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FISHERIES MANAGEMENT IN THE LESSER ANTILLES

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TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Characteristics of the Fisheries	1
1.2 Ecosystems and Species	2
1.2.1 Conch	2
1.2.2 Spiny Lobster	2
1.2.3 Sea Urchins	2
1.2.4 Algae	3
1.2.5 Turtles	3
1.2.6 Nearshore Demersal/Reef Fishes	3
1.2.7 Deep Water Demersal Fishes	3
1.2.8 Pelagic Fishes	3
2. LEGAL FRAMEWORK FOR FISHERIES MANAGEMENT	4
2.1 The Law of the Sea Convention and Living Marine Resources	4
2.1.1 Conservation Management and Utilisation of Living Marine Resources	4
2.1.2 Regional Co-operation	4
2.2 EEC Common Fisheries Policy	5
2.2.1 Marine Fishing Act Covering Guadeloupe and Martinique	5
2.3 Organisation of Eastern Caribbean States	5
2.3.1 OECS Harmonised Fisheries Legislation	6
2.4 Magnuson Fishery Conservation and Management Act	7
2.4.1 Other US Federal Legislation	7
2.5 US Virgin Islands Act 3330	8
3. INSTITUTIONAL STRUCTURE FOR FISHERIES MANAGEMENT	9
4. FISHERY MANAGEMENT OPTIONS	10
4.1 Fisheries Management and Development	10
4.2 Control of Fishing Effort	11
4.3 Control of the Quality of the Catch	11
4.4 Licenses and Permits	12
4.5 Stock Rehabilitation	12
5. POLLUTION AND ENVIRONMENT CONTROL	13

6. ENFORCEMENT	14
7. ACHIEVEMENTS AND CONSTRAINTS	15
7.1 Regional Co-operation	15
7.2 Fisheries Eanagement Plans	16
7.3 Data and Information	16
7.4 Staffing and Training	17
8. MANAGEMENT AND OPTIONS	17
8.1 Fishery Management Plans	17
8.2 Stock Assessment	18
8.3 Community Based Management	19
8.4 Government Policy and Development Planning	19

FIGURE

1. THE LESSER ANTILLES SUB-REGION	22
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TABLES

1. BACKGROUND DATA ON THE FISHERIES OF THE LESSER ANTILLES	23
2. CONSERVATION MEASURES	24
2(a) Technical Specifications for Fish Traps/Pots	24
2(b) Technical Specifications for Nets	24
2(c) Conservation Measures for Spiny Lobsters	25
2(d) Conservation Measures for Conch	26
2(e) Conservation Measures for Turtles	26
2(f) Conservation Measures for Sea Urchins	26
3. EXISTING MARINE PARKS IN THE LESSER ANTILLES	27
4. NATIONAL LIMITS RELATING TO TERRITORIAL SEAS, EXCLUSIVE FISHING ZONES AND EEZ's	28
5. STATUS OF THE CONVENTION FOR THE PROTECTION AND DEVELOPMENT OF THE MARINE ENVIRONMENT OF THE WIDER CARIBBEAN REGION AND THE PROTOCOL CONCERNING CO-OPERATION IN COMBATING OIL SPILLS IN THE WIDER CARIBBEAN REGION	28

LITERATURE CITED AND BIBLIOGRAPHY	30
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Abstract:

The Lesser Antilles comprises one of the most compact and diverse aggregation of nations in the world. This island chain, which extends from the Virgin Islands in the north to Grenada in the south, includes seven dependent nations, dependencies of France, the Netherland Antilles and the United Kingdom, and territories of the United States of America. This paper provides a description of the fisheries management techniques used in the sub-region during the last five years. It includes a summary of the achievements as well as the failures of the fisheries management programmes, and the main constraints faced by these island states. Based on these constraints, a number of observations and suggestions for improvement of fishery management options are presented.

FISHERIES MANAGEMENT IN THE LESSER ANTILLES

1. INTRODUCTION

The Lesser Antilles is composed of a number of territories, each of which is an island or group of islands that lie between the high seas of the west central Atlantic Ocean and the eastern reaches of the Caribbean Sea, Figure 1. The sub-region was defined by WECAFC (Western Central Atlantic Fisheries Commission) as extending from and including the Virgin Islands in the North to Grenada in the South and including Barbados. This island chain comprises one of the most compact aggregation of nations in the world. It includes seven independent nations (Antigua & Barbuda, Barbados, Dominica, Grenada, St. Christopher & Nevis, Saint Lucia and St. Vincent & the Grenadines) dependencies of the United Kingdom (Anguilla, British Virgin Islands, Montserrat) dependencies of France (Martinique, Marie Galante, Guadeloupe, St. Martin, St. Barthelemy); dependencies of The Netherlands (St. Eustatius, St. Maarten) and territories of the United States of America (US Virgin Islands).

Physically the island States of the Lesser Antilles are generally small, sometimes being comprised of a number of tiny islands. Their populations are also small but quite often the population density is very high (from 72 persons per km² in the British Virgin Islands to 590 persons per km² in Barbados). They have few natural resources and their economies are centered mainly around agriculture, tourism and light industry. Comparative studies of the Caribbean by Gajraj (1978), Putney (1979) and UNEP/ECLAC suggest that the living natural resources in the Lesser Antilles are under greater stress than anywhere else in the region. The resource base of the islands is so limited that virtually all their resources are critical to the maintenance and development of their human populations.

The people of the Lesser Antilles are big consumers of fish, about 25 kg per head per year. In comparison, per capita consumption in the Greater Antilles (Cuba, Haiti, Dominican Republic and Jamaica) is 12.5 kg per annum. As in the past, a large part of this high demand is met by imports since local production cannot satisfy this high demand. An estimated 18,900 t was imported in 1991 at an estimated cost of US\$ 76 million (FAO Yearbook of Fishery Statistics Vol. 73, 1991).

1.1. Characteristics of the Fisheries

Most of the islands of the Lesser Antilles have relatively narrow shelf areas. However, substantial shelf areas exist around the Virgin Islands, Anguilla, St. Martin/St. Maarten/St. Barthelemy, Saba, Antigua/Barbuda and between St. Vincent and Grenada (The Grenadines). The shallow areas are characterised by coral reefs and sea-grass beds. There are also several banks scattered through the region. The general oceanic productivity of the region is low since there are no important upwellings or currents; and wetlands (mangroves), bays, estuaries and lagoon areas are small. Water exchange takes place between the Caribbean Sea and the Atlantic Ocean through the channels existing between the islands thereby concentrating food and pelagic fish in the vicinity.

As a result of their small continental shelf areas the islands do not have abundant demersal fish, mollusc or crustacean stocks. In most islands these resources are fully exploited or even overfished. The most abundant stocks are the offshore pelagics most of which are migratory and move through the islands on a seasonal basis.

The fishing industry of the area is relatively simple consisting of primary harvesting and tertiary marketing with little or no secondary processing, although some capacity has been developed in Barbados, Saint Lucia, Grenada, British Virgin Islands and Antigua & Barbuda. Harvesting is primarily artisanal with fishers operating from small boats utilising relatively simple gear consisting

mainly of fish traps, handlines, trolling lines, gillnets, trammel nets, beach seines and longlines (palang). There have been no successful attempts to develop industrial fisheries.

Since 1990, larger boats (21.5 - 27.5 m longliners) with specialised equipment are being introduced to the industry through foreign vessels, mainly from the USA, which are targeting specific species such as the swordfish and tuna for the US and Japanese markets. By 1993, seven of the foreign built longliners, owned by local entrepreneurs, were operating out of Barbados. With assistance from FAO, Grenada in June 1989 introduced a 10 m fishing catamaran that was used for pole and line live bait fishing, trolling for tuna, and pelagic and demersal longlining. The catamaran can achieve a speed of 12 knots required for tuna trolling in addition to having a shallow draft. Such a speed is difficult to obtain with an inboard engine in a displacement boat and at a reasonable price that artisanal fishers can afford. Unfortunately, the catamaran was damaged beyond repair during a storm in 1990 before a proper evaluation of its suitability for harvesting the pelagic resources in the Lesser Antilles.

At present, in the Lesser Antilles, anyone who chooses to fish may do so (with the exception in some cases of expatriate residents who may need special permits) and as such is classified as an open-access fishery. Since there is no control of fishing effort, and coupled with the fact that demand highly exceeds supply, overfishing of the nearshore demersal resources, and especially of the economically important species such as conch and lobster, is quite probably the case.

1.2. Ecosystems and Species

Coral reefs, sea-grass beds and mangroves are the three major ecosystems responsible for much of the nearshore and shelf fishery resources of the Lesser Antilles. These habitats are sites of high biological productivity, serve as nursery areas and also provide shelter for the larvae and juveniles of many economically important species.

The importance of these habitats to fisheries has been widely acknowledged. In the Lesser Antilles these habitats are being exposed to the impacts of coastal developmental activities related mainly to urbanisation, tourism, agriculture and light industry.

The fishery resources of the region can be grouped into the following eight major species groups:

1.2.1 Conch (*Strombus gigas*) are seldom found in depth exceeding 30 m and being relatively sedentary are easily exploited by divers. It is the most important edible mollusc in the Lesser Antilles and is considered to be overfished. It was declared an 'economically endangered species' by the International Union for the Conservation of Nature and Natural Resources (IUCN Red Data Book, 1983).

1.2.2 Spiny Lobster: *Panulirus argus* is the most common species even though other *Panulirus* and *Scyllarus* spp. are occasionally landed. Adults, marketable before sexual maturity, can be found in depths ranging from 2-200 m and being relatively sedentary are easily exploited. *P. argus* has a long planktonic larval life (6 months or more) which makes it difficult to determine the origin of the stock. In the easily accessible areas of the region lobster stocks have been severely depleted. Putney (1982) described it as an 'economically endangered species'.

1.2.3 Sea Urchins: White sea urchins (*Tripneustes esculentus*) are harvested as 'sea eggs' in a number of the islands of the Lesser Antilles. It has a planktonic larval stage of about four weeks during which its distribution is unknown. The adults are sedentary and can be found in shallow habitats which makes them vulnerable to overexploitation as demonstrated by the collapse of the fishery in Barbados.

1.2.4 **Algae:** Gracilaria sp. (sea moss) has been traditionally harvested in most of the islands even though several other species occur in the region. It is used mainly as food and in drinks. Gracilaria has been successfully cultured in Saint Lucia and the technology is being transferred to other Eastern Caribbean Islands.

1.2.5 **Turtles:** All marine turtles are acknowledged to be endangered species. Green (Chelonia mydas), hawksbill (Eretmochelys imbricata), loggerhead (Caretta caretta) and leatherback (Dermochelys coriacea) are commonly found and captured throughout the Lesser Antilles. Marine turtles are long-lived and late maturing and must return to the beach where they were hatched to lay their eggs. These characteristics make them vulnerable to overharvesting. Green, hawksbill and leatherback turtles have been declared 'economically important and endangered species' by the International Union for the Conservation of Nature and Natural Resources (IUCN Red Data Book, 1983.)

1.2.6 **Nearshore Demersal/Reef Fishes:** The majority of nearshore demersal fish in the Lesser Antilles are associated with coral reefs. Traps are the main gear used for harvesting reef fishes and catch many species simultaneously. The multispecies nature of reef fishery makes it difficult to use traditional single species assessment and management methods. The trap fishery is probably the most economically important in the region in that it employs the majority of the fishers and vendors and accounts for about 50% of the fish consumed. Most of the trap fishers fish part-time and land their catch at a large number of sites thereby facilitating distribution. It has been widely accepted that there is overfishing of nearshore demersal resources although there is no documented evidence. The marked absence of large individuals from the catch and the scarcity of some species (e.g. parrot fishes) and low catch rates on traditional fishing grounds are indicators of overfishing.

1.2.7 **Deep Water Demersal Fishes:** These are mainly snappers and groupers which are often found on the edge of the shelf or on deep banks (145-270 m). Depending on the depth, handlines or traps are used to exploit these species. It is generally felt that these fisheries are probably underexploited although there are reports of localised depletion. The habitat of these species (crevices, holes, steep rocky slopes) make them difficult to fish.

1.2.8 **Pelagic Fishes:** Pelagic species can be divided into two groups. Coastal pelagics which include a variety of small pelagic fishes such as schooling clupeids, jacks and ballahoo. These are exploited primarily by beach seines, gillnets and cast nets. Although there is no documented evidence on the state of exploitation of the fishery a few islands have reported a decline in catches.

The oceanic pelagics include tunas (bluefin, yellowfin, and skip jack), billfishes, dolphin, kingfish, jacks, flyingfish and sharks. These species move through the Atlantic side of the Lesser Antilles on a seasonal basis (November - June) and account for a major part of the fish landings in most of the islands of the Lesser Antilles. These resources are generally considered to hold the greatest potential for increasing production in the region even though information on their current state of exploitation is lacking. These species are at present exploited by boats ranging from canoes with outboard engines to large (12 - 17 m) launches with ice storage facilities.

2. LEGAL FRAMEWORK FOR FISHERIES MANAGEMENT

2.1. The Law of the Sea Convention and Living Marine Resources

The United Nations Convention on the Law of the Sea of 1982 resulted in the global acceptance of the coastal states' authority to manage fisheries within their jurisdiction. This authority created new opportunity and responsibilities as well as problems of adjustments to countries operating distant water fleets (e.g. Barbados).

The Law of the Sea Convention has made it necessary for most countries to revise their fisheries legislation. The Convention accords to all coastal states the jurisdiction to exploit, conserve and manage the living marine resources within their exclusive economic zone (EEZ). It should be emphasised that this right includes certain responsibilities which are stipulated in the Convention. As appropriate, the Convention requires the coastal state to cooperate with competent international, regional and sub-regional organisations to determine proper management and conservation measures and their implementation.

2.1.1. Conservation Management and Utilisation of Living Marine Resources

The core of the Law of the Sea Convention on fisheries are Articles 61 and 62 which deal with the conservation, management and utilisation of the living resources within the EEZ. Article 61 specifies that the living resources in all economic zones must be managed and conserved so as to prevent over-exploitation and maintain sustainability. It requires the coastal state to take measures to maintain or restore populations of harvested species at levels which can produce a maximum sustainable yield and to determine the "allowable catch of the living resource". The coastal state is required to take "into account the best scientific evidence available" to determine management and conservation measures.

In relation to fisheries management, Article 62 promotes the "optimum utilisation of the living resource" and states that where a state is not capable of harvesting the entire allowable catch of living resource within its EEZ, it should give other states access to the surplus through agreement and other arrangements. Article 64 (4) gives a non-exhaustive list of measures which a coastal state is permitted to proclaim and enforce in order to achieve the stipulated management and utilisation objectives. These include, inter alia: licensing (of fishers, vessels, gear), fixing catch quotas, determining species to be caught, regulating fishing effort, seasons and areas, regulating fisheries research programmes, placing observers and trainees on board vessels, specifying information to be provided, training and transfer of fisheries technology, stipulating terms and conditions of co-operative agreements and enforcement.

Since coastal states retain the primary responsibility to explore, exploit, conserve and manage the living resources within the EEZ, they have the obligation to ensure that conservation measures and regulations are complied with. Article 73 allows the coastal state to board, inspect, arrest and take judicial action against foreign fishers, within important limitations, in order to ensure compliance with its laws and regulations.

2.1.2. Regional Co-operation

The Law of the Sea Convention also raises the question of regional co-operation with regard to fisheries and for other EEZ functions as well. Article 123 of the Convention calls for regional co-operation in enclosed or semi-enclosed seas to "co-ordinate the management, conservation, exploration and exploitation of the living marine resources of the sea" and to "protect and preserve the marine environment". Given that the definition of an enclosed or semi-enclosed sea (Article 122) is

applicable to the Caribbean, it provides the basis for regional co-operation in fisheries matters in the Lesser Antilles. The need for regional, international and bilateral co-operation is critical for a variety of reasons. These include the dangers of over exploitation of stocks under the jurisdiction of two or more states, the growing complexity of fishery and environmental problems, species that come under the jurisdiction of more than one country at different times of their life cycle and the existing disparity in expertise, experience, technical and financial resources.

Other references to regional co-operation can be found in Article 63, which deals with straddling stocks; Article 64, which deals with highly migratory species; and Articles 69 and 70, which pertain to the rights of landlocked and geographically disadvantaged states.

2.2. EEC Common Fisheries Policy

The common fisheries policy of the European Economic Community (EEC), which came into effect in January 1983, covers Martinique and Guadeloupe as overseas departments of France. The policy calls for common rules for fishing in the maritime waters, and co-ordination of structural policies, of Member States to promote the harmonious and balanced development of the fishing industry (Council Regulation (EEC) No 101/76). Member States could have exclusive fishing access to waters up to six nautical miles or in some cases twelve miles from their shore. Provision is made for the European Council to adopt the necessary conservation measures for fish stocks in the maritime waters of one or another Member State. These measures could include restrictions to the catching of certain species, to areas, to fishing seasons, to methods of fishing and fishing gear.

Even though EEC regulation may apply, the Member State could pass legislation concerning the conservation and management of its fishery. These include, inter alia, temporary bans or regulating the fishing of certain species to limit volume of catch by vessel and by species or by species groups, determining minimum size, regulating mesh size, and technical characteristics of vessels. Member states of the Commission will have to be notified of these laws, regulations and administrative rules.

2.2.1. Marine Fishing Act Covering Guadeloupe and Martinique

The Marine Fishing Act of January 1852 with amendments, the last of which was made in 1986, provides the guidelines for fishery regulations in Guadeloupe and Martinique. The Act takes into consideration the EEC Common Fisheries Policy concerning conservation and management of the fisheries resources.

Article 3 of the Act deals with conservation and resource management. It allows for regulations concerning open and closed seasons, protected species, marine parks and reserves, licensing of vessels, gear and fishers, size of catch per vessel and size of the species and the provision of data. As shown in Table 2, the fishing regulations of Guadeloupe and Martinique are different even though they were guided by the same fishery legislation.

2.3. Organisation of Eastern Caribbean States

The Organisation of Eastern Caribbean States (OECS) as a sub-regional grouping within the Caribbean Community (CARICOM) became a reality in July 1981. It grew out of the need to review the operations of the West Indies Associated States Council of Ministers, as its members, being "Associated States", moved towards political independence. The main purpose of the OECS is to promote co-operation, to seek to achieve the fullest possible harmonisation of foreign policy, and to promote economic integration among Member States.

Member States are Antigua & Barbuda, Dominica, Grenada, Montserrat, St. Christopher and Nevis, Saint Lucia and St. Vincent and the Grenadines; the British Virgin Islands has Associated Status and Anguilla, Observer Status.

With the objectives of the OECS in mind and in accordance with the Law of the Sea Convention, the Member States have agreed to co-ordinate, harmonise and pursue joint policies in matters relating to the sea and its resources and mutual defence and security. Three OECS/FAO sponsored fishery workshops held in 1983 and 1984 led to the preparation of draft harmonised fisheries laws and regulations for the OECS Member States. With minor changes, all Member States of the OECS have enacted the harmonised fisheries laws. OECS Members have also enacted the harmonised regulations with minor changes while others are in the process of doing so. Barbados, not a member of the OECS, changed their fisheries laws and regulations to be in harmony with that of the OECS countries.

The Netherlands Antilles have also enacted new fisheries laws which are similar to the OECS harmonized fisheries laws (van Buurt, 1990 per. comm.).

With assistance from the Government of Canada, the OECS has established a fisheries unit based in St. Vincent and the Grenadines. The responsibilities of the unit include assistance to OECS countries in the development and management of their fishery resources and the preservation of their marine environment, assistance in preparing national fisheries development plans, establishing a regional fisheries information centre and assistance to OECS governments in monitoring the application of fisheries laws and regulations.

2.3.1. OECS Harmonised Fisheries Legislation

The harmonised legislation does not spell out in any detail the management and development objectives. Normally this is left to the administration to elaborate and is contained in the fisheries regulations. The legislative authority for fisheries management and development rests with the appropriate Minister. For example, the Antigua & Barbuda Fisheries Act No 14 of 1983, Section 3(1) states: "The Minister shall take such measures as he thinks fit under this Act to promote the development and management of fisheries so as to ensure the optimum utilisation of the fisheries resources in Antigua and Barbuda". The Minister "may appoint a Fisheries Advisory Committee to advise on the management and development of fisheries" and may also enter into arrangements or agreements with other countries in the region or with any competent regional organisation concerning co-operation in fisheries management.

The legislation requires the fisheries officer to prepare and keep under review a plan for the management and development of fisheries. The harmonised fisheries legislation also provides for access agreements, fishing licences (local and foreign), the establishment of fishing priority areas and marine reserves, fisheries research, conditions on fishing methods and gear and the formation of local fisheries management authorities. Provision is also included for the Minister to make regulations for the management and development of fisheries. A non-exhaustive list of regulations the Minister may make include: licensing regulations and management of a particular fishery; prescribing fishery management and conservation measures - minimum mesh sizes, minimum species size, closed seasons, prohibited fishing methods, schemes for limiting entry into specified fisheries, etc.; prescribing the functions of the Fisheries Advisory Committee; prescribing measures for the protection of certain species e.g. turtles, conch, lobsters; providing for the registration of fishermen and fishing gear; regulating the landing, marketing and distribution of fish; and regulating the management and protection of marine reserves and fishing priority areas, the taking of corals and shells, the taking of aquarium fish and aquaculture development.

2.4. Magnuson Fishery Conservation and Management Act

The Magnuson Fishery Conservation and Management Act, Public Law 94265, approved by the United States Congress in April 1976, created eight Fishery Management Councils for the conservation and orderly utilisation of the fishery resources of the United States of America (U.S.A.). This federal legislation established a national Fishery Conservation Zone (FCZ) extending from seaward boundaries of the coastal states to 200 nautical miles, and exclusive US fishery management authority over fish resources within the FCZ with the exception of the highly migratory tunas. The Federal Government, through the councils, has managerial responsibility in the FCZ.

The Caribbean Fishery Management Council (CFMC) is responsible for the orderly utilisation of the fishery resources in the FCZ of the Commonwealth of Puerto Rico, and the US Virgin Islands which is included in the Lesser Antilles region. The Council's major responsibility is the formulation of fishery management plans for single species or a group of species which can be managed as a unit, and does not engage in the enforcement of regulations contained in the management plans. Enforcement is the responsibility of the US Coast Guard and the National Marine Fisheries Service.

In preparing fishery management plans the Council is guided by the National Standards contained in the Magnuson Act. The standards require that the plans:

- Prevent overfishing while achieving optimum yield;
- Be based on the best scientific information available;
- To the extent practicable, manage individual stocks as a unit;
- Conservation and management measures shall not discriminate between residents of different states;
- Where practicable, conservation and management measures should promote efficiency in the utilisation of the fishery resources;
- Take into account and allow for variations among contingencies (risks) in fisheries, fishery resources and catches;
- Where practicable, conservation and management measures should minimise costs and avoid duplication.

2.4.1. Other US Federal Legislation

The following Federal legislations are also applicable to fisheries management in the US Virgin Islands:

Endangered Species Act

The Endangered Species Act protects particular species of marine life, for example turtles, and lists endangered or threatened species known to occur in the US Caribbean Fisheries Conservation Zone (FCZ).

Marine Mammal Protection Act

The regulations associated with this act make it a federal crime to kill, capture or harass any marine mammal. They prohibit the international killing of these mammals under any circumstances. All marine mammals are listed as endangered species.

Coastal Zone Management Act

The Coastal Zone Management Act places responsibility for comprehensive land and water management of the coastal zone with the Federally sponsored Office of Coastal Zone Management in the US Virgin Islands. The Coastal Zone Management Plan for the US Virgin Islands provides for the identification of territorial waters and onshore areas of "particular concern" or "especially productive" with respect to fishery resources and which are critical to marine life.

Outer Continental Shelf Act

Under this Act coral communities located on the outer continental shelf are protected. Regulations under this Act prohibit operations which directly cause damage or injury to viable coral communities. Viable coral communities are defined as living coral and all dead coral formations and associated reef organisms that are part of a coral reef or other ecological communities containing living corals. Permits are required for operations such as dredging or oceanographic surveys which disturb or damage coral or its environment.

Federal Water Pollution Control Act

Among the provisions of this Act are sections on the protection of estuaries, establishment of standards for marine sanitation, and prohibiting the dumping of hazardous substances into marine waters. These restrictions help to protect the marine resource.

Marine Protection Research and Sanctuaries Act

The Marine Protection, Research and Sanctuaries Act is administered by the Department of Commerce of the U.S. National Atmospheric and Oceanographic Administration which has the authority to designate ocean areas having distinctive conservation, recreation, ecological or aesthetic value as marine sanctuaries.

2.5 U.S. Virgin Islands Act 3330

The US Virgin Islands Act 3330, approved in 1972, assigns commercial fishing promotion to the US Department of Commerce and all other fishery matters, including enforcement, to the Department of Conservation and Cultural Affairs of the US Virgin Islands.

The Act provides for jurisdiction of all waters out to a distance of either 12 miles from the shoreline or to any international boundary located within the 12 mile limit, whichever is shorter. All

aquatic life and all waters, including inland ponds over 50 acres, are declared the property of the Virgin Islands and of common ownership and public use.

The Act also provides for conservation and management, regulation of vessels, issuance of licences, certificates and registration, advice and assistance to fishers, dissemination of information to the public, conduct and publication of scientific research, and enforcement. It establishes fishing seasons and minimum sizes for some species, certain conditions on gear and fishers. It mandates catch reports and establishes penalties and rewards.

3. INSTITUTIONAL STRUCTURE FOR FISHERIES MANAGEMENT

In most countries of the Lesser Antilles the State itself plays a leading role in all aspects of fishery policy by regulating management and conservation of the resources and through direct intervention in the implementation of policies through development programmes. It is possible to identify different fisheries administrative structures. These range from the complex administration of the US Virgin Islands to the more simple, as in the OECS countries.

In the OECS countries it is normal to find fisheries located within a wider Ministry concerned with Agriculture and other matters. For example, in St. Vincent and the Grenadines fisheries policy is in the hands of the Fisheries Officer who is part of the Ministry of Trade, Industry and Agriculture, while in Grenada fisheries form part of the Ministry of Agriculture, Natural Resources and Industrial Development. Taking into account the population, size, existing manpower, present importance of fisheries and present economic circumstances in many of the OECS countries, it is not practical to set up fisheries as a separate ministry in most of them.

Although the present situation may create problems for implementing fisheries policy, the relative smallness of the Ministries can itself be an advantage in that it may allow for direct access by the Fisheries Officer to the Minister or other senior government officers such as the Permanent Secretary. However, no matter where the fisheries sector is located within government's administrative system, it is very important that the sector be given its appropriate share of development resources.

With the emergence of the extended fisheries jurisdiction under the UN Law of the Sea Convention the co-ordination of fisheries policy between governments and between governmental bodies responsible for scientific research, foreign affairs, co-operatives, marketing, merchant shipping, etc. in each country becomes more critical in the Lesser Antilles sub-region. The FAO Lesser Antilles Committee of the Western Central Atlantic Fisheries Commission (WECAFC) and the recently established OECS Fisheries Unit are involved in the co-ordination of fisheries matters at the sub-regional level.

However, there is a general concern throughout the region as to the need for inter-agency co-operation and co-ordination at the national level, and as to the means by which it can best be achieved. Under the OECS harmonised legislation this can be achieved by the establishment of a Fisheries Advisory Committee by the Minister. This Committee has no legal status as such but is important in formulating and co-ordinating government policy by advising the Minister on the management and development of fisheries. The Fisheries Advisory Committee includes the fishing industry and scientists, and may invite other government departments to participate in meetings on matters of mutual interest.

The Caribbean Fisheries Management Council is responsible for the preparation of a detailed fishery management plans for the US Virgin Islands, according to the guidelines set out by the

Magnuson Act (Section 2.4). The plan is to ensure that the best scientific evidence available is used and the optimum utilisation of the resource is achieved as well as to ensure, as far as possible, integrated management of individual and inter-related stocks. The plan has to take into account existing Federal and State laws concerning the marine and coastal environment (Section 2.4) which therefore necessitates inter-agency co-ordination. In preparing a plan the CFMC holds bi-monthly meetings which are open to the press and the public. In addition there is provision for public participation and public hearings where comments are taken into consideration before the plan is drafted in final form.

In comparison, the OECS Harmonised Legislation makes provision for the establishment of a Fisheries Advisory Committee and for the Minister to designate an area as a "local fisheries management area" and "designate any local authority, (fishers co-operative or association or other appropriate body representing fishers in the area as the Local Fisheries Management Authority for that area)". Neither the legislation nor regulations spell out any details for implementing this management system.

The fisheries sector in the Lesser Antilles does not generally receive a high place in government priorities and as such the organisation of the fishers into fisheries co-operatives can play a vital role in promoting the development of this sector. Generally the existing fisheries laws contain the necessary provisions which reflect the importance of this matter. However, in most Islands fishers co-operative societies are regulated by the Co-operative Societies Ordinance or Act and as a result is subject to the supervision of the Registrar of Co-operatives who is assisted by a Fisheries Officer responsible for fishers co-operatives.

It should be emphasised that, in the case of the small developing island states of the Lesser Antilles, fisheries administrative schemes should reflect the comparatively limited living resources in their EEZ and not be so elaborate that they utilise more bureaucratic resources than the resource itself is worth.

4. FISHERY MANAGEMENT TOOLS

4.1. Fisheries Management and Development

Fisheries management embraces conservation measures, economic issues such as how to obtain maximum outputs and the administrative structure for regulating fishing activities. Of course this overlaps with development.

In the Lesser Antilles only the US Virgin Islands, through the Caribbean Fishery Management Council, has published fishery management plans. Management plans for the spiny lobster, shallow-water reef fish, Atlantic billfishes (except sword fish) and sharks and coastal migratory pelagic fish resources have been published. Draft management plans for deep-water reef fish, molluscs (conch and whelk), bait fish, crustaceans (other than spiny lobster), corals and ornamental aquarium fish have also been published for public comment.

The OECS Harmonised Legislation provides for the Chief Fisheries Officer to prepare and keep under review a plan for the management and development of fisheries which "shall be submitted to the Minister for approval". The legislation identifies certain contents of the plan and provides for consultation with local fishers, local authorities, persons affected by the plan and the Fishery Advisory Committee.

Determining Total Allowable Catch (TAC) and Maximum Sustainable Yield (MSY) requires substantial data little of which are readily available in most Islands. With the help of FAO and ICOD,

on-shore data collection systems for the OECS countries was set up in 1987. In the absence of the data the TAC could be estimated using past catches as a guideline and using a higher or lower figure than past catches depending on whether the resource is considered underfished or overfished. However, this approach requires continuous monitoring and enforcement capability which is not presently available to most Fisheries Divisions in the sub-region.

4.2. Control of Fishing Effort

If it is correct to generalise that many of the coastal fishery resources in the Lesser Antilles are approaching full exploitation and some are probably already over-exploited, greater attention should be paid to the means by which effort can be controlled. This could be done by limiting the number of boats operating in a particular fishery including, perhaps also control over building or importing of boats, whether licences should be transferable or replaceable and the period for which licences should be issued. Other forms of control may include regulation of types of fishing gear, including mesh sizes, the imposition of quotas, restriction of fishing to certain areas or for certain periods.

Although provisions are made for most of these measures in the various fisheries legislations of the region, most countries are not enforcing them even though some islands like the US Virgin Islands, for example, possess relatively better administrative and enforcement capabilities in the US Coast Guard and the National Marine Fisheries Service.

4.3. Control of the Quality of the Catch

This technique is applied to regulate the fishing of certain species or of individuals of certain species usually in order to allow the organism to reproduce at least once before being harvested and so lower the probability of recruitment overfishing.

Knowledge of the size of the organism at maturity (i.e. reproduction) and of its reproductive behaviour is required for setting these limits. For most species this information is lacking, or is costly to determine. In addition, there are a large number of species to deal with in the Lesser Antilles

The fishing laws and regulations of the Lesser Antilles contain these types of measures for some species (e.g. conch, lobster, turtle, etc.). For example, it is prohibited in the OECS countries to harm, take, have in possession, sell or purchase any lobster carrying eggs, any lobster which is undersize (less than 25 cm in length when laid flat or a carapace length of less than 9.5 cm; less than 680 g in weight or having a tail weighing less than 200g) and any lobster which is moulting.

Provisions for closed and open seasons for fishing, the type of fishing gear and methods to be used and the area in which they can be used and the minimum sizes for nets and pots are also included. There are also prohibitions on certain gear and methods, and on harvesting of coral. In Guadeloupe there are special conditions for the use of SCUBA gear for fishing, one of which is third party insurance.

Setting gear limitations is an indirect way of controlling the size of fish being caught, and is probably easier to enforce than size limitations by species. However, it is very difficult to set gear limitations for trap fishing, which is one of the major fishing methods in the Lesser Antilles, because several species are caught together which may have different minimum size limits.

Prohibiting fishing in areas where organisms aggregate to spawn or closing the fishery during the reproductive season is useful to reduce fishing mortality. However, it also reduces efficiency and

results in higher priced fish. Prohibitions of this kind are normally included as conditions of the fishing

Minimum size of species, mesh size, closed seasons and other conservation measures are given in Table 2.

4.4. Licences and Permits

Licensing is considered one of the most basic requirements of fisheries management as it can be used as a measure for controlling effort and access and serve as a source of revenue and data. This approach also gives the fisheries administration considerable flexibility in the application of conservation and management measures. The fisheries laws of the sub-region contain detailed provisions establishing conditions for the granting of a licence or permit. In addition to the nationality criteria and conservation and management measures there are also requirements for the provision of information, fees and registration.

However, even though there is adequate provision for licensing in the OECS legislation and regulations, there is no effective licensing system in place for either local or foreign fishers. There seems to be a general reluctance in most OECS countries to licence the local fishers and charge them the fees proposed in the regulations. In contrast, the US Virgin Islands, Barbados, Guadeloupe and Martinique have relatively effective licensing and registration systems.

Licensing also requires that certain information and data be provided to the fisheries administration. Most legislation requires the vessel to keep a log book of detailed information on fishing area, effort, species and other relevant information which according to the OECS legislation must be submitted to the Fisheries Officer "not later than 45 days after the completion of the voyage to which the log book relates or at any other time at the request of the Chief Fisheries Officer". Such information, if reliable, is critical for the management and development of the fishery. In the OECS countries local fishers are required to keep log books "if so required by the Chief Fisheries Officer". There is no log book system in place for local fishers in the OECS countries and there are hardly any foreign vessels licensed to fish in waters under the OECS jurisdiction. It is not known whether this requirement is successful in obtaining reliable information in the US Virgin Islands and in the French Departments of Martinique and Guadeloupe.

Most legislation requires registration of the vessel in a special fisheries register, and sometimes even the crew, as a condition for the granting of a licence to a local fisherman. Such information is another input into the fisheries data base required for the management and development of the fisheries. Most OECS countries do not maintain a register but are making efforts to do so. The OECS Fisheries Unit is also in the process of establishing a register of foreign fishing vessels operating in the region.

4.5. Stock Rehabilitation

Stock rehabilitation through restocking is receiving increasing attention as a management tool for certain fisheries where overfishing has severely depleted the breeding stocks. The effectiveness of this technique has still to be demonstrated in actual practice. However, this is an attractive prospect for conch and spiny lobster and merits further study. While the studies are incomplete, preliminary results of genetic studies of conch populations (Berg, 1983) in the Lesser Antilles suggest that some degree of genetic isolation exists and that distinct differences can be recognised in animals from different locations within the region. The significance of this is not very clear but it is possible that seeding the region with hatchery-produced juvenile conch could result in undesirable effects within natural populations by mixing different gene pools and also lower overall genetic diversity.

5. POLLUTION AND ENVIRONMENT CONTROL

Fisheries management and conservation measures are very dependent on the existence of a wholesome marine environment. Generally the marine environment in the sub-region is considered to be comparatively healthy.

Although most fisheries legislation in the sub-region does not pay particular attention to environmental considerations there is a recognition of the inter-relationship between fisheries management objectives and the need to protect the marine environment. For example, certain methods of fishing are prohibited because of their destructive effects on the marine environment and its resources. The prohibition applies to the use of explosives such as dynamite and other noxious and poisonous substances for the purpose of killing, stunning, disabling or catching fish. In some cases, as in the OECS harmonised legislation, prohibition extends to the carrying on board or even the mere possession of these substances.

In the OECS countries the debate is whether fisheries legislation should make provisions aimed at the preservation of fish stocks or whether to enact separate comprehensive legislation covering all aspects of environmental protection including the preservation of fish stocks. There is no existing comprehensive legislation even though there are specific legislations that deals with environmental protection in the context of regulating the disposal of waste and emission from factories, etc. and legislation concerning the preservation of the marine environment in the territorial sea. For example, the Barbados Territorial Waters Act, 1977 and the Grenada Territorial Waters Act, 1978 define non-innocent passage to include *inter alia* "any act of pollution calculated to or likely to cause damage or harm to the marine environment". In Guadeloupe the dumping, draining or depositing into the sea of substances harmful to the conservation of marine species is prohibited according to Law No.64-1245 of December 1964, pertaining to the waters policy and prevention of pollution.

Often it is considered necessary to protect certain areas because of the sensitivity of their ecosystems or their importance in the biological and reproductive cycles as breeding or nursery areas. Accordingly, power is given in the fishery laws for the proclamation of marine reserves or marine parks where fishing and other activities detrimental to the flora and fauna are prohibited. Even though a number of marine parks and protected areas have been proclaimed, sometimes under National Parks legislation, most of them are not managed nor possess management plans mainly because of the non existence of the necessary administrative arrangements in many countries. Table 3 gives a list of existing marine parks in the Lesser Antilles.

A number of countries in the sub-region have signed and or ratified the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean and the Protocol concerning co-operation in combatting oil spills in the Wider Caribbean Region, Table 5. The Convention, which is a comprehensive umbrella agreement for the development and protection of the marine environment, was sponsored by UNEP under its Regional Seas Programme. It lists the sources of pollution that require control, identifies environment issues that require co-operative efforts and areas of scientific and technical co-operation. The Convention provides the legal framework for co-operative regional and national actions to protect the marine and coastal environment and by ratifying the party accepts obligations to control pollution from a discrete source or to co-operate in a specific aspect of environmental management.

The Protocol concerning co-operation in combatting oil spills applies to oil spill incidents which result in or pose a threat of pollution to the Wider Caribbean Region. It calls for co-operation in taking the necessary measures, both preventative and remedial, for the protection of the coastal and marine

environment of the Wider Caribbean Region, particularly the coastal areas of the Islands, from oil spill incidents.

The Convention and Oil Spill Protocol together with the Law of the Sea Convention provide the framework for the harmonisation of legislation concerning the protection of the marine and coastal environment in the Lesser Antilles sub-region. The Regional Co-ordinating Unit of the UNEP Caribbean Action Plan, based in Jamaica has initiated a number of activities in this direction.

6. ENFORCEMENT

Fishery laws and regulations are only likely to be effective if they are adequately enforced. Most laws of the sub-region make detailed provisions for the powers of competent authorities to enforce the law and for punishment for breaches of the law. Unfortunately, the fisheries administration in most OECS countries lack the required resources, both human and material, for an effective surveillance and enforcement programme and, as a result, there is very little inspection at landing sites, etc. For example, legislation protecting turtles has been in place for over 15 years or more yet the sale of turtle meat, eggs, shell products and stuffed juvenile turtles still takes place in public.

In many cases there is reluctance to enforce laws for which there is local empathy. One of the main reasons for the countries not applying the regulations is because issues related to fisheries management are usually complex, comprising socioeconomic and political issues as well as biological ones. This is particularly applicable in the Lesser Antilles where authorities sometimes avoid taking decisions in view of the unpopular nature of regulatory measures motivated by the precarious economic and social situations of small-scale fishers in most of the islands. The coastal communities which these fisheries resources support seem particularly exposed to social and economic problems and as a result the political will to enforce these regulations is usually absent. Therefore, under such circumstances the best the Fisheries Officer can hope for is to reduce some of the negative aspects of an uncontrolled fishery so that the fishery is some what better off than an unmanaged one.

Taking into consideration the difficulties faced by most fishery administrations in enforcing fishery regulations, and the importance of their implementations to conserve the resources, responsibilities of control could be assigned to the fishers or fishers groups. However, the co-operation of the resource users (fishers, vendors, hotels etc.) are essential for voluntary adherence to fishery regulations. They have to be consulted and their opinions sought in the framing of regulatory measures since their involvement is essential for voluntary adherence to regulations.

Mechanisms for the continuous review of management plans and involvement of fishers should be established. Such mechanisms are being utilised in some islands (Saint Lucia, Dominica, British Virgin Islands) for the management of natural areas. Attempts could be made to introduce them in fisheries management.

However, most fisheries administrations of the sub-region acknowledges that a primary role could be played by the police, coast guard and various defence organisations in enforcement and the OECS countries have initiated dialogue to work out an acceptable national and regional mechanism. This relates to national inter-agency and regional cooperation as described in Section 3. In the US Virgin Islands enforcement is the responsibility of the US Coast Guard, the National Marine Fisheries Service and the Department of Conservation and Cultural Affairs.

It should be emphasised that the principal issue in enforcement and surveillance is cost-effectiveness in the light of the value of the Islands marine resources and whether other tasks need to be undertaken

concerning defence, patrol of the territorial sea, etc. However, enforcement should not be seen in terms of physical control of the EEZ but to encourage compliance with the fisheries laws and regulations through measures that are relatively cheap. For example, such measures could include port inspections, inspections at sea, regular communication with fisheries authority while fishing is in progress, issuing of licences and an education programme for fishers whose cooperation is vital.

The degree to which management measures prove effective will vary in direct proportion to the extent they are applied and accepted by the users. Enforcement and acceptance of fishery regulations involve a number of variables which include resource user perceptions and participation, education, economic need and government enforcement capabilities. Thus it requires a programme that addresses these variables simultaneously.

7. ACHIEVEMENTS AND CONSTRAINTS

7.1. Regional Co-operation

The forum provided by FAO through WECAFC and its associated Lesser Antilles Committee, and the Caribbean Technical Co-operation Network in Artisanal Fisheries and Aquaculture has contributed significantly towards regional co-operation and dialogue. The Network, based on the TCDC concept, is the mechanism adopted by the English-speaking countries and Suriname to promote inter-regional technical co-operation and training in artisanal fisheries and aquaculture. Also, the establishment of the OECS Fisheries Unit and the adoption of harmonised fisheries laws and regulations by OECS countries are major achievements towards regional co-operation in the management and development of fisheries in the Lesser Antilles sub-region.

Co-operation is being achieved through these bodies by exchanging information on living resources and on conservation and management measures being applied, the harmonisation of collecting statistical data and efforts to establish a regional database and discussions on the management of shared resources. The activities and projects of FAO and WECAFC Working Parties on fishery resources, economics, planning and statistics, have contributed immensely towards co-operation in the above-mentioned areas.

A possible combination of interlocking zones after the delimitation of maritime boundaries, straddling stocks and the presence of highly migratory species could pose some difficulties for regional co-operation. Co-operation regarding highly migratory species such as tuna may be more complicated because the US does not view these resources as being within the control of the coastal state within its EEZ, while the other states of the Lesser Antilles hold the opposite view.

The OECS countries have also taken initiatives to co-operate in exchanging information on suspected illegal foreign fishing, establishing a registry for all foreign vessels, formulating guidelines for fisheries joint ventures and developing a common approach to negotiation of access by foreign vessels, including the terms and conditions that could be applied to such access. Such forms of co-operation are particularly useful for the small island states of the sub-region and allows for implementation of regionally agreed measures concerning the conservation and management of the living marine resources.

7.2. Fisheries Management Plans

The new Law of the Sea Convention has provided developing countries with the basis for proper management and more beneficial use of their marine resources. Most of these countries are trying to

rationalise their fishery development efforts and allocate more efficiently their natural, human and financial resources. Sound planning of fisheries management and development is of utmost importance as was stressed by the 1984 FAO World Conference on Fisheries Management and Development. The conference established strategies and a five point "Plan of Action" aimed at increasing their production while conserving the resources upon which the production depends. Special attention was given to the development of small-scale fisheries.

The Caribbean Fisheries Management Council has prepared management plans for some of the fishery resource types of the US Virgin Islands and is in the process of preparing others. The main limitation of these plans is that they concentrate mainly on biological aspects to the neglect of the socio-economic aspects. Many small-scale fishers continue in fishing although the activity generates marginal surpluses or is sometimes uneconomical, even with government subsidies. Such issues should be addressed in the management plan.

Generally, fisheries administrators have given great attention to biological information while the acquisition of social and economic information has been somewhat neglected. This has been one of the most serious impediments to effective policy making and planning especially in the case of small-scale fisheries. The involvement of the resource users (fishers, vendors etc.) and the community in the preparation of management plans is also important.

7.3. Data and Information

Most Islands of the Lesser Antilles have some type of data collection programme. The most common is the periodic collection of catch landings from selected landing sites. Many of these efforts were stimulated by the FAO workshop on fisheries statistics held in Saint Lucia in 1979. However, on-site follow-up has been sporadic and in some cases data have accumulated for years without being analysed. This has caused some administrators to question the allocation of resources to collect data which is of no apparent use.

One of the major constraints in preparing fisheries management plans is the paucity of reliable biological, social and economic data and information. Without adequate data it is difficult to give good advice on managing the fishery. The collection and or improvement of data should therefore be of high priority. Generally in the Lesser Antilles and especially in the OECS countries the resources (trained personnel, transport, finance, etc.) available for data collection are limited. At the same time, the fisheries are scattered, which suggests that data collection is likely to be more difficult and expensive than collecting data from an industrial fleet landing the same amount of fish.

Given these difficulties, it is more important to identify management objectives (for species or species groups, etc.), decide on which items of data are of maximum importance to meet these objectives and establish how these items could be collected in a cost-effective way, rather than to make attempts to collect all the data that would be desirable to have, even if that was possible. It is not necessary to collect data in a comprehensive census type manner. For example, it is unnecessary and impractical to have records of the landings by all boats at all landing sites on a daily basis. A well designed sampling system will produce data that is sufficiently accurate for all purposes. With the limited human and financial resources in the small islands this approach is recommended. An on-going data collection programme is necessary for monitoring the effectiveness and the measurement of achievement of management objectives. Based on this principle, and with the assistance of FAO and ICOD, a harmonious on-shore data collection system for the OECS countries, Anguilla, Barbados, British Virgin Islands and Montserrat was initiated in July 1987. The effectiveness of this system will depend on the commitment of the fisheries administration as it was designed by taking into

consideration the existing constraints. A similar system was introduced in Martinique. These systems should be evaluated and reorganized if necessary.

7.4. Staffing and Training

Most Fisheries Divisions in the Lesser Antilles are staffed by less than half a dozen individuals, including clerical personnel. They lack the required technical and support staff to administer and manage their respective fisheries, and to act as counterparts for projects financed and partially staffed by external agencies.

The economies of most of the islands cannot afford them the luxury of employing professionals in every discipline. For this reason fisheries officers and assistants should be trained as "general practitioners" rather than specialising, and be supported by "middle-technicians", who should be involved in basic data collection (for research as well) and extension. The objective of the fisheries division should be to make the optimum use of available resources by selecting priority management activities and do this well rather than spreading the resources too thin as is presently the case.

The sub-region needs experts and specialists in various subject areas related to fisheries but governments may not be able to employ and keep them for reasons mentioned. One suggestion is that the Universities should play a more active role by employing such persons who could be available to assist the Islands and at the same time be involved in problem oriented research. The University environment is probably the only one that may be able to attract and keep a pool of specialists that could be shared within the region.

8. MANAGEMENT OPTIONS

In the Lesser Antilles, due to the nature of the fisheries, management is very complex and involves social, political and biological issues. Even though there are adequate legislation and regulations for managing the fisheries, there is very little effective management. In most of the islands fishing is uncontrolled. Fishing (and agriculture) is seen as the buffer to unemployment. This, coupled with the social and economic problems of the fishing communities, makes enforcement of regulations very difficult without the political will. Under these circumstances the best a fisheries officer (manager) can hope for is to reduce some of the negative aspects of an uncontrolled fishery.

The fisheries officer has a wide array of management tools (Section 4) at his disposal, each with its advantages and disadvantages. Most of these tools are applicable to the fisheries of the sub-region but the choice of tools must take into account the local conditions and resources in order to be effective.

8.1 Fishery Management Plans

One technique that could be effective in the Lesser Antilles is the preparation of fisheries management plans. Such plans do not need additional legislation for implementation by the administration. In cases where legislation is needed they can be implemented as policy. One of the big advantages is that the plans would provide an overview of the fisheries and the many issues facing administrators. This is very useful in a situation with limited human and financial resources. Against this background and as part of the plan, specific conservation and management measures and development plans can be formulated. Plans of this kind will not only assist in co-ordinating the different sectoral and bureaucratic interests that could play a role in fisheries management and development but also provide for a degree of continuity in fisheries policy. Fisheries management problems in the sub-region are complex and long term and cannot be resolved within the fisheries

sector alone, given the realities and constraints that exist. Inter-agency co-ordination and co-operation and regional co-operation are essential for managing the fisheries. Another advantage of these plans is that they could prove very useful in seeking development aid.

These plans, if reviewed regularly, would give a continuous picture of the status of the fisheries and would allow for preventive action to be taken before fishing has reached a critical level.

8.2 Stock Assessment

The need for stock assessment is usually emphasised as one of the main limiting factors to fishery management in the Lesser Antilles. However, the determination of TAC (Total Allowable Catch) may not be realistic short or medium term objectives as the demands for data are great in relation to the resources available to the Islands. Also, the stock assessment models developed for industrial fisheries of the northern temperate waters may not be applicable to tropical nearshore fisheries for obvious reasons. Therefore, in a situation with limited resources it will be better to continuously monitor the fisheries rather than focus on stock assessment. This does not mean that stock assessment should not be attempted if the resources are available. In any case monitoring the fishing industry is the foundation for stock assessment. For example, time series of catch and effort data are required for over seven years to calculate and analyse TAC.

Several approaches could be applied. One is to look at the overall species composition in the markets. Comparisons could be made between areas at the same time or between different years in the same place. Changes could be taken as an indication of an effect of fishing. Such information coupled with relative prices and scarcity or abundance of certain species on the market could give an indication of the level of the stock. Also, monitoring relative abundance of "indicator species" (e.g. parrot fishes, squids) in fish markets can also provide an indication of whether or not the stocks are heavily fished. In addition, examination of the sizes of fish on the market could be interpreted as an index of fishing intensity.

Monitoring the rate of entry or exit from the fishery by both fishers and boats can give an indication of the success of the fishery. A visit to the boat-yards to check on the volume of orders for new boats can provide an indication of levels of profit in the industry and can serve as an early warning of the problem of over-capacity in the years to come, if there is a backlog of orders.

Discussions with fishers may also provide an invaluable insight into the state of the fishery and of the resources. For example, a short fishing trip resulting in enough fish without using much gear is probably a sign that the resources are in a good state while the opposite could be a sign of a depleted resource.

In the Lesser Antilles continuous monitoring of the industry is probably a more realistic short term and cost-effective objective rather than stock assessment. However, whatever the objective, reliable data are essential for effective management. In the small island states of the Lesser Antilles, with limited living marine resources in their potential EEZ, one should guard against elaborate administrative schemes and management measures that may utilise more resources than the resource itself is worth.

8.3 Community Based Management

Community based fisheries management was traditionally practised in the Pacific Islands (Johannes, 1978) but was succeeded by other concepts such as "open access" fisheries due to the imposition of

Western culture. Development models adopted by most developing countries have been based largely on centralised planning and management concepts. This is the main reason why local knowledge and management skills have been ignored and not allowed to develop. However, in some coastal states like Japan, it has been institutionalised (Shima, 1983).

In the opinion of many investigators, "open access" fisheries have facilitated too rapid development in the quest for maximum profits while paying too little attention to conservation of the exploited stocks (Hardin, 1968; Berkes and Shaw 1986; Johannes 1978).

Management as applied to natural resources can be defined as the set of rules, labour, finance and the technologies that determine the location, extent and rate of resource depletion or renewal when applied to renewable resources. According to this definition, the users of the resource, in this case fishers, are the managers of the resource, because they make conscious decisions regarding the resource and the way they should be applied. They have centuries of experience to draw from.

Attempts should be made to introduce and encourage community based management to the Lesser Antilles even though there is no record of "formal tradition" in the region. However, there are examples of fishers acknowledging traditional fishing rights to marine space and observing unwritten rules and regulations concerning conservation. Community based management has to be initiated on an experimental basis and implemented through fishers organisations. The OECS harmonised Fisheries Legislation views the establishment of Local Fisheries Management Authority as a tool to give local communities preferential fishing rights that could encourage not only self reliance but self restraint in harvesting, viz conservation. Community based management is probably more suitable to the small-scale fisheries of the Lesser Antilles.

This complex and little researched subject holds great significance for the management of coastal resources in the Lesser Antilles. It has the potential of reducing administrative costs to government, use of local knowledge and expertise, responding to the needs of the community and being acceptable to the resource users. Local commitment is essential for conservation. It has the potential to cultivate self confidence and self regulation at the local level and also to reduce the decline of coastal fisheries. It can be viewed as the median between centralised and decentralised fisheries management. These potentials are highly desirable to the Lesser Antilles due to the scarcity of human and financial resources.

However, the implementation of community based management does not mean ecologically sustainable fisheries would evolve overnight. It requires the fishers to assume leadership roles if it is to succeed and the enactment of appropriate policies to facilitate and encourage the process which will involve decentralising decision making and participation of the resource users.

8.4 Government Policy and Development Planning

It has been accepted that in most of the islands the demersal fishing resources are fully exploited or even overfished. This fact should be reflected in Governments' policy in terms of maintaining or reducing landings rather than always planning for increases, which are then used as indicators of development. The criterion should be, how to reduce or maintain effort and renewable natural resources (fisheries) content, in achieving developmental growth. In other words, growth should take place at present or lower levels of exploitation. This calls for increased efficiency, reduction of post harvest losses, improve technology, utilisation of underutilised species, promoting aquaculture and effective planning.

Another factor that public policy needs to address is the increasing competition for coastal and marine resources by other economic sectors such as tourism and marine transport. Priorities have to be set and choices made. This should be reflected in governments' policy and development plans.

International, bilateral and regional co-operation in fisheries management should also be reflected in public policy since the islands of the Lesser Antilles are geographically close to each other and share various fishery resources which can only be managed jointly. In determining institutional framework for management, geography, type, range and biology of the targetted species, and environmental concerns are some of the factors that would determine whether international, regional or bilateral co-operation are required for the management of the fishery. For example, the characteristics of flying fish resource determines that it should be managed sub-regionally.

Although development planning, in theory and in practice, is widespread in the region, it has not been used in the fisheries sector as intensively as in the agricultural and industrial sectors. The peculiar characteristics of fisheries (common ownership of resources, biological, ecological and environmental factors, handling, processing and marketing aspects, etc.) require the State to take the lead role in fisheries planning, management and development. However, the States' role should be fulfilled in such a way that it never becomes an obstacle to the development of the sector.

Planning will allow and promote better resource management without dispersed or wasted efforts. It permits not only the adjustment of means to ends, so important for the sector in terms of steady and continuous operation, but also the introduction of appropriate policies and instruments aimed at growth and management of the activity. Fisheries planning experience in different countries of Latin America and the Caribbean has shown that it is a continuous process which requires not only short - and medium - but also long term forecasting. It is very important for planning systems to reflect the specific character of the sector and be closely integrated and co-ordinated with planning systems at the national level.

The work of fisheries development planning should take into account the following five basic criteria:

Flexibility: the uncertain character of fisheries activity due to both the nature of the resource and its biological characteristics can be reflected through unforeseen fluctuations in the production chain. Fisheries planning systems should provide mechanisms for control, adjustment and periodic updating of the formulated plans.

Multidisciplinary: fisheries activity constitutes a system that covers a number of scientific disciplines. Although each of them has a specific role in the plan preparation, both in this phase and that of implementation and execution, there must be a flexible communication system which includes teamwork by the different specialists involved. This methodology should ensure that objective, complete and effective plans are produced.

Participation: fisheries planning systems should provide suitable mechanism for the participation of resource users, the fishing community and other sectors of the economy in plan preparation and implementation. Their opinions, degree of involvement, and commitment to the established goals and objectives are of fundamental importance for achieving the desired results.

Integration: plans should be integrated into national development plans and national food plans.

Universality: plans should take into consideration as far as possible other variables and phenomena (coastal development, environmental concerns, tourism, etc.) that are related to and impact on fisheries.

The Report of FAO World Conference on Fisheries Management and Development (Rome, 1984) contains numerous valuable suggestions concerning the formulation of fisheries development objectives, policies and plans.

Countries planning fisheries development for the first time, and countries with planning experience but who wish to improve their efforts should consider including fisheries management and resource protection as integral components of fisheries development plans or programmes so as to achieve optimum benefit from their fishery resources.

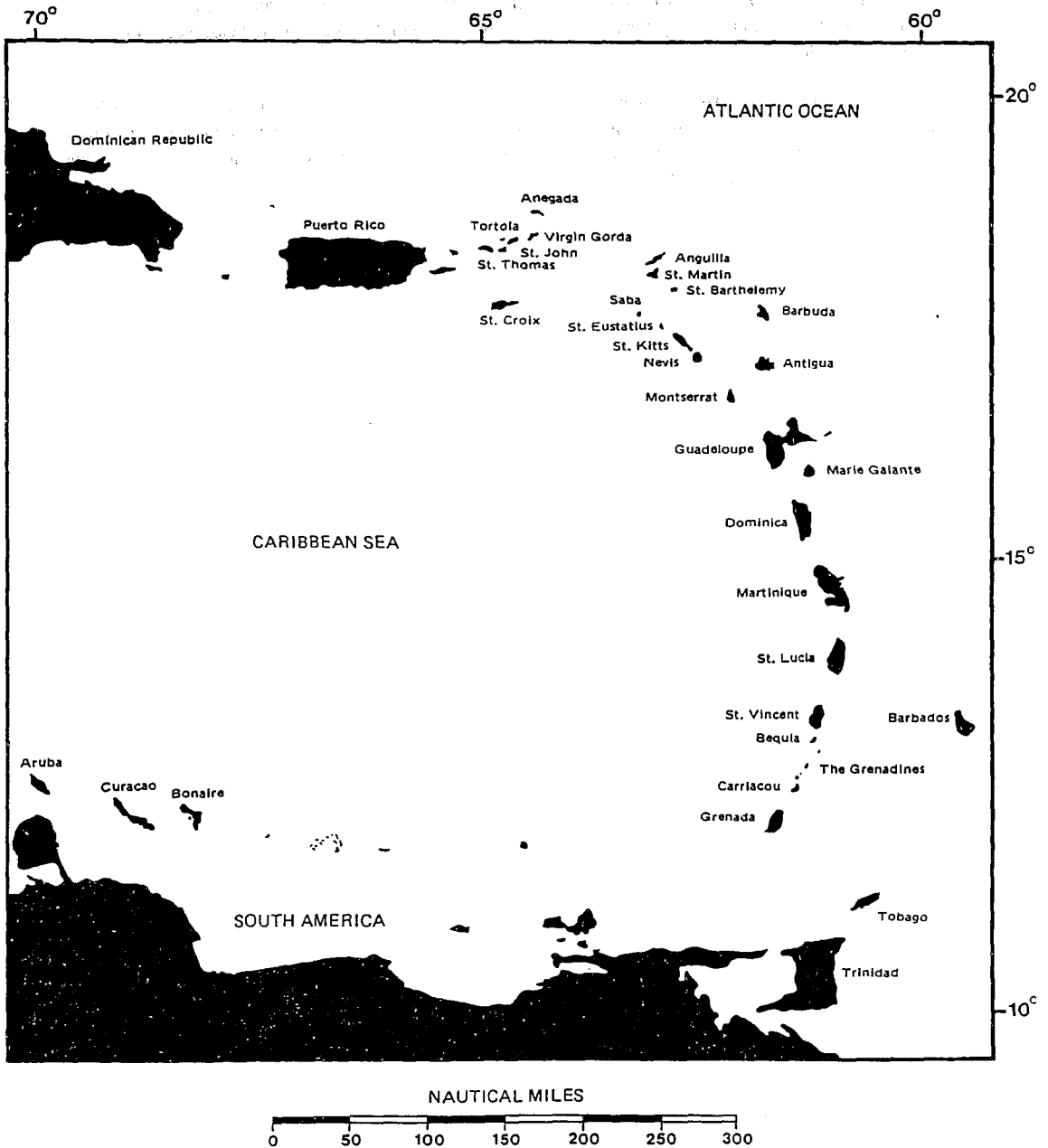


Figure 1. The Lesser Antilles Sub-Region

TABLE 1: BACKGROUND DATA ON THE FISHERIES OF THE LESSER ANTILLES

ISLANDS	STATUS	LAND AREA km'	POPULATION	LANDINGS				DEMAND	NUMBER OF FISHERS	NUMBER OF BOATS		
				1985 ^a mt	1985 ^a mt	1990 ^a mt	1991 ^a mt			5-10 M	11-17 M	20-30 M
Anguilla	UK	91	8,000	0	485	0	0	1,400 (incl. St. Martin & St. Barthelemy)	350	129	-	
Antigua/Barbuda	I	442	77,226	2,246 R	1,300	2,200 F	2,300 F	2,000	800	250	80	
Barbados	I	431	254,000	3,915	3,100	2,967	2,697	4,300	1,500	500	80	7
Dominica	I	750	80,300	446	950	600 F	590 F	2,000	1,700	630	11	
Grenada	I	344	100,000	1,584	1,100	1,784	1,990	5,600 (incl. St. Vincent & the Grenadines)	1,255	580	12	
Guadeloupe (incl. Marie Galante, Ile des Saintes)	F	1,779	344,000	8,390 F	8,400	8,642	8,444	9,100	1,596	1,000	30	
Martinique	F	1,101	350,000	4,604 F	4,600	3,385 F	3,587 F	9,100	855	1,140	26	
Montserrat	UK	102	13,000	111 R	100	115 F	120 F	300	200	70	3	
Netherland Antilles (Aruba, Bonaire, Curaçao & St. Martin)	N	1,204	260,000	1,030		1,200 F	1,100 F					
St. Christopher & Nevis	I	262	44,700	1,500	1,500	1,720 F	1,750 F	1,000	850	315	2	
Saint Lucia	I	616	140,000	1,052	1,200	903	910 F	3,100	2,000	650	1	
St. Vincent & the Grenadines	I	388	110,000	547 R	1,700	8,370	7,665	5,600 (incl. Grenada)	2,050	740	1	
Virgin Islands (UK) (Tortola, Anegada, Virgin Gorda)	UK	153	11,000	318 R	760	1,377	1,400	2,000 (incl. US Virgin Islands)	180	120		
Virgin Islands (US) (St. Croix, St. John, St. Thomas)	US	342	120,000	600	519	684	880	2,000 (incl. UK Virgin Islands)	480	325	10	

1. F = French, I = Independent, N = Netherlands, UK = United Kingdom, US = United States.
2. FAO, 1985 Yearbook of Fishery Statistics Vol. 60: F = FAO estimate, O = less than half metric ton, R = repetition of data previously reported by country.
3. Extracted from:
 - WECAFC Fishing Landings, 1985. FAO/WECAFC Working Party on Fisheries Statistics, 1986.
 - Draft Report, Workshop on Data Collection Systems in Eastern Caribbean, OECS Fisheries Unit, 1987.
4. FAO Year book of Fishery Statistics. Vol.72, 1991.
5. Includes part-time fishermen.
- 5 & 6. Extracted from:
 - 3 and 5 above
 - Chakalall, B., 1984. Perspectives and Alternatives for Fisheries Development in the Lesser Antilles. Proc. of 37 GCFI.

TABLE 2: CONSERVATION MEASURES

a) Technical Specifications for Fish Traps/Pots

Country	Minimum Mesh Size	Remarks
Barbados	1 1/2 ins (38 mm)	Measured across narrowest part.
Dominica	1 1/2 ins (38 mm)	Measured across narrowest part.
Guadeloupe	45 mm	From 1 Dec. 1987; In waters North of 16 50'N parallel and in waters South of 16 50'N parallel of more than 50 m depth.
	45 mm	From 1 June 1989; In waters more than 50 m in depth North of 16 50' N.
	38 mm	From 1 Dec. 1987; In waters South of 16 50'N parallel and less than 50 m in depth.
	38 mm	From 1 June 1989; In waters South of 16 50'N.
		Note: All measurements are taken as the longest distance between two parallel sides of a hexagon.
Martinique	30 mm, square mesh (x2) 40 mm, triangular mesh (x3) 17 mm, hexagonal mesh (x6)	Represents measurement of each side of mesh.
Virgin Islands (UK)	1 1/2 ins (38 mm)	Measured midway along the aperture of the mesh.
Virgin Islands (US)	1 1/4 ins (32 mm)	Measured across narrowest part. Must possess a self-destruct panel and/or self-destruct door fastening. Owner identification and marking.

b) Technical Specifications for Nets

Country/Net	Minimum Mesh Size	Remarks
Dominica - Cast net - Beach seine - Bottom gill net - Flying fish net - Trammel net	1/4 in (5.4 mm) 1/2 in (12 mm) 3 ins (76 mm) 3/4 in (22 mm) prohibited	All nets measured diagonally at full stretch
Guadeloupe - Fixed nets - Trawl nets - Trammel nets	20 mm (stretched 40 mm) prohibited centre net 40 mm (stretched 80 mm) outer nets 200 mm (stretched 400 mm)	Note: All nets measured wet
- For specific species: 'Colas' - Fr (<i>Ocyurus chrysurus</i> ; lane snapper - Eng)	20 mm (stretched 40 mm) sides 35 mm (stretched 70 mm) bottom/pouch (length 200 m, width 10 m)	
'Coulison' - Fr (<i>Selar crumenophthalmus</i> ; big-eyed scad Eng)	20 mm (stretched 40 mm)	
Small fish **	14 mm (stretched 28 mm)	
Martinique - Fixed nets - Trawl nets - Cast nets - Seines	25 mm2 35 mm2 15 mm2 15 mm2	Permitted 3 miles offshore only Note: Special nets for certain types of small fish may be permitted
St. Vincent and the Grenadines - Seine - Ballahoo* net - Tangle net (trammel net)	1 sq in 1/2 sq in prohibited	Not to be drawn on land
Virgin Islands (US)	1 1/2 ins	Stretched mesh except for bait fish, may have smaller mesh. Prohibited to take seines up to the shore or remove from water to withdraw fish.

* *Hemiramphus* sp. (Halfbeaks)

** Examples include:

- *Hemiramphus* sp. (Balaou - Fr; Halfbeaks - Eng.); *Decapterus punctatus* (Quianquia - Fr; Scad - Eng.); *Ablennes hians* (Orphie - Fr; Needlefish - Eng.)

e) Conservation Measures for Spiny Lobster (*Panulirus argus*) in the Caribbean

Country	Closed Season	Minimum Length	Minimum Tail Weight	Minimum Total Weight	Other
Bahamas	1 April - 31 July	3 3/8 in ¹			A fishing permit is required. Traps should be wooden 3 ft x 2 ft x 2 ft, with slats no less than 1 inch apart. Prohibited to: - possess 'berried' or egg-bearing females; - remove eggs from 'berried' females; - harvest lobsters with tail length less than 6 in.
Belize	15 March - 14 July inclusive	3 in ¹	4 ozs		No person shall take in the waters of Belize, or have in his possession, lobsters that: - have eggs or spawn; - have had the eggs or spawn removed; - have a soft shell.
Cuba	1 March - 31 May 15 Feb - 31 May (in Bahía de Carahatas only) 1 Feb - 31 May (in Cayo de Espartillo Nursery Zone only) (Res. No. MIP 647/87) Fishing is prohibited in nursery areas (Res. No. MIP 647/87)	15 cm ² (Res.No. MIP 135/85)			Prohibited to catch: - berried or spawning females; - lobsters other than by hand/traps/nets (Decreto No. 103/82)
Jamaica	1 April - 31 July				
Guadeloupe		210 mm ⁴			(Ref: Arrête du 16/07/1987 portant réglementation de la pêche en Guadeloupe)
Martinique		200 mm ³			(Ref: Decret du 05/12/1927 portant réglementation de la pêche en Martinique)
OECS Countries ⁵	Minister has power to declare notice in Gazette (1 April - 31 October in some islands)	250 mm ² or 95 mm ¹	200 g	680 g	Prohibited to: - harm, catch, possess, sell and purchase undersize, moulting or berried lobsters; - capture lobsters other than by hand/loop/pot/trap; - remove eggs from lobster; - land lobsters from a fishing vessel that are not whole.
Virgin Islands (UK)		3.5 in ¹		1 lb	Prohibited to: - harm, catch, possess, sell and purchase undersize or egg-bearing lobsters; - capture lobsters other than by hand/snare/tangle net/pot. (Virgin Islands Fisheries Rules No. 31, 1982)
Virgin Islands (US)		3.5 in ¹ (88.9 mm)			Prohibited to: - retain egg-bearing lobsters except in pots or traps until eggs are shed; - strip egg-bearing lobsters of eggs; - land and transport lobsters that are not whole; - use spears/hooks/drugs/poisons or other chemicals for catching lobsters; - import lobsters of less than 3.5 in carapace length or 6 oz. total weight. Requirements: - reporting of catch and effort information; - self-destruct panel or door fastenings on traps or pots and owner identification marking of same (CFMC, Environmental Impact Statement/Fishery Management Plan and Regulatory Impact Review for the spiny lobster fishery of Puerto Rico and US Virgin Islands, 1981)

Notes:

- (1) Carapace length.
- (2) Length from behind rostral horns to edge of telson.
- (3) Length from eyes to beginning of tail.
- (4) Length tip of supraorbital spine to end of tail.
- (5) Antigua/Barbuda, Dominica, Grenada, Montserrat, St. Christopher/Nevis, Saint Lucia, St. Vincent and the Grenadines.

d) Conservation Measures for Conch (*Strombus gigas*)

Country	Closed Season	Minimum Weight	Minimum Size	Other
Guadeloupe		250 g cleaned fish		Shell with flared lip. Note: Restrictions only apply to marine reserve. (Arrête du 16 juillet 1987).
OECS Countries***	Minister to declare by notice in Gazette.	225 g (8 ozs)	18 cm in length	Prohibited to take conch which do not have a flared lip. (OECS Harmonised Fisheries Act).
Virgin Islands (US)				5-year moratorium imposed in January 1988, in St. Thomas and St. Croix in process of establishing separate regulations. (Personal communication, Tobias, Dept. of Fish and Wildlife).

e) Conservation Measures for Turtles*

Country	Closed Season	Minimum Size	Other
Barbados		30 lbs	No taking of turtles or eggs within 10 yds. of the shore. (Fisheries Legislation Act. Cap. 131 S.2(1)).
Guadeloupe	15 May - 15 September for Green and Hawksbill. Ban on fishing for Loggerhead and Leatherback.	Carapace length 80 cm	Taking of turtle eggs prohibited. (Arrête du 16/7/1987 portant réglementation de l'exercice de la pêche en Guadeloupe).
Martinique			Taking of turtle eggs prohibited. (Decret du 5/12/1927 portant réglementation de l'exercice de la pêche en Martinique).
OECS Countries***	1 March - 31 July**	Leatherback 350 lbs** Green 180 lbs Hawksbill 85 lbs Loggerhead 160 lbs	5-year moratorium on fishing of all species approved by OECS countries. General protection: no taking or sale of turtles or eggs or interfering with nests. (OECS Harmonised Fisheries Act).
Virgin Islands (US)			General protection: no taking or sale of turtles or eggs or interfering with nests. (Virgin Islands Code, Title 12 Vol. 2B, Conservation S.318, 1982). Federally listed endangered species.

* Chelonia mydas - green
Eretmochelys imbricata - hawksbill
Caretta caretta - loggerhead
Dermochelys coriacea - leatherback

** Specified in some islands only; in others Minister to declare by notice in Gazette.

*** Antigua/Barbuda, Dominica, Grenada, Montserrat, St. Christopher/Nevis, Saint Lucia, St. Vincent and the Grenadines.

f) Conservation Measures for Sea Urchins (Sea Eggs) (*Tripneustes esculentus*)

Only Barbados has regulations controlling the fishing of sea urchins (except black sea urchins).

Country	Closed Season	Other
Barbados	1 April to 31 August. A two-year ban on fishing was instituted in August 1987 as an extension of the closed season until 31 August 1989.	No wilful or wanton destruction or injuring of sea eggs lying in any bay or shallow water. (Fisheries Regulations Act. Cap. 131 S.10(1)).

TABLE 3: EXISTING MARINE PARKS IN THE LESSER ANTILLES

Name/Year	Area (ha)	Status*	Noteworthy Marine Fauna	Administration
Antigua and Barbuda - Diamond Reef (Antigua), 1973 - Palaster Reef (Barbuda), 1973	2000 500	L L	Typical Caribbean coral reef fauna Typical Caribbean coral reef fauna	Fisheries Department, Ministry of Agriculture, Lands and Fisheries
Barbados - Barbados Marine Reserve, 1980	250	P	Varied population of sponges, anemones, polychaetes, sea urchins and sea cucumbers. 35 species of coral, 400 species of reef fish, 3 species of marine turtles.	Parks and Beaches Commission, Ministry of Housing, Lands and the Environment.
Guadeloupe (France) - Parc National de la Guadeloupe, 1982; includes Marine Parks Ilet Fajou Grand Cul-de-Sac Marin	21,500 (4,850 ha)	P	Marine area includes coral reef formations, sea grass beds and mangrove swamp. Includes a nesting site for turtles.	Mission pour la création du Parc National de la Guadeloupe.
Martinique (France) - Réserve Naturelle de la Caravelle, 1976	517	P	Beaches, reefs, sea grass beds, mangrove and coastal vegetation.	Parc Naturel Régional de la Guadeloupe.
Netherland Antilles - Bonaire Marine Park, 1979 - Curaçao Underwater Park, 1983 - Washington-Slabai Natural Park, Curaçao, 1969 (enlarged in 1977 by 400 ha)	2600 600 5900	P P P	Extremely rich Caribbean coral reef fauna Typical Caribbean coral reef fauna Caribbean coral reef fauna	Netherland Antilles National Parks Foundation (STINAPPA) STINAPPA STINAPPA
Saint Lucia - Maria Islands Nature Reserve, 1982	45	P	Caribbean coral reef fauna	Saint Lucia National Trust
St. Vincent and the Grenadines** - Tobago Keys Marine Reserve - Young Island and Callagua Reefs Marine Reserve - Petit Canouan Island Marine Reserve - Milligan Bay Marine Reserve	NI NI NI NI	L L L L	NI NI NI NI	NI NI NI NI
Virgin Islands (UK) - Wreck of the Rhone, 1980 (incl. 14 ha land)	323	P	Typical Caribbean coral reef species	BVI National Parks Trust
Virgin Islands (US) - Virgin Islands Natural Park (St. John), 1956 - Buck Island Reef (St. Croix), 1961	6073 356	F P	More than 50% Highland with some marine area Marine Caribbean coral reef fauna	US National Park Service

Notes:

- NI - No information
 * L - Legally existing no government protection or management plans
 P - Partially protected by government
 F - Fully protected by government

Sources:

- IUCN, 1982, IUCN Directory of Neotropical Areas
 - Wood, J. (ed.), 1984. Proceedings of the Workshop on Biosphere Reserves and Other Protected Areas for Sustainable Development of Small Caribbean Islands. US Dept. of Interior, National Park Service.

** Extracted from the Organization of American States Preliminary List of Existing Caribbean Marine Park-like Protected Areas, OAS, 1987.

TABLE 4: NATIONAL LIMITS RELATING TO TERRITORIAL SEAS, EXCLUSIVE FISHING ZONES AND EEZs

Country	Territorial Sea	Fishing Zone	EEZ
Antigua and Barbuda*	12 mi (1982)	200 mi (1982)	200 mi (1982)
Barbados*	12 mi (1977)		200 mi (1978)
British Virgin Islands (UK)	3 mi (1978)	200 mi (1977)	
Dominica*	12 mi (1981)	200 mi (1981)	200 mi (1981)
Martinique and Guadeloupe (France)	12 mi (1971)	200 mi	200 mi (1977)
Grenada*	12 mi (1978)		200 mi (1978)
Montserrat	3 mi (1978)	200 mi (1983)	
Netherland Antilles	12 mi (1986)	200 mi (1991?)	
St. Christopher/Nevis*	12 mi (1984)		200 mi (1984)
Saint Lucia**	12 mi (1984)		200 mi (1984)
St. Vincent and the Grenadines*	12 mi (1983)		200 mi (1983)
US Virgin Islands	3 mi	200 mi (1977)	200 mi (1983)

* Country is a signatory to a UN Law of the Sea Convention.

** Country has ratified UN Law of the Sea Convention.

TABLE 5: STATUS OF THE CONVENTION FOR THE PROTECTION AND DEVELOPMENT OF THE MARINE ENVIRONMENT OF THE WIDER CARIBBEAN REGION AND THE PROTOCOL CONCERNING CO-OPERATION IN COMBATTING OIL SPILLS IN THE WIDER CARIBBEAN REGION (AS AT 15 JANUARY 1987)

State	Convention		Protocol	
	Signed	Ratified	Signed	Ratified or acceded (1)
Antigua and Barbuda	-	-	-	-
Bahamas	-	-	-	-
Barbados	5 March 84	28 May 85	5 March 84	28 May 85
Belize	-	-	-	-
Colombia	24 March 83	-	24 March 83	-
Costa Rica	-	-	-	-
Cuba	-	-	-	-
Dominica	-	-	-	-
Dominican Republic	-	-	-	-
European Economic Community	24 March 83	-	-	-
France (Martinique and Guadeloupe)	24 March 83(2)	13 November 85	24 March 83	13 November 85
Grenada	24 March 83	30 May 85	24 March 83	-
Guatemala	5 July 83	-	5 July 83	-
Guyana	-	-	-	-
Haiti	-	-	-	-
Honduras	24 March 83	-	24 March 83	-
Jamaica	24 March 83	-	24 March 83	-
Mexico	24 March 83	9 April 85	24 March 83	9 April 85
Netherlands (Netherland Antilles)	24 March 83	16 April 84	24 March 83	16 April 84
Nicaragua	24 March 83	-	24 March 83	-
Panama	24 March 83	-	24 March 83	-
St. Christopher and Nevis	-	-	-	-
Saint Lucia	24 March 83	30 November 84	24 March 83	-
Saint Vincent and the Grenadines	-	-	-	-
Suriname	-	-	-	-

State	Convention		Protocol	
	Signed	Ratified	Signed	Ratified or acceded (1)
Trinidad and Tobago	-	24 January 86	-	24 January 86
United Kingdom (Virgin Islands, Montserrat)	24 March 83	28 February 86	24 March 83	28 February 86
United States of America (Virgin Islands)	24 March 83	31 October 84	24 March 83	31 October 84
Venezuela	24 March 83	-	24 March 83	-

- (1) Date when instruments of ratification or accession deposited with Government of Colombia.
 (2) Signed with reserve.

Source: UNEP Regional Seas Programme, UNEP/IG.67/3.

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