

REVIEW OF STATUS OF FISHERY STATISTICS AND FISHERY RESEARCH CAPABILITIES IN THE WECAF PROJECT AREA



UNITED NATIONS DEVELOPMENT PROGRAMME



FOOD AND AGRICULTURE ORGANIZATION OF
THE UNITED NATIONS

WECAF REPORTS No. 2
western central atlantic fishery commission

INTER-REGIONAL PROJECT FOR THE DEVELOPMENT OF FISHERIES IN THE WESTERN CENTRAL ATLANTIC

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por

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DEVELOPMENT OF FISHERIES IN THE WESTERN CENTRAL ATLANTIC

The Inter-Regional Project for the Development of Fisheries in the Western Central Atlantic (WECAF), which was initiated in March 1975, entered its second phase on 1 January 1977. Its objectives are to assist in ensuring the full rational utilization of the fishery resources in the Western Central Atlantic through the development of fisheries on under-exploited stocks and the promotion of appropriate management actions for stocks that are heavily exploited. Its activities are coordinated by the Western Central Atlantic Fishery Commission (WECAFC) established by FAO in 1973. The Project is supported by the United Nations Development Programme (UNDP) and the Food and Agriculture Organization of the United Nations as the Executing Agency.

As in the initial phase, two series of documents will be prepared during the second phase of the Project to provide information on activities and/or studies carried out. This document is the second of the series WECAF Reports. The other series of documents is entitled WECAF Studies.

W.F. Doucet
Programme Leader

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1. Summary

The study covers 23 of the 36 countries situated in the WECAF Project area. In the main it consists of a review of the type and complexity of the fisheries statistics collected in the area, on-going fishery research and the facilities existing for carrying out resource research. Information is also presented on fishery administrations and related matters affecting the development of fisheries.

A number of obstacles in the way of sound planning for the fuller utilization of the area's fishery resources were encountered in the course of the analysis, especially the scarcity of catch and effort statistics, particularly relating to artisanal fisheries, and the lack of documented studies on the fish stock potential. These are mainly due to the weakness of governmental institutions in charge of fishery matters arising from the lack of financial resources and trained fishery personnel.

The Project, recognizing that the solution of most of these problems rests largely with national governments, has prepared a programme aimed at assisting governments with their tasks. Actions considered by the Project are: technical assistance and training of local personnel for the improvement of statistics, resource evaluation and aquaculture. Training may take the form of regional courses organized by the Project, visits by the Project staff to the countries of the area, visits of government personnel to the Project Headquarters and selected countries of the region, and sub-regional cooperative activities of fishery scientists.

2. Conclusions and Recommendations

The degree of complexity and resources locally available to compile statistics of catches and effort, to carry out research on fishery resources and on farming in brackish and marine waters, have been reviewed in the following pages because of the effect these have on the quality of resource evaluation and on local fishery production.

The most obvious limitations found in the topics reviewed refer to the reliability of the statistical data available and the lack of data on the magnitude and state of exploitation of some resources. These are more obvious in the small countries, which generally have a smaller number of people trained in statistics and resource evaluation and more limited financial means.

Although there is information available on catches and effort of artisanal and industrial fisheries in all the countries studied, the quality of the data is still far from perfect. The limited data on artisanal fisheries make it impossible to determine the state of exploitation of the populations exclusively fished by small vessels, or those caught by artisanal and industrial fleets. These limitations affect all the countries of the region, but it is relatively more important for the small countries to correct the situation as their fisheries are almost exclusively artisanal.

To gather data on artisanal fisheries is even more difficult than to obtain similar information from the industrial fleets. Basically, records are not kept for small craft, their crews in general not being qualified to maintain them. To endeavour to compile artisanal catch and effort fishing data as frequently as that of industrial boats is impossible in practice. Therefore, more sophisticated statistical techniques have to be employed.

For the reasons stated above, the WECAF Project has reserved eight months during 1978 for statistical services aimed at carrying out studies to design better systems for the compilation of fishery statistics (especially regarding artisanal fisheries) in various countries of the region. This type of work will continue in the Project's remaining years, together with the necessary technical assistance to implement these systems.

Aware of the fact that one of the main reasons affecting the quality of fishery statistics is the lack of trained personnel, the Project is looking for sources to finance a one month regional course, aimed at training personnel belonging to the national agencies responsible for the compilation of these data.

There are many ways to correct the present lack of data necessary to estimate the potential of certain resources, each one of which will result in a different type of action on the part of the Project.

The limited resources of the small countries do not allow them to exert too great an effort, such as carrying out surveys in their domestic waters. In those cases, it is more advisable that their efforts be concentrated on improving catch and effort data compilation while the Project searches for means to carry out these programmes. This is the approach that has been followed.

For those countries having greater human and material resources, the task of obtaining the necessary information for resource evaluation should be the responsibility of the countries themselves. The support the Project is able to offer should be directed toward increasing the technical capacity of the nationals of those countries.

Although resource evaluations have been made in several countries of the region covered by the WECAF Project, it is believed that the number of persons qualified to carry out those studies is still insufficient having regard to the regional needs.

The Project plans to use various supplementary means to extend the use of such techniques:

(a) collaboration with local staff in data analysis for domestic fisheries;

(b) encourage the execution of cruises designed to further resource evaluation and aid in the participation of scientists of the region during the planning, execution and analysis of the data gathered during the operations at sea;

(c) participation of scientists from countries exploiting a common fishery in working groups for the evaluation of its state of exploitation and suggest steps to improve management of the resource;

(d) training courses in resource evaluation techniques by using a catch and effort statistics and surveys.

Regarding the two latter points, the Project has organized a working group which will deal with the shrimp fishery of the Guianas-Brazil, and it is

endeavouring to obtain funds to finance the training courses previously mentioned. Together with the obvious training function of the working group, it is necessary to emphasize its usefulness in the future management of the multi-national resource which it will cover. The analysis of the data gathered by a working group and its recommendations on adequate methods and levels of exploitation for the resource will be very useful to the coastal governments, under whose jurisdiction it falls, in order to decide on its management.

Since the aquaculture potential of the greater part of the Lesser Antilles is presently unknown, the Project has decided to employ a consultant in this field for a period of two months during 1978. This expert would visit the islands to evaluate the possibilities of establishing fish farming in brackish and marine waters.

Due to the limitations observed regarding the number of people trained in aquaculture techniques, the Project is planning to organize a training course on the subject.

In addition to the Project's own activities to improve the situation, it is planned to help staff members of the fishery services or fishery research centres to make short visits to the appropriate institutions of the region in order to improve their knowledge relative to the collection, compilation and presentation of fishery statistics, and resource evaluation and management.

As the limitations in the fields reviewed are more evident in small countries, the Project will give special attention to these countries, in recognition of the fact that the technical solutions to be proposed must take full account of the countries' particular characteristics.

An important aspect of the development process to which due attention should be given, since it will affect the results of any technical assistance programme, is that of the government's attitude toward implementing the changes recommended by technical studies carried out. It should be borne in mind that those activities tending to improve the present situation are in general the responsibility of national governments. Without governmental support in the form of more personnel and funds to accomplish the new tasks related to the improvement of statistics or the carrying out of fishery research, all technical assistance may only result in beautifully written reports, whilst the objectives which motivated the assistance remain unattained.

3. Introduction

The field activities of the UNDP/FAO Project for the Development of Fisheries in the Western Central Atlantic, known as the WECAF Project, began in September 1977 when its headquarters was set up in Panama.

As part of its activities, the Project will strive to cooperate with member countries in improving their fishery statistics, assist in and promote fishery resource evaluation and management, contribute to the development of aquaculture in brackish and marine waters, and encourage the training of local personnel in these fields.

The geographical area covered by the Project, from 35° Latitude North to 10° Latitude South, includes the whole WECAF region (FAO Fishing Area No. 31) and Northern Brazil (part of FAO Fishing Area No. 41). This area, which includes 36 countries, is characterized by its diversity. Within it the world's four most common languages are spoken; republics which have been independent for many decades coexist with states which have recently gained their independence or which will do so in the near future; many different types of administrative and educational systems are found; and there are countries with great human and material potential as well as others whose size and population are no more than those of a small average city.

The present report reviews the status of statistics on catch and fishing effort, fishery research and aquaculture in relation to the existing human and material resources in the developing countries of the region in order to determine the necessary action required to correct the limitations discovered.

In any programme designed to improve the present situation, the diversity which exists within the region requires a grouping together of countries having more or less similar characteristics, in order to facilitate the identification of the solutions needed to achieve that objective. As a result, the steps proposed in this report are made with reference to such groupings and do not infer solutions to the special problems of any one country.

Due to incomplete information regarding the issues being considered in this study, 13 countries were not included (Netherland Antilles, Brazil, Costa Rica, Guatemala, Guadeloupe, French Guiana, Guyana, Haiti, Honduras, Martinique, Panama, Surinam and Virgin Islands (U.K.)).

In spite of this limitation, it is considered that the results of the research carried out in those countries covered by the study reflect the conditions that exist in those countries where information is lacking. As a consequence, the results, conclusions and recommendations submitted in this report are believed to be applicable to the majority of the countries of the region.

The summaries prepared for each country are based on reliable data originating from a variety of sources, too numerous to mention individually.

4. Local Situation

(a) Antigua

Surface: 441 km²
Estimated population (1975): 2 78 000 inhabitants
Continental shelf: 2 533 km²

Yearly landings during the period 1971-76 have been estimated at approximately 800 t.

Although there are no detailed data on the species landed, it can be said that the main exploited resources are the demersal species living at depths of up to 55 m. These resources are captured with traps. It is known that small quantities of groupers, snappers and lobsters are caught.

There are no records available regarding fishing vessels operating in the country. Recently estimated figures indicate that there are approximately 250 fishing boats, the majority propelled by oars. There are 30 sloops of 9-15 m (29-49 ft) which have motors.

The Fisheries Division of the Ministry of Agriculture is responsible for fisheries administration. Provision is made for the posts of Fishery Officer and Assistant Fishery Officer. Among the division's activities is the compilation of statistical data on landings. These statistics are far from complete, as they are gathered from 8 of the 20 landing sites available.

The Division lacks personnel and facilities to carry out fishery research.

(b) Bahamas

Surface: 13 935 km²
Population (1976): 210 000 inhabitants
Continental shelf: 195 000 km²

Two thousand eight hundred tons of marine products were landed in 1976 in Nassau, capital of Bahamas. The local fishery is mainly based on the demersal species living around the reefs. About 50 percent of the recorded landings is composed of lobsters and about 1 000 t refer to groupers, snappers and other fish.

The total number of fishing boats is unknown, but it is estimated that it is composed of approximately 500-600 small sailing sloops (some with motor) and approximately 30 diesel motor boats of 10-13 m (33-43 ft), several of which having refrigerated holds.

The Fishery Department under the Ministry of Agriculture and Fisheries is responsible for the compilation of fishery statistics. Data on catches are gathered by Department inspectors, but this information is far from complete as only Nassau is covered.

On the Department's professional staff there is provision for four Fishery Officers. At present there are two vacant posts.

In the Bahamas there are no national research facilities for marine sciences.

(c) Barbados

Surface: 430 km²
Estimated population (1976): 250 000 inhabitants
Continental shelf: approximately 320 km²

Although complete records are not available, local landings have been estimated at 4 000 t per year.

The main fishery is that of flying fish, representing more than half of the amount of fish caught. The demersal fish landings are not significant.

The local fishing fleet is made up of about 560 artisanal boats and 21 trawlers. The bigger boats, 6-9 m (20-29 ft), of which there are about 400, take part in the flying fish fishery. The trawlers mainly fish for shrimp off the Brazilian coast.

In the Ministry of Agriculture, Food and Consumer Affairs there is a Fisheries Division in charge of fishery matters in the country. The Division's personnel payroll includes provision for two fishery officers.

Landings sold during the day at 12 sites are recorded and total landings are estimated on these figures. For various reasons it is believed that these "total landings" for the island are underestimates of actual landings.

In spite of the fact that the Fisheries Division has participated in certain biological marine research carried out by a Canadian Centre, at present neither human nor material resources are available in the country to carry out activities of this nature.

(d) Belize

Surface: 22 965 km²
Population (1974): 130 000 inhabitants
Continental shelf: 10 000 km²

In 1974, 1 900 t were landed in Belize, 730 of which were exported. Eighty eight percent of the landings were comprised of lobsters and conch.

Artisanal fishing coexists with a small industrial fleet involved in shrimp fishing. Six shrimp boats with an average length of 18 m (59 ft) operate in the country, together with an undetermined number of canoes and other vessels of less than 10 m (33 ft), some of which are provided with motors. The most commonly used fishing gears are fish pots and handlines. Lobsters and conch are also caught through diving. Practically 75-80 percent of the landings are made by fishermen who are members of cooperatives.

The Ministry of Commerce, Industry, Cooperatives and Consumer Protection is responsible for the preparation and execution of the fishery policy. The Ministry has a fishery laboratory in the city of Belize. The laboratory is responsible for: research (resources and gear); resource management; fisheries development and extension work.

The laboratory gathers data on the quantity and value of fish and shellfish delivered to the cooperatives, exports and, as from 1976, the number and type of boats involved in fishing. In 1976 data began to be compiled on time devoted to fishing.

Through its research programme, the laboratory strictly controls the effects of fishing on conch, lobster and shrimp stocks.

(e) Bermuda

Surface: 54 km²
Population: 60 000 inhabitants
Continental shelf: 518 km²

During 1976, 468 t of fish and shellfish were landed in Bermuda. Almost 90 percent of the landings were of fish.

Approximately 180 vessels with lengths of between 5 and 15 m (16-49 ft) participate in pot fishing but only 50 do so on a continuous basis. The catches are landed at 30 sites scattered throughout the archipelago.

The Department of Agriculture and Fisheries of the Ministry of Public Works and Agriculture is in charge of fisheries matters for the country. The Department gathers data on weight, value and composition of landings, sea time and quantity of traps used. There are indications that these quantities underestimate the total catches and effort value due to the dispersion of landing points.

Although there are four institutions with a total of 14 scientists who are involved in marine research, only one of them works on fishery problems.

(f) Cayman Islands

Surface: 259 km²
Population: 11 000 inhabitants²
Continental shelf: about 250 km²

Fishing is of an artisanal type and there are no data available on the quantity of fish and shellfish landed, the number of persons devoted partially or wholly to fishing and the number of fishing vessels.

In the near future, the Government of the islands intends to create a unit to be responsible exclusively for fishery matters.

(g) Colombia

Surface: 1 138 300 km²
Estimated population (1975): 27 718 000 inhabitants²
Atlantic continental shelf: 23 310 km²

The landings made on the Atlantic coast fluctuate around 10 000 t. In 1975 1 648 t of shrimp and about 9 000 t of fish were landed.

Industrial and artisanal fleets fish off the Atlantic coast. The main fishery in this zone is that of shrimp carried out by 73 shrimp boats based in Cartagena. An unknown number of canoes and vessels of up to 12 m use traps and handlines to catch fish and lobsters. Some lobsters are caught by skin divers.

Compilation of fishery statistics, resource evaluation and aquaculture are included among the functions of the "Instituto de Desarrollo de los Recursos Naturales Renovables" (INDERENA) (Institute for the Development of Renewal Natural Resources) under the Ministry of Agriculture.

The catch and effort data available for the industrial fleet are quite complete but that for artisanal catches is incomplete. There is no information available on fishing effort of the artisanal fleet.

INDERENA has approximately 75 professionals working in fisheries. Some of them are working in Cartagena, where INDERENA has a Fisheries Research Centre,

with good laboratories, a library, tanks for the cultivation of fresh water shrimp (Macrobrachium), as well as a small boat. This institute also breeds striped mullet (Mugil) in the El Totumo swamp.

Another institute which has a research programme in the Caribbean area is the Colombian Navy, working almost exclusively in the field of oceanography.

The Magdalena Technological University in Santa Marta has a staff which participates in marine biology and oceanography programmes.

There is a university in Colombia having a School of Marine Sciences and Food Technology which trains marine biologists.

(h) Cuba

Surface: 114 524 km²
Estimated population (1975): 29 528 000 inhabitants
Continental shelf: 40 000 km²

During 1974 Cuba landed approximately 165 000 t of marine products. Of these, 73 000 t were caught in the WECAF region.

Besides the deep water fleet operating in the Atlantic off the African and North American coasts, there are about 180 fishing boats with lengths of 23-25 m together with about 2 300 smaller vessels operating in the WECAF area.

The country has a good system for the compilation of fishery statistics.

Three institutes carry out activities relating to marine research and training in those disciplines: the "Instituto de Oceanografía de la Academia de Ciencias" (Oceanographic Institute of the Academy of Science), the Fisheries Research Centre under the Ministry of the Fishing Industry and the Marine Research Centre of the University of Havana.

The Institute carries out oceanographic and biological research on the Cuban continental shelf. Thirty two scientists work at the Institute, which has a total staff of 168. The Institute has three boats available for research purposes of around 20 m in length and several other smaller boats.

The activities of the Fishery Research Centre (CIP) cover the fields of fisheries oceanography, evaluation and resource management, as well as aquaculture. Its research programme covers all the regions where Cuban vessels operate.

CIP has seven boats with lengths of about 20 m for its activities on the Cuban shelf. A SRTM type boat of 45 m is used for fishery research activities in the Gulf of Mexico and the Caribbean. A stern trawler of 70 m, equipped to carry out research, enables CIP to work on the fishing grounds where the deep sea fleet operates.

Eighty five professionals (19 of them biologists) and 50 technicians are working in CIP.

The main responsibility of the Marine Research Centre is to train personnel in disciplines related to Marine Biology. It also does some work in the

cultivation of fish, shrimp and other species. These experiments are accompanied by biological studies on the species being cultivated or being suitable for cultivation.

The Science Faculty of La Havana University gives degree courses in Marine Biology. Scientists from the Oceanographic Institute and CIP give some of the lectures.

(i) Dominican Republic

Surface: 48 734 km²

Estimated population (1976): 4 840 000 inhabitants

Continental shelf: approximately 1 350 km²

During 1976, 6 435 t of fish were landed in the country.

The fishery is of the artisanal type. There are about 1 400 small boats, all of them less than 10 m in length. Half of these boats are motorized. The main fishing gear used are pots and handlines.

The Hunting and Fishing Department, under the Secretary of State for Agriculture, is in charge of fishery matters for the Republic. The Department has personnel responsible for compiling fishery statistics in various areas of the country but it is believed that these statistics are far from complete, due mainly to the great number of landing sites that have to be covered.

There is no real fishery research in the country. The Marine Biology Department of Santo Domingo University is investigating the biology of certain marine species and plans to begin an aquaculture programme.

(j) Grenada

Surface: 344 km²

Population (1975): 100 000 inhabitants

Continental shelf: approximately 2 000 km²

Landings for 1977 were estimated by the Fisheries Division at 800-1 000 t. About 90 percent of the landings were composed of pelagic fish. It is known that a small quantity of lobsters are caught.

There are no records on number and type of boats. It has been estimated that there are some 700 boats of 2-12 m (6-39 ft) participating in the fishery.

The Fisheries Division of the Ministry of Agriculture, Forestry and Fisheries is responsible for fishery matters for the country. Provision is made for the posts of Fishery Officer and Assistant Fishery Officers.

Statistics on catches are recorded by the Division staff and are considered good. The Division does not compile data on the number and type of fishing vessels.

Grenada does not have the necessary human and material resources to carry out marine research on fisheries.

(k) Jamaica

Surface: 11 430 km²
Population (1975): 2 060 000 inhabitants²
Continental shelf: approximately 3 250 km²

Around 10 000 t of fish and shellfish were landed annually in Jamaica during the seventies.

Jamaican fishing is characterized by being carried out almost exclusively with small vessels. Industrial fishing boats do not exist.

Basically, three fisheries are practised by local fishermen:

- (1) coastal - including banks found 10 n mi from the coast;
- (2) high seas - in Jamaican waters;
- (3) high seas - in waters of other countries.

The coastal fishery lands approximately 75 percent of the total. It is practised by 7 000 fishermen operating approximately 3 500 canoes. Almost half of these boats are equipped with outboard motors. The gears used are fish traps, handlines, gillnets and purse seines.

Approximately 120 canoes, six vessels and two other boats used for training fishermen, with a length of 14-22 m (46-72 ft) take part in high seas fishing. Canoes are transported to the distant banks on board 30 boats with a length of 9-35 m (30-115 ft). The deep sea fleet mainly uses lines and pots.

The development of the fishing industry is the aim of the Fishery Division of the Ministry of Agriculture. Among the multiple functions of the Division are some related to fishery research and continental aquaculture. The Division is divided into various sections, one of which is Marine Research and Statistics.

There is no routine system for the collection of fishery statistics at the landing points. The Division makes estimates on the quantities landed and the number of boats operating yearly from the data obtained in a census carried out each year throughout the island.

The Division is carrying out various research programmes related to local fisheries. It also is experimenting in the cultivation of mangrove oysters.

Some 100 persons work in the Division, some of them have a knowledge of aquaculture and they are qualified to carry out fishery biological research. The Division does not have a library nor is it fully equipped to undertake research programmes.

The Department of Zoology of the University of the West Indies hopes to carry out aquaculture research (oyster, fresh water shrimp and tilapia), and undertake studies on fishery biology and resource management. It makes use of the good facilities (library, instruments, etc.) available at the university

campus and in two coastal laboratories. The Department owns two ships for coastal work of 7.6 and 8.5 m (25 and 28 ft) and a 17 m (56 ft) boat for research equipped for fishing, being able to stay at sea for seven days.

In the last ten years, 13 students have completed advanced research studies oriented toward fishery problems.

The University has requested assistance from the British Ministry of Overseas Development to carry out a research programme on coastal pelagic resources. The programme includes resource evaluation and the establishment of management measures.

(1) Mexico

Surface: 1 972 546 km²
Population (1975): 59 200 000 inhabitants
Atlantic continental shelf: 235 000 km²

During 1976 the fishery production of the Mexican seas reached 554 000 t of which 123 000 t were captured in the Atlantic. Due to its production, Mexico held third place among the Caribbean countries. Twenty two percent of the landings during that year consisted of shrimp.

Together with an industrial fleet of shrimp boats and purse seiners, a few thousand artisanal boats operate in the Atlantic.

Mexico is reasonably well provided with fishery research institutes.

In 1977 there were 12 university centres and higher educational institutions carrying out marine research, but only one of these centres was located on the Atlantic. One hundred and thirty two scientists (of whom 19 specialize in fishery biology) work in the centres.

The Department of Fisheries, through the "Instituto Nacional de Pesca" (INP) (National Fisheries Institute), is responsible for the technical and scientific research on the species of most economic importance. In 1977, INP had 113 researchers on its payroll; 26 scientists working in 16 laboratories on the Atlantic coast. INP has also three boats of 22-35 m available for research purposes.

Aquaculture is an important activity in Mexico. There are over 100 biologists participating in work related to this discipline. On the Atlantic coast, the cultivation of oysters and penaeid shrimps is carried on.

Data on landings is gathered from the Fisheries Department. Since 1925, data are available for monthly landings by species. Due to the semi-artisanal nature of the Atlantic fisheries, the data available on fishing effort are very limited. There are several institutes associated with universities or higher educational institutions devoted to training in fishery research.

(m) Montserrat

Surface: 98 km²
Estimated population (1975): 15 000 inhabitants
Continental shelf: 140 km²

In 1976, 126 t of fish were landed in the country. There are no data available on the species landed, but it is believed that the majority were snappers and groupers and some migrating pelagic fish.

The fishing fleet is of the artisanal type. There are about 80 canoes with lengths of 5-7 m (16-23 ft) and ten boats between 5-15 m (16-49 ft).

Approximately 200 persons take part in fishing but only 15 of them make a living exclusively from fishing.

The Department of Agriculture of the Ministry of Agriculture, Trade, Lands and Housing is responsible for fishery matters. On its staff there is an Assistant Fishery Officer.

Landings are recorded daily in the most important landing places. These data are available since 1968 but their reliability is unknown. No data are gathered on the quantity and type of fishing boats operating in the country.

Neither human nor material resources are available for fishery research.

(n) Nicaragua

Surface: 139 699 km²
Estimated population (1976): 2 330 000 inhabitants
Continental shelf: around 15 000 km²

During 1976, about 10 000 t of fish were landed in Nicaragua on the Atlantic side. Twenty seven percent of the total amount landed consisted of lobster and 47 percent of shrimp.

Two types of fleet operate on the Atlantic coast of Nicaragua:

- (1) industrial - made up of 83 shrimp boats of the Florida type, with a length of 20-24 m (66-79 ft) and 32 lobster boats of 10 to 27 m (33-88 ft). Fifty percent of the lobster boats are less than 15 m (49 ft) in length;
- (2) artisanal - composed of approximately 130 smaller boats of 10 m (33 ft) which fish lobsters, and an undetermined number of Indian canoes (cayucos) which catch fish and juvenile shrimp.

There are at least three Government agencies that carry out activities related to fishing: the "Instituto de Fomento Nacional" (INFONAC) (National Development Institute), the Ministry of Agriculture and Livestock, and the Ministry of Economy.

Through its Fishery Division, INFONAC collects fishing statistics, assesses the resources and promotes fishery development. Statistics on the catch and effort of the industrial fisheries are regularly compiled. Figures referring to annual artisanal catches are only estimates and do not reflect total landings.

Research relating to marine fisheries is carried on solely by this Fishery Division, which has four biologists on its staff.

In the mariculture field, work is being done on the cultivation of mangrove oyster and shrimp.

Regardless of the fact that local universities train biologists, courses on marine topics and aquaculture are not given.

(o) Puerto Rico

Surface: 8 897 km²
Estimated population (1976): 2 3 120 900 inhabitants
Continental shelf: 3 990 km²

The local fleet operates in the Puerto Rico coastal waters and in 1975 landed 1 819 t of fish and shellfish. Almost 70 percent of the landings were demersal species. The production of snappers and groupers was 573 t and that of lobsters 141 t.

Eight hundred and seventy five fishing boats were recorded in Puerto Rico during 1975, 92 percent of which were motor boats. Eight hundred and thirty boats, mostly 4-6 m (13-20 ft) yawls, were involved in coastal fishing and 30 modern 8-15 m (24-49 ft) boats worked with reels or traps in waters deeper than previously exploited.

The most commonly used fishing gears are fish and lobster pots and lines.

At least two Governmental departments carry out activities related to marine fisheries. The Department of Agriculture is responsible for fishery development and research on the exploited resources and fishing gear. The Natural Resources Department is in charge of sport and continental water fisheries, as well as the conservation of marine and continental resources.

The University of Puerto Rico has a Department of Marine Science and a Marine Laboratory. The laboratory, located in Mayagüez, carries on some work on mariculture, consisting of feeding fish kept in cages.

There is a Commercial Fisheries Laboratory, created in 1971, which comes under the Department of Agriculture. The laboratory has good facilities, qualified personnel and has available two 11 m (37 ft) boats in length for its marine activities. Their work programme includes compilation of fishery statistics (catch and effort), exploratory and experimental fishing, demonstration of new fishing gear and oyster cultivation. The laboratory publishes annual summaries containing data on catches by species and their respective value, number of boats by length and HP or engine, and quantity of various types of fishing gear used. These summaries are available for the 1970-75 period. Data on effort began to be compiled in 1975.

It is believed that 80 percent of the total landings are recorded but the proportions of the total landed recorded by species are not known.

(p) St. Lucia

Surface: 616 km²
Estimated population (1975): 100 000 inhabitants
Continental shelf: 522 km²

It is estimated that 2 200 t of fish and shellfish were landed during 1976. Around 60 percent of the landings were of fish.

Almost all the vessels participating in the fishing are of the canoe-type with a length of 5-8 m (16-26 ft). Their exact number is unknown, but there are probably between 500 and 600.

The Fisheries Management Unit of the Ministry of Agriculture, Lands and Fisheries is concerned with fishery matters. Two Fishery Officers work there at present.

The Department does not compile any type of fishery statistics. It is thought that the figures showing the amounts sold in the main local market do not reflect the total island landings.

Neither human nor material means are available to carry out research activities relating to fisheries.

(q) St. Kitts-Nevis

Surface: 261 km²
Estimated population (1976): 46 000 inhabitants
Continental shelf: 882 km²

FAO was informed by St. Kitts and Nevis that 27 t were landed in 1976, but according to other sources, actual landings were several times higher.

The number of fishing vessels in the country is unknown. Official statistics indicate that there were 312 boats in 1975. The majority of vessels used for fishing purposes are small sail boats with an average length of 4.5 m (15 ft).

The Senior Agricultural Officer of the Department of Agriculture is in charge of fishery matters.

Systematic data on catches and number and type of vessels taking part in the fishery have never been compiled.

(r) St. Vincent

Surface: 388 km²
Estimated population (1976): 101 650 inhabitants
Continental shelf: around 1 300 km²

In 1976, 379 t of fish were landed. There are no detailed data available on the species landed but it is known that jacks form a major part of the catches. Small quantities of dolphins and whales are also caught.

Approximately 750 boats with lengths of 2-8 m (6-26 ft) took part in fishing activities in 1975. Ninety eight percent of the vessels had a length of less than 5 m (16 ft).

The Fisheries Department of the Ministry of Trade and Agriculture consists of a Fishery Officer.

There are no data available on total landings for the country.

There are no material or human resources available to carry out fishery research.

(s) Trinidad and Tobago

Surface: 5 139 km²
Estimated population (1975): 1 162 000 inhabitants
Continental shelf: approximately 20 400 km²

In 1976, 4 322 t were landed in the country by the national vessels. About 50 percent of total landings were of pelagic species.

The local fleet is basically of the artisanal type. Approximately 1 600 small crafts, variations of the pirogues, operate in the country. The larger ones, some 100 of 8-11 m (26-36 ft) in length, fish for shrimp in the Gulf of Paria and for flying fish during the season.

Seventy seven shrimp boats, operating mainly in the Guianas-Brazil region, landed in Port of Spain during 1977. Twenty two of these vessels were flying the Trinidad and Tobago flag as well as three other trawlers of 25 m (82 ft) in length which dedicated their activities almost exclusively to fishing.

Data regarding quantities landed by species and fishing effort are recorded by the Fisheries Division staff of the Ministry of Agriculture, Lands and Fisheries. These data are not complete since they cover only 16 of the 60 landing sites existing in the country.

Total landings throughout the country are estimated from these figures and certain hypotheses about the percentage of landings which pass through the markets.

The Biology Department of the University of the West Indies (with headquarters in Trinidad) has carried out some research on topics relating to local fisheries.

(t) Turks and Caicos Islands

Surface: 430 km²
Population (1977): 7 650 inhabitants
Continental shelf: 1 200 km²

The most recent data available indicate that 400 t of lobsters and 650 t of conch were landed in the country in 1974. Landings of fish have not been significant. The majority of landings are exported. Lobsters are caught mainly with traps, and conch by diving.

Fishery matters are the responsibility of the Ministry of Tourism and Development of Industries and Resources. Provision is made for the post of Fishery Officer in this Ministry, which is presently vacant.

Although there are data available on lobster and conch landings during the 1967-77 period, reliable information is lacking regarding the number and type of vessels operating in the country.

(u) Venezuela

Surface: 916 490 km²
Population (1976): 12 361 090 inhabitants
Continental shelf: 90 600 km²

The Venezuelan fishery production (excluding fresh waters) reached 139 000 t in 1976. The most important species in the landings is sardine (Sardinella anchovia) which in 1976 accounted for 27 percent of total landings. Approximately 6 000 t of shrimp are landed yearly.

There are two fishing fleets in the country:

- (1) artisanal - made up of about 5 700 vessels, of which about 5 000 are small and 700 medium size;
- (2) industrial - approximately 150 trawlers and 50 tuna fish boats working with longlines.

The artisanal fishery is very important as it accounts for all the sardines landed, as well as a certain part of the shrimp landings.

Although the number of agencies created to carry out oceanographic-fishery research is much greater, at present there are five centres which actually work to a greater or lesser degree in this field. Of these five centres, one of them works almost exclusively in oceanography. The Multinational Centre in Marine Sciences of the Organization of American States (OAS) is located in one of them. These centres also provide training courses.

The institutes considered have excellent facilities and equipment, among them a recently constructed boat with a length of 25 m for oceanographic research and another of 30 m, about 15 years old, used for resource evaluation and the training of crews for fishing vessels. Approximately 50 scientists work at the five centres mentioned, but probably less than 10 percent of them carry out research on fishery biology.

At present there are several research centres, some already described above, which carry out activities in the cultivation of various species of oysters, mussels and shrimp. There are private groups in the country engaged in mussel cultivation on a commercial scale.

Landing statistics and boat records are regularly gathered by the inspectors under the Directorate of Fishery Development of the Ministry of Agriculture and Farming (former National Fisheries Office). In 1971 logbooks were provided for some fishing boats and it is estimated that about 30 percent of the owners record at least part of the data requested for these books.

The reliability of fishery statistics relating to the industrial fleet is not known, although it is believed to have certain limitations.

The available data on artisanal fisheries are incomplete and inadequate for resource evaluation.

5. Results

The region covered by the Inter-regional Project for the Development of Fisheries in the Western Central Atlantic (WECAF Project) includes countries of the most varied sizes, having different levels of development and human and material potential.

Although the study includes a slight majority of small and medium-sized nations, it is believed that, due to the great number of countries included, the conditions that can be found in the countries of the region are well reflected.

If one considers certain factors such as surface, population and gross domestic product (GDP) of each state (Annex 1), at least three groups of countries can be identified:

(a) small - of a high population density and a low GDP. The majority are found in the Lesser Antilles and are basically devoted to export agriculture and/or tourism;

(b) medium - with land areas close to or greater than 10 000 km², populations exceeding one million inhabitants and having a GDP between six hundred thousand and eight million dollars;

(c) large - land areas nearing or over a million km², large populations (over ten million inhabitants) and with a GDP over ten billion dollars.

Fishery activities of the countries of the region, excepting Barbados, Cuba, Jamaica, the U.S.A. and Trinidad and Tobago are carried out exclusively within the waters under national jurisdiction.

Some vessels from Japan, Korea and the U.S.S.R. participate in the region's fisheries. The catches which these countries report to FAO amount to some 3-5 percent of the total for Zone 31 which is the biggest portion of the WECAF Project region. In the region, there is a marked difference of distribution between the industrial and artisanal fleets. With very rare exceptions, artisanal vessels are the only ones fishing in the Antilles, industrial fleets existing only in the mainland countries and in some of the larger islands.

In general, the industrial boats fish for export and deliver a very small part of their catches to the local markets. The supply of those markets depends on the artisanal contribution and fish imports.

The artisanal vessels used are distinguished by their small size and technical simplicity. Only exceptionally do they exceed 10-12 m (33-39 ft) in length and use internal motors. Due to their size, the majority operate at a short distance from the landing places.

In the majority of the countries analysed (Table 1), fishery matters fall under a defined governmental organization known as a Department, Division or something similar, which is exclusively responsible for these activities. Only in some of the smaller islands are these functions under administrative units covering other fields of activities as well.

The level of participation of these organizations in activities relating to fishing vary greatly from one country to another, from the recording of partial data on landings to resource management and the execution of fishery development plans.

A characteristic of the region is that the number of personnel having adequate training working in fishery services increases with the country's economic capacity, and the lack of personnel is the factor which most affects the quality and quantity of the data available on fisheries.

One of the main tasks fulfilled by the fishery services is the compilation of landing data. Generally, the weight and value of the species landed monthly are recorded but, in extreme cases, only the annual total landing figures are indicated. If the data available are analysed, one notes great differences between the catch and effort statistics for the industrial and artisanal fleets (Table 2).

All the countries studied which have industrial fisheries compile such data, which are more or less accurate according to the level of concentration of these activities in fishing companies. However, only statistics on catches are complete. Excepting in rare cases, information on fishing effort is reduced to the number of boats registered per year or, in the best of cases, the number of trips during the same period. It should be noted that in some countries the annual listing of domestic fishing boats and licensed foreign vessels are only updated versions of old lists, without eliminating vessels which are no longer operating.

Some factors linked to the region's artisanal fisheries, such as the presence of a great number of small craft operating from innumerable landing points, fishery activities supplementing the main occupation of agriculture, and direct consumer sale of the catches, make it difficult to compile data about them. Only a small number of countries in the region are able to gather good artisanal catch statistics. Generally, the data submitted as "artisanal catches" refer to an undetermined part of the fleet and the degree of accuracy is unknown. Limitations regarding the figures indicating the artisanal fishing effort are even greater since, with the exception of a very few countries, there is no register of boats devoted to this type of activity, nor have there been regular censuses or samples to determine their number.

Due to greater general development in mainland countries, research carried out on aspects relating to fishery resources (including cultivation) is more common there than in the islands (Table 3). It should be pointed out that the

lack of human and material resources to carry out these activities is more marked in the latter region.

Research related to fishery resources is carried out both by the fishery services and other national institutes (generally universities), but there are differences between the objectives of the work undertaken by each group. In general, research carried out by the services is of a more practical nature.

From the data analysed, it is noted that there is at least one fisheries research centre in each linguistic region with material and human resources adequate to fulfil its assignments. Furthermore, there are three countries in the region having research boats available of a size that enables them to extend their activities outside their national waters, but at present it is not known whether their future programmes contemplate this possibility.

Regarding the type of studies carried out in the various countries, it is noted that activities aimed at evaluating and managing fishery resources are done in almost all of those having marine research programmes (Table 4). Other frequent research fields are marine biology (mainly taxonomy and life cycle) and fish farming in salt and brackish waters. Oceanographic research is carried out only in those countries where scientific capacities are more developed.

In spite of the fact that there are apparently many countries carrying out scientific activities for the evaluation and management of fishery resources, it must be emphasized that the personnel actually carrying out this research is very small in number.

Since data are lacking for each country studied on the quantity of persons required in future to work on certain disciplines related to resources exploitation, a list was prepared based on an evaluation of available data which indicates the degree of urgency in training local personnel on fishery statistics and resource evaluation and management.

From Table 5, it can be seen that there are very few countries included in this analysis not requiring personnel training in some of the fields already listed. The majority of the small countries, specially the Antilles, need people trained in the collection of statistics and resource evaluation. Although the other countries have trained and experienced personnel in the activities related to fishery statistics, this advantage is only apparent, as the artisanal fisheries statistics available are not adequate for use in resource evaluation.

If local available resources are considered for training personnel in marine biology, oceanography and resource evaluation and management, it is observed that in the majority of the Spanish-speaking countries instructions can be received in at least one of the topics mentioned. On the other hand, the situation is completely different in the English-speaking area; only one or two countries are qualified for local training of personnel (Table 6). With reference to the possibilities of training in aquaculture, it should be pointed out that one or more good centres are available for each linguistic area.

Basic Information About Countries in the WECAF Region*

Country	Population (1 000)	Surface ₂ (1 000 km ²)	Estimated GNP (US\$ '000 m)
Antigua	78	0.4	0.02
Bahamas	210	13.9	0.57
Barbados	250	0.4	0.25
Belize	130	23.0	0.06
Bermuda	60	0.05	
Brazil	109 180	8 562.0	93.13
Cayman Islands	11	0.2	
Colombia	27 718	1 138.3	13.05
Costa Rica	2 010	50.9	1.89
Cuba	9 528	114.5	6.06
Dominican Republic	4 840	48.7	2.79
Dominica	74	0.7	0.02
French Guiana	52	90.1	
Grenada	100	0.3	0.03
Guadeloupe	335	1.8	0.27
Guatemala	6 260	108.9	2.82
Guyana	790	215.0	0.33
Haiti	4 584	27.7	0.62
Honduras	3 040	112.1	1.02
Jamaica	2 060	11.4	2.59
Martinique	346	1.1	0.44
Mexico	59 200	1 972.5	47.77
Montserrat	15	0.1	0.008
Netherlands Antilles	230	1.0	0.34
Nicaragua	2 330	139.7	1.79
Panama	1 720	77.1	1.90
Puerto Rico	3 121	8.9	7.78
St. Lucia	100	0.6	0.03
St. Kitts-Nevis	46	0.3	0.01
St. Vincent	102	0.4	0.03
Surinam	422	136.3	0.37
Trinidad and Tobago	1 162	5.1	1.00
Turks and Caicos Islands	8	0.4	0.003
U.S.A.	215 120	9 363.5	1 507.99
Venezuela	12 361	916.5	29.93
Virgin Islands (U.K.)	73	0.5	0.10

Source: WECAF Project

* Data given are for 1976 if available, otherwise for 1975.

Table 1

Availability of Fisheries Services in
Selected Countries of the WECAF Region

<u>Country</u>	<u>Service</u>
Antigua	X
Bahamas	X
Barbados	X
Belize	X
Bermuda	X
Cayman Islands	O
Colombia	X
Cuba	X
Dominican Republic	X
Grenada	X
Jamaica	X
Mexico	X
Montserrat	O
Nicaragua	X
Puerto Rico	X
St. Lucia	X
St. Kitts-Nevis	O
St. Vincent	X
Trinidad and Tobago	X
Turks and Caicos Islands	O
Venezuela	X

Note: X = Exists
O = Does not exist

Table 2

Type of Catch and Fishing Effort Statistics Collected in
Selected Countries of the WECAF Region

Country/Territory	Type of Fishery			
	Artisanal		Industrial	
	Catch	Effort	Catch	Effort
Antigua	X	0 ^{1/}	-----	NE -----
Bahamas	X	X ^{1/}	-----	NE -----
Barbados	X	X ^{1/}	X	X ^{1/}
Belize	X	X	X	X
Bermuda	X	X	-----	NE -----
Cayman Islands	0	0	-----	NE -----
Colombia	X	0	X	X
Cuba	X	X	X	X
Dominican Republic	X	0	-----	NE -----
Grenada	X	0 ^{1/}	-----	NE -----
Jamaica	X	X ^{1/}	-----	NE -----
Mexico	X	0	X	X
Montserrat	X	0	-----	NE -----
Nicaragua	X	0 ^{1/}	X	X
Puerto Rico	X	X ^{1/}	-----	NE -----
St. Lucia	0	0	0	0
St. Kitts-Nevis	0	0 ^{1/}	-----	NE -----
St. Vincent	X	X ^{1/}	-----	NE -----
Trinidad and Tobago	X	X	X	X
Turks and Caicos Islands	X	0	-----	NE -----
Venezuela	X	0	X	X

Note: ^{1/} Only number and type of boat
 NE = Non existent
 X = Exists
 0 = No information is collected

Table 3

Institutions Engaged in Research Related to
Fisheries and Coastal Aquaculture in
Selected Countries of the WECAF Region

<u>Country</u>	<u>Fisheries Service</u>	<u>Others</u>
Antigua	0	0
Bahamas	0	0
Barbados	0	0
Belize	X	0
Bermuda	X	X
Cayman Islands	0	0
Colombia	X	X
Cuba	X	X
Dominican Republic	0	X
Grenada	0	0
Jamaica	X	X
Mexico	X	X
Montserrat	0	0
Nicaragua	X	0
Puerto Rico	X	X
St. Lucia	0	0
St. Kitts-Nevis	0	0
St. Vincent	0	0
Trinidad and Tobago	X	X
Turks and Caicos Islands	0	0
Venezuela	X	X

Note: X = Exists
0 = Does not exist

Table 4

Type of Research Related to Fishery Resources Carried Out in
Selected Countries of the WECAF Region

Country	<u>1/</u>	<u>2/</u>	<u>3/</u>	<u>4/</u>	<u>5/</u>
Belize			X		
Bermuda	X		X		X
Colombia	X	X	X	X	
Cuba	X	X	X	X	X
Dominican Republic	X				
Jamaica	X		X	X	
Mexico	X	X	X	X	X
Nicaragua			X	X	
Puerto Rico	X	X	X	X	X
Venezuela	X	X	X	X	X

Note: 1/ Marine Biology
2/ Oceanography
3/ Resource evaluation/Resource management
4/ Sea or brackish water aquaculture
5/ Others

Table 5

Estimates of Future Needs in Personnel in
Fisheries Statistics, Resource Evaluation/Management and Aquaculture in
Selected Countries of the WECAF Region

Country	Fisheries Statistics	Resource Evaluation/ Management	Aquaculture
Antigua	XXX	XXX	*
Bahamas	XXX	XXX	*
Barbados	XXX	XXX	*
Belize	XX	XX	*
Bermuda	XX	XX	*
Cayman Islands	XXX	XXX	*
Colombia	XX	X	XX
Cuba	X	X	XX
Dominican Republic	XXX	XXX	XXX
Grenada	XXX	XXX	*
Jamaica	XX	XX	XXX
Mexico	XX	X	X
Montserrat	XXX	XXX	
Nicaragua	XX	X	XX
Puerto Rico	X	X	X
St. Lucia	XXX	XXX	*
St. Kitts-Nevis	XXX	XXX	*
St. Vincent	XXX	XXX	*
Trinidad and Tobago	XX	XXX	*
Turks and Caicos Islands	XXX	XXX	*
Venezuela	XX	XX	X

Note: X = No need or small
 XX = Medium
 XXX = Great
 * = Unknown

Table 6

Facilities for Training Personnel in
Selected Countries of the WECAF Region

Country	Marine Biology	Oceanography	Resource Evaluation/ Management	Aquaculture
Antigua	0	0	0	0
Bahamas	0	0	0	0
Barbados	0	0	0	0
Belize	0	0	0	0
Bermuda	0	0	0	0
Cayman Islands	0	0	0	0
Colombia	X	X	X	X
Cuba	X	X	X	X
Dominican Republic	X	0	0	0
Grenada	0	0	0	0
Jamaica	X	0 ?	0 ?	X
Mexico	X	X	X	X
Montserrat	0	0	0	0
Nicaragua	0	0	0	0
Puerto Rico	X	X	X	X
St. Lucia	0	0	0	0
St. Kitts-Nevis	0	0	0	0
St. Vincent	0	0	0	0
Trinidad and Tobago	X	0 ?	0 ?	0
Turks and Caicos Islands	0	0	0	0
Venezuela	X	X	X	X

Note: 0 = Does not exist
X = Exists

