fishermen, making use of the latest available knowledge and new techniques for achieving higher efficiency in fishery production and helping fishermen and their families to adapt to modern socioeconomic conditions.

Such training can be provided through relatively short-term training courses of three months or so and it is recommended that every effort should be made to find suitable funding. As such courses can conveniently be given through a regional training centre, it is also recommended that enquiries be made to see whether one of the existing facilities in the region could be made available for these and other courses.

The development of fisheries in the WECAFC area will be very dependent in the future on what financial assistance can be mobilized to finance the activities recommended above. The recommendations made are of a regional nature and, for the small islands at least this is felt to be the best approach, since they can seldom hope to achieve their own national projects in view of their size and limited numbers of boats and fishermen. Some of the larger countries of the region, however, may expect to secure their own national fishery projects.

Appendix 1

REPORTS

1. Quarterly Reports

<u>Number</u>	<u>Expert's Name</u>	<u>Expert's Title</u>	<u>Period Covered</u>
1	D.A. Lintern	Development Officer	15/9-31/12/77
2	" "		1/1-30/6/78
3	D.A. Lintern & A.J. Wirth		1/7-30/9/78
4	" " " "		1/10-31/12/78
5	" " " "		1/1-31/3/79
6	" " " "		1/4-30/6/79
7	" " " "		1/7-30/9/79
8	D.A. Lintern, A.J. Wirth and P. Salz		1/10-31/12/79
1	L. Villegas	Resource Evaluation	14/10-31/12/77
2	" "		1/1-30/6/78
3	" "		1/7-30/9/78
4	" "		1/10-31/12/78
5	L. Villegas & P. Charlier		1/1-31/3/79
6	" " " "		1/4-30/6/79
7	" " " "		1/7-30/9/79
8	" " " "		1/10- 31/12/79
1	D. Chakraborty	Statistician	1/1-31/3/79
2	" "		1/4-30/6/79
3	" "		1/7-30/9/79
4	" "		1/10-31/12/79
1	M. Giudicelli	Fishing Technologist	27/2-7/7/78
2	" "		7/7-30/9/78
3	" "		1/10-31/12/78
4	" "		1/1-31/3/79
5	" "		1/4-30/6/79
6	" "		1/7-30/9/79
7	" "		1/10-31/12/79
1	M.S. Peña	Fish Processing	29/11/78-31/3/79
2	" "		1/4-30/6/79
3	" "		1/7-30/9/79
4	" "		1/10-31/12/79

2. Semi-annual Reports

- 1 January-30 June 1977
- 1 July - 31 December 1977
- 1 January - 30 June 1978
- 1 July - 31 December 1978
- 1 January - 30 June 1979
- 1 July - 31 December 1979

3. Travel Reports

(a) Antigua

28-29 July 1979 by D.A. Lintern

(b) Bahamas

25-28 July 1979 by D.A. Lintern

(c) Barbados

21-27 October 1977 by D.A. Lintern

10-16 April 1978 by Eric Dixon

15-19 November 1978 by H.R. Bullis

13-15 November 1978 by A.J. Wirth

22 May-9 June 1979 by D. Chakraborty (also included St. Lucia and Panama)

(d) Belize

16-18 April 1979 by M. Giudicelli

18-20 July 1979 by D.A. Lintern

(e) Bermuda

17-30 September 1979 by M.S. Peña

(f) Brazil

2-8 September 1979 by L. Villegas

2-17 October 1979 by D. Chakraborty

(g) Cayman Islands

19-27 February 1979 by E.R. Fidell

28-31 July 1979 by D.A. Lintern

(h) Colombia

November 1978 by M.N. Mistakidis

17-21 July 1979 by M.S. Peña

24-31 July 1979 by M. Giudicelli

(i) Costa Rica

6-16 August 1978 by L. Villegas (also included Nicaragua)

(j) Cuba

2-5 April 1978 by W.F. Doucet and L. Villegas

(k) Dominica

19-22 April 1978 by D.A. Lintern

15 November-2 December 1978 by M. Giudicelli

28 February-3 March 1979 by E.R. Fidell

(l) French Guiana

23 October-7 November 1979 by L. Villegas (also included Guyana,
Suriname and Brazil)

(m) Guatemala

18-19 April 1979 by M. Giudicelli
9-10 July 1979 by M. Giudicelli
4-14 February 1980 by M. Giudicelli (also included Honduras)

(n) Guyana

17-21 October 1977 by D.A. Lintern
1-13 March 1978 by W.F. Doucet
February 1979 by A.J. Wirth (also included Trinidad & Tobago)

(o) Honduras

19-21 April 1979 by M. Giudicelli

(p) Jamaica

3-7 July 1978 by D.A. Lintern (also included Cayman Islands)

(q) Mexico

30 March-2 April 1978 by L. Villegas
30 September-7 October 1978 by D.A. Lintern
8-10 June 1979 by M. Giudicelli

(r) Montserrat

30 April-1 May 1979 by M. Giudicelli

(s) Netherlands Antilles

15-22 July 1979 by L. Villegas (also included Grenada, Barbados and
St. Lucia)

(t) Nicaragua

22 October-2 November 1979 by M. Giudicelli, D.A. Lintern and M.S. Peña

(u) St. Lucia

27-30 April 1979 by M. Giudicelli

(v) Suriname

9-13 April 1978 by D.A. Lintern

(w) Trinidad & Tobago

18 August-8 September 1979 by D. Chakraborty (also included Guyana
and Suriname)
27-30 October 1977 by D.A. Lintern
June 1978 by E.O. Oswald

(x) Turks and Caicos Islands

30 July-5 August 1978 by D.A. Lintern
21-24 July 1979 by D.A. Lintern

(y) Venezuela

19-24 November 1978 by L. Villegas
15-17 May 1979 by M. Giudicelli
7-20 August 1979 by M. Giudicelli (also included Colombia)

(z) Virgin Islands (U.K.)

23-25 April 1978 by D.A. Lintern
16-19 April 1979 by D.A. Lintern
29-31 August 1979 by D.A. Lintern

4. Technical Reports (published)

- a. WECAF Studies No. 6 - A Review of the Clupeoid and Carangid Fishery Resources in the Western Central Atlantic
- b. WECAF Reports No. 2 - Review of Status of Fishery Statistics and Fishery Research Capabilities in the WECAF Project Area
- c. WECAF Reports No. 3 - Shark Fishing in the Western Central Atlantic
- d. WECAF Reports No. 4 - Report of the First Session of the Executive Committee of the WECAF Project, 18-20 May 1978, Panama City, Panama
- e. Informes WECAF No. 5 - Aspectos Técnicos de la Pesca Artesanal en la República Dominicana y Recomendaciones para su Mejoramiento y Desarrollo
- f. WECAF Reports No. 6 - Report on Fish Handling, Processing and Quality Control in Jamaica
- g. WECAF Reports No. 7 - Programme of Fisheries Development and Diversification in Jamaica
- h. Informes WECAF No. 8 - La Pesca Artesanal Marítima en la Costa Caribeña de Colombia: Su Situación, sus posibilidades y sus Necesidades para el Desarrollo

- i. WECAF Reports No. 9 - Report on Mission to Suriname to Evaluate the Fishermen's Training Proposal
- j. WECAF Reports No. 10 - Report on Mission to Antigua, Barbados, Dominica and St. Lucia
- k. WECAF Reports No. 11 - Fishery Situation in Dominica
- l. Informes WECAF No. 12 - Informe de la Misión a Nicaragua para Prestar Asistencia en las Operaciones de Pesca Parguera Exploratoria y Experimental
- m. WECAF Reports No. 13 - Bahamian Fisheries Development, Mission Findings and Recommendations
- n. Informes WECAF No. 14 - Investigación Preliminar sobre las Condiciones Higiénico-Sanitarias y Tecnológicas del Manipuleo, Procesamiento, Comercialización y Control de Calidad de Productos Pesqueros en Nicaragua
- o. WECAF Reports No. 15 - Purse Seining Demonstration and Training in Montserrat and Study of Adequate Technologies for Fisheries Development in the Country
- p. Informes WECAF No. 16 - Informe Sobre Tratamiento del Pescado en República Dominicana Incluyendo Referencias a Programas de Extensión.
- q. Informes WECAF No. 17 - Asistencia a INDERENA en su Programa de Introducción de Redes de Arrastre para la Producción de Pescado en Colombia
- r. WECAF Reports No. 18 - Marine Artisanal Fisheries in Northeast Brazil and some Suggestions for the Improvement of the Extension Programmes
- s. WECAF Reports No. 19 - Extension Training of Artisanal Fishermen and other Fisheries Personnel in the WECAF Region
- t. WECAF Reports No. 20 - Grenadian Fisheries Development, Mission Findings and Recommendations
- u. WECAF Reports No. 21 - Report on the Demonstration and Training in Fishing for Red Snapper in Belize and Identification of Fisheries Development Opportunities
- v. Informes WECAF No. 22 - Programa de Diversificación de la Pesca de Arrastre en Venezuela
- w. Informes WECAF No. 23 - Programa para la Investigación y la Evaluación Comercial de los Principales Potenciales Pesqueros Marítimos de Honduras

- x. WECAF Reports No. 24 - Report on Mission to Grenada
 - y. Informes WECAF No. 25 - Programa Preliminar para el Desarrollo de la Pesca Artesanal en la Región de San Andrés y Providencia, Colombia
 - z. Informes WECAF No. 26 - Informe de la Misión a Honduras con Relación a Diversas Posibilidades de Desarrollo Pesquero en el País
 - i. WECAF Reports No. 27 - Proceedings of the Working Group on Shrimp Fisheries Resources of the Guianas/Brazil. Report of the Meeting, and National Reports
 - ii. WECAF Reports No. 28 - Proceedings on the Working Group on Shrimp Fisheries Resources of the Guianas/Brazil. Contributions
5. Technical Reports (not published)
- a. Report on Mission to Bermuda
 - b. Report on Mission to Turks and Caicos Islands
 - c. Report on Mission to the Cayman Islands
 - d. Report on Mission to the British Virgin Islands
 - e. Report on Fishery Statistical Programmes Following Mission to the Bahamas, Barbados, Jamaica and Panama
 - f. Asistencia a INFONAC en su Programa de Pesca Exploratoria y Experimental de los Recursos Pargueros en las Aguas Caribeñas de Nicaragua
 - g. Informe de la Misión para Asistir a Nicaragua en el Desarrollo de un Programa de Mercadeo y Distribución de Pescado
 - h. Informe de la Misión para Mejorar los Programas de Estadísticas Pesqueras de Panamá
 - i. Report on the Status of Conch Fisheries and Related Research in Selected Countries of the WECAF Area
 - j. Belize - Problems in Fisheries Development
 - k. Five-Year Fisheries Development Programme for Dominica
 - l. Report on Mission to Brazil
 - m. The Status of Shrimp By-Catch Utilization in Some Countries of the WECAF Region

- n. Informe sobre la Fauna de Acompañamiento del Camarón en el Area de WECAF
 - o. Recomendaciones para Futuros Cursos de Capacitación de Patrones de Pesca Artesanal Costera en Panamá
 - p. Report of Mission to the Netherlands Antilles
 - q. Informe del Viaje a Colombia
 - r. Algunos Aspectos Económicos y Técnicos para el Desarrollo de la Acuicultura a Pequeña Escala en la Región de la COPACO
 - s. Informe sobre Características de la Fauna de Acompañamiento del Camarón en el Area de la Bahía de Panamá y su Posible Aprovechamiento
 - t. Informe de la Misión a Colombia con Descripción del CNPC y Recomendaciones Preliminares con Relación a la Capacitación de Pescadores
 - u. Investigación y Evaluación Comercial de los Recursos Demersales en las Aguas Profundas de Honduras (100 a 450 brazas)
 - v. Report of Mission to Trinidad and Tobago in Connexion with Life Bait Fishing and Other Technical Aspects of the Artisanal Fisheries Development
 - w. Report of Mission to St. Lucia
 - x. Informe de la Misión a Nicaragua para la Reconstrucción y Desarrollo del Sector Pesquero
 - y. Report of Mission to the Netherlands Antilles (Bonaire)
 - z. Informe de la Misión para Asistir a Jamaica en el Mejoramiento del Procesamiento y Producto Final de las Especies de Pescado Manipuladas en la Planta Jamaican Frozen Foods en Kingston (Government Owned)
6. Draft Project Proposals
- a. Development of the Artisanal Shark Fishery - pilot project in Trinidad and Tobago
 - b. Development of a Scale Fishery in Providenciales, Turks and Caicos Islands
 - c. Development of a Scale Fishery in South Caicos, Turks and Caicos Islands
 - d. Assistance to Fisheries in Jost Van Dyke, British Virgin Islands

- e. A Sub-Project for the Training of Artisanal Fishermen in the WECAF Area - Development and Direct Transfer of Fishing Technology
- f. Project for the Repopulation and Management of Conch in the Caribbean
- g. Proyecto del Gobierno de Nicaragua - Estudio de Factibilidad de una Pesquería de Crustáceos en Aguas Profundas
- h. Regional Training Course in Aquaculture
- i. Aprovechamiento de la Fauna de Acompañamiento en la Pesca del Camarón en las Aguas del Litoral Pacífico
- j. Capacitación Directa de los Pescadores del Proyecto Piloto de La Boquilla, Cartagena, Colombia
- k. Belize - Fishermen Training
- l. British Virgin Islands - Assistance to Fisheries
- m. Cayman Islands - Assistance in the Development of Fisheries (2)
- n. Turks and Caicos Islands - Assistance to Fisheries
- o. Bermuda - Fish Processing and Marketing
- p. Nicaragua - Asistencia en el Planeamiento de un Programa de Mercadeo de Pescado
- q. Venezuela - Instituto Universitario de Tecnología Pesquera

Appendix 2

PROJECT STAFF

<u>Name</u>	<u>Function</u>	<u>Dates of Service</u>	
		<u>Starting Date</u>	<u>Concluding Date</u>
<u>FAO Staff</u>			
W.F. Doucet	Programme Leader	1 Sep. 1977	31 Dec. 1979
A.M. Lorenzo	Secretary	1 Sep. 1977	31 Dec. 1979
D.A. Lintern	Development Officer/Economist	11 Sep. 1977	31 Dec. 1979
L. Villegas	Resource Evaluation Specialist	14 Oct. 1977	31 Dec. 1979
M. Giudicelli	Fishing Technologist	26 Feb. 1978	31 Dec. 1979
A. Wirth	Associate Expert	23 Mar. 1978	15 Dec. 1979
M. Peña	Fish Processing Specialist	26 Nov. 1978	19 Dec. 1979
D. Chakraborty	Statistician	28 Jan. 1979	31 Dec. 1979
P. Charlier	Associate Expert	14 Jan. 1979	31 Dec. 1979
P. Salz	Associate Expert	24 Nov. 1979	31 Dec. 1979

Consultants

V.C. Salin	Field Liaison Officer - Administration	3 Oct. 1977	2 Nov. 1977
R. Kreuzer	Fishery Technologist	31 Oct. 1977	16 Dec. 1977
J. Reintjes	Fishery Biologist	9 Jan. 1978	9 Mar. 1978
E. Greenhood	Fishery Statistician	25 Feb. 1978	26 Apr. 1978
E. Oswald	Fishery Training Adviser	23 Apr. 1978	11 Jul. 1978
M.N. Mistakidis	Aquaculture	19 Nov. 1977	12 Dec. 1977
D. Chakraborty	Statistician	29 Apr. 1978	31 May 1978
S. Springer	Fishery Biologist	20 May 1978	10 June 1978
W. Dixon	Naval Architect	11 Apr. 1978	17 Apr. 1978
C.L. dos Santos	Fish Processing	1 July 1978	27 Aug. 1978
W. Brownell	Fishery Extension	1 July 1978	13 Oct. 1978
" "	" "	13 Nov. 1979	17 Dec. 1979
C. Day	Journalist	12 Nov. 1978	26 Nov. 1978
S. Martínez	Shrimp By-catch Utilization	18 Jan. 1979	18 Mar. 1979
E. R. Fidell	Fishery Legislation	14 Feb. 1979	3 Mar. 1979
C.R. Carleton	Marketing Economist	24 July 1979	24 Aug. 1979
H.R. Bullis	Fishery Scientist	16 Oct. 1979	16 Dec. 1979
J.R. Roullot	Masterfisherman	24 Set. 1979	16 Dec. 1979

<u>Name</u>	<u>Function</u>	<u>Dates of Service</u>	
		<u>Starting Date</u>	<u>Concluding Date</u>
<u>Counterpart Staff</u>			
C. Arellano Lennox	Director of Marine Resources	1 Sep. 1977	31 Dec. 1979
D. Herrera	Clerk	7 Nov. 1977	30 Nov. 1977
E. Vergara	Driver	7 Nov. 1977	31 Mar. 1979
S. Rivas	Cleaning woman	18 Oct. 1977	31 Dec. 1979
J. Galván	Librarian	14 Dec. 1977	31 Dec. 1979
A. de Gante	Clerk	21 Feb. 1978	31 Dec. 1979
B. Edghill	Receptionist	8 Mar. 1978	31 Dec. 1979
M. de Arosemena	Secretary	1 Apr. 1978	31 Dec. 1979
T. Fuentes	Driver	2 Apr. 1979	31 Dec. 1979

Appendix 3

INSERVICE TRAINING CARRIED OUT

<u>Name</u>	<u>Function</u>	<u>Dates of Service</u>	
		<u>Starting Date</u>	<u>Concluding Date</u>
J.R. Gómez	Fishery Statistical Systems	30 Aug. 1978	16 Sep. 1978
A. Arostegui	Analysis of data on red snapper	29 Oct. 1978	1 Dec. 1978
H. Walters	Fisheries Development Prog.	17 Mar. 1979	7 Apr. 1979
Eleven participants	Seminar for Project Liaison Officers of English-Speaking Countries	12 Sep. 1979	14 Sep. 1979

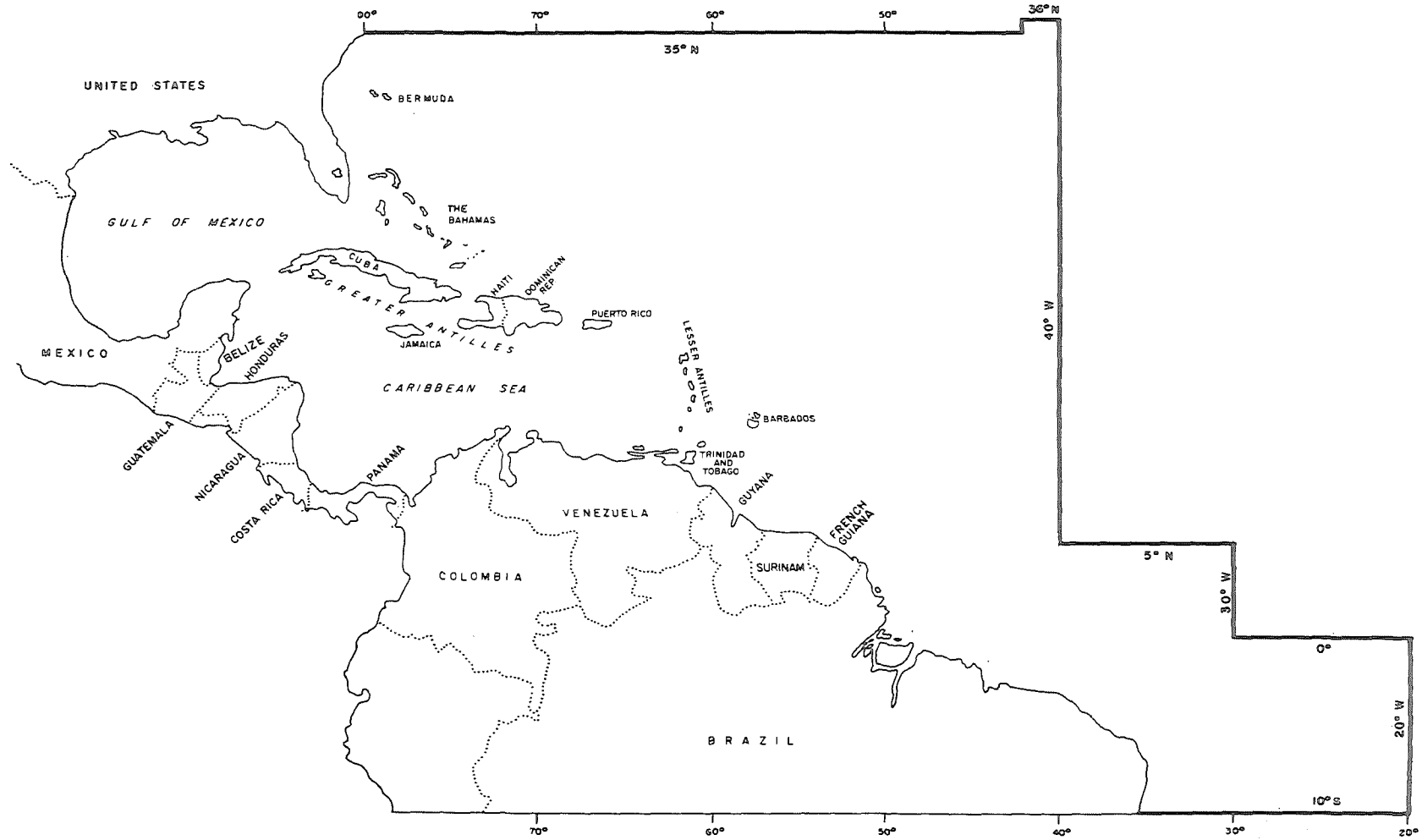
Appendix 4

LIST OF MAJOR ITEMS OF EQUIPMENT PROVIDED BY THE UNDP

<u>Quantity</u>	<u>Item</u>	<u>Value in US\$</u>
1	Vehicle, Chevrolet Impala, 4-door sedan	4 854.21
1	Typewriter IBM Standard 16"	
1	Typewriter IBM Standard 19"	
3	Typewriters IBM Selectric Corrector	
2	Portable typewriters Olympia	5 088.92
12	Air conditioners - Hitachi	4 083.00
1	Vehicle, Ford Pinto Squire Wagon	<u>3 615.61</u>
	Total	17 641.74 =====

Appendix 5

MAP OF PROJECT AREA



Appendix 6

ORGANIZATIONS CONNECTED DIRECTLY OR INDIRECTLY WITH
FISHERIES DEVELOPMENT IN THE WECAF REGION

British Development Division in the Caribbean (BDD)
British Ministry of Overseas Development (ODM)
Canadian International Development Association (CIDA)
Caribbean Common Market (CARICOM)
Caribbean Development Bank (CDB)
Commonwealth Funds for Technical Corporation (CFTC)
Cooperative for American Relief Everywhere (CARE)
Economic Commission for Latin America, U.N. (ECLA)
European Economic Community (EEC)
Gulf and Caribbean Fisheries Institute (GCFI)
Inter American Development Bank (IDB)
Inter-Governmental Maritime Consultative Organization, U.N. (IMCO)
Inter-Governmental Oceanographic Commission for the Caribbean and Adjacent
Regions (IOCARIBE)
International Bank for Reconstruction and Development (IBRD) (Also known as
World Bank)
International Commission for the Conservation of Atlantic Tunas (ICCAT)
International Development Research Centre (Ottawa, Canada)
National Marine Fisheries Service (NMFS)
Ocean Economic and Technology Branch of the United Nations (OETB)
Organization of American States (OAS)
Sistema Económico Latino Americano (SELA)
United Nations Department for Technical Cooperation and Development (UNDTCD)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
United Nations Environmental Programme (UNEP)
United States Agency for International Development (USAID)
West Indies States Association (WISA)

WECAF Reports

1. Fishery Training Needs in the Western Central Atlantic by R.C. Cole. 1976. (distribución restringida).
2. Review of Status of Fishery Statistics and Fishery Research Capabilities in the WECAF Project Area by L. Villegas. November 1978.
3. Shark Fishing in the Western Central Atlantic by S. Springer. March 1979.
4. Report of the First Session of the Executive Committee of the WECAF Project, 18-20 May 1978.
5. Aspectos Técnicos de la Pesca Artesanal en la República Dominicana y Recomendaciones para su Mejoramiento y Desarrollo por M. Giudicelli. Junio 1979.
6. Report on Fish Handling, Processing and Quality Control in Jamaica by C.A.M. Lima dos Santos. July 1979.
7. Programme of Fisheries Development and Diversification in Jamaica by M. Giudicelli. July 1979.
8. La Pesca Artesanal Marítima en la Costa Caribeña de Colombia: Su Situación, sus Posibilidades y sus Necesidades para el Desarrollo por M. Giudicelli. Agosto 1979.
9. Report on Mission to Suriname to Evaluate a Fishermen's Training Proposal by E. Oswald. June 1978.
10. Report on Mission to Antigua, Barbados, Dominica and St. Lucia by R. Kreuzer and E. Oswald. June 1978.
11. Fisheries Situation in Dominica by D.A. Lintern. June 1978.
12. Informe de la Misión a Nicaragua para Prestar Asistencia en las Operaciones de Pesca Parguera Exploratoria y Experimental por M. Giudicelli. Agosto 1978.
13. Bahamian Fisheries Development Mission, Findings and Recommendations by M. Giudicelli. June 1978.
14. Investigación Preliminar sobre las Condiciones Higiénico-Sanitarias y Tecnológicas del Manipuleo, Procesamiento, Comercialización y Control de Calidad de Productos Pesqueros en Nicaragua por C.A.M. Lima dos Santos. Agosto 1978.
15. Purse Seining Demonstration and Training in Montserrat and Study of Adequate Technologies for Fisheries Development in the Country by M. Giudicelli. September 1978.

16. Informe sobre el Tratamiento de Pescado en República Dominicana Incluyendo Sugerencias Referentes a Programas de Extensión por W. Brownell. Octubre 1978.
17. Asistencia a INDERENA en su Programa de Introducción de Redes de Arrastre para la Producción de Pescado en Colombia por M. Giudicelli. Octubre 1978.
18. Marine Artisanal Fisheries in Northeast Brazil and Some Suggestions for the Improvement of the Extension Programmes by W. Brownell. October 1978.
19. Extension Training of Artisanal Fishermen and Other Fisheries Personnel in the WECAF Region by W. Brownell. October 1978.
20. Grenadian Fisheries Development Mission, Findings and Recommendations by M. Giudicelli. November 1978.
21. Report on the Demonstration and Training in Fishing for Red Snapper in Belize and Identification of Fisheries Development Opportunities by M. Giudicelli. January 1979.
22. Programa de Desarrollo y Diversificación de la Pesca de Arrastre en Venezuela por M. Giudicelli. Abril 1979.
23. Programa para la Investigación y Evaluación Comercial de los Principales Potenciales Pesqueros Marítimos de Honduras por M. Giudicelli. Mayo 1979.
24. Report on Mission to Grenada by M. Peña and A.J. Wirth. June 1979.
25. Programa Preliminar para el Desarrollo de la Pesca Artesanal en la Región de San Andrés y Providencia, Colombia por M. Giudicelli. Agosto 1979.
26. Informe de la Misión a Honduras con Relación a Diversas Posibilidades de Desarrollo Pesquero en el País por M. Giudicelli y A.J. Wirth. Setiembre 1979.
27. Proceedings of the Working Group on Shrimp Fisheries of the Northeastern South America. Panama City, Panama, 23-27 April 1979. Report of the Meeting. National Reports.
28. Proceedings of the Working Group on Shrimp Fisheries of the Northeastern South America. Panama City, Panama, 23-27 April 1979. Report of the Meeting. Contributions.
29. User's Guide to Exploratory Fishing Data for the WECAF Project Area by H.R. Bullis, Jr. August 1980.
30. Report on the Training Course in Fishery Statistics held in Castries, St. Lucia, West Indies, 19 November-1 December 1979.

31. Report of Mission to St. Lucia by C.R.C. Carleton and A.J. Wirth. August 1980
32. Programme for Fisheries Development and Diversification in Southern Netherlands Antilles: Aruba, Curaçao and Bonaire by M. Giudicelli. August 1980.
33. Report on Mission to the Netherlands Antilles (Bonaire) by J. Roullot. August 1980.
34. Informe de la Misión en la Laguna de Perlas, Nicaragua por J. Roullot. Setiembre 1980.
35. Bibliographies on the Offshore Shrimp Fishery of Northeastern South America by J. Tashiro and A. Dragovich. October 1980.
36. Informe de la Misión para Asistir a Nicaragua en la Evaluación de sus Recursos Pesqueros y en la Preparación de un Programa de Investigaciones Pesqueros por L. Villegas y P. Charlier. Agosto 1980.

