

Perspectives and Alternatives for Fisheries Development in the Lesser Antilles

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ABSTRACT

All aspects of fisheries development should be based on plans that derive from an analysis of the physical, biological, human, and economic resources and combined with inputs from the community, especially from the local fishermen. In the Lesser Antilles an appreciable number of fish stocks have been over-exploited or nearly so. Obviously, this points the way to adopting measures conducive to the management of the fishery resource. However, with the increased number of plans and effort to develop fisheries in the region there is the need to distinguish between the development of fishing activities which means increased or better use of the resource and management of that resource in order to bring about sustained production. This paper attempts to look at fisheries development in the Lesser Antilles and to mention some of the inputs and questions that are not normally considered in preparing fisheries development plans.

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 (Fig. 1). The 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 Barbados; it includes 13 countries or territories, some of which still have dependent status.

Physically the island states of the Lesser Antilles are generally small, sometimes being composed of a number of tiny islands. Their populations are also small but quite often the population density is very high (from 72 persons per square mile in the British Virgin Islands to 568 persons per square mile in Barbados) compared with the continental countries of the Caribbean region (Guatemala is the highest with 47 persons per square mile (United Nations, 1977)).

The Lesser Antilles have few natural resources and their economies are centered mainly around agriculture, tourism and light industries. Comparative studies of the Caribbean by Gajraj (1978), Putney (1978) and UNEP/ECLA suggest that the living natural resources in the Lesser Antilles are under

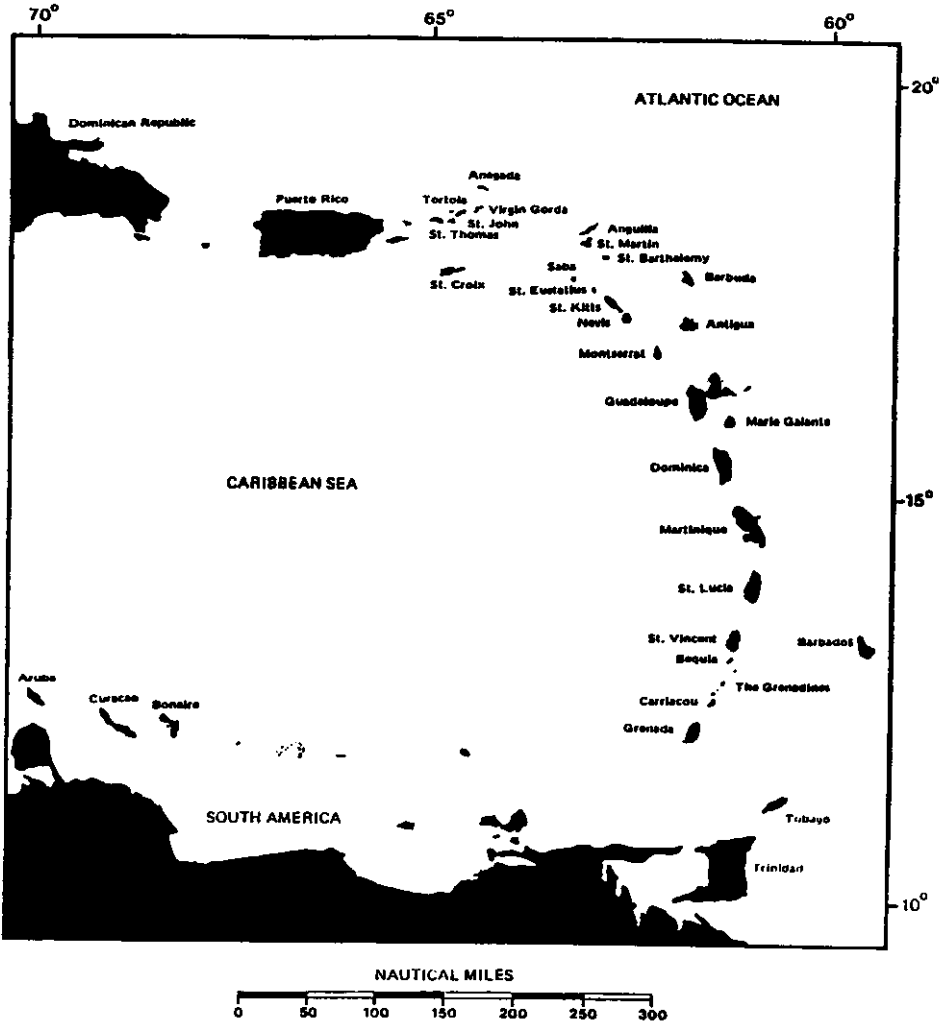


Figure 1. The Lesser Antilles Region.

greater stress than anywhere else in the region. The resource base of the islands are so limited that virtually all their resources are critical to the maintenance and development of their human populations.

The islands are nearly all endowed with only small continental shelf areas, with limited stocks of reef fishes which are generally over-exploited. Fishing is carried out by relatively simple gear consisting mainly of fish traps, handlines, gillnets and beach seines. The people of the region are large consumers of fish, about 20 kg per head/year. 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 14,000-16,000 t was imported in 1980 at an estimated cost of U.S. \$26-28 Million (WECAFC, 1983).

FISHERY RESOURCES

The islands of the Lesser Antilles are located on 15 different island platforms most of which present a narrow shelf area with a steep slope. The important shelf areas and banks exist around or near the Virgin Islands, Anguilla, Saba, Barbuda - Redonda and between St. Vincent and Grenada (The Grenadines). The shallow areas are characterized by coral reefs and sea grass beds. The general 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 exchanges between the Caribbean and the Atlantic take place through the channels existing between the islands thereby concentrating food and pelagic fish in the vicinity. The main area of exchange is near Grenada and Dominica. In addition to reef communities, species associated with the warm, clear oceanic waters such as tunas, billfishes, mackerels, sharks, flying-fish and turtles are found around the islands on a seasonal basis.

For simplicity the fishery resources of the Lesser Antilles can be roughly divided into three main categories.

(a) Littoral or inshore demersal and coastal pelagic and reef fish inhabiting the narrow shelves of the islands.--In most islands these resources are fully exploited or even overfished (conch, lobster and most species of reef fish). In many areas the habitats are very limited in area, providing a narrow fringe of shallow productive area bordering the land surrounded by much deeper and less productive waters.

(b) Offshore demersal species inhabiting offshore banks and reefs and slopes of the continental shelves, accessible to comparatively larger craft, either decked and powered with diesel engines or large, open boats driven by powerful outboard engines.--These resources are being exploited mainly by fishermen from Antigua/Barbuda, Guadeloupe and Martinique. In general, catch rates have been satisfactory but the fishermen of Antigua are reporting decreasing catches (Joseph, 1983).

(c) **Offshore pelagic resources.**--Large pelagics such as dolphin, skipjack, king-mackerel, sharks, bonito and some other species of tuna are fished offshore by fishermen mainly from the French islands, St. Lucia and Barbados. These migratory species are part of the oceanic stocks of the Atlantic which seasonally approach the waters of the Lesser Antilles. Fishing takes place in the Atlantic, but a French report (Sacchi et al., 1981) indicated that some areas, mainly south of the Leeward Islands, in the area of Aves and east of Grenada where seasonal concentrations occur, may be exploited by a small-scale fishery.

A large migratory stock of flying fish is seasonally exploited by the fishermen of the Windward Islands, especially Barbados.

There have been reports of sightings of Japanese longline vessels fishing for tuna in the Caribbean, which gave rise to the belief that there is the potential to develop a commercial tuna fishery in the Lesser Antilles. However, according to Idyll (1971) the fishing for tuna cannot be conducted on a sustained basis and catch rates have fallen in recent years. It is believed that the maximum sustainable yield can be harvested by about 10 million hooks or half the present fishing effort.

FISHERIES DEVELOPMENT

In the Lesser Antilles, fisheries development is centered around technological innovation to increase production with less effort, centralized service facilities (fisheries complexes), exploitation of under-utilized or unexploited species and technical assistance. This formula is not irrelevant to the region but judging from past experiences and recent trends, a number of other factors need to be considered, emphasized and included in development strategies.

TECHNOLOGICAL INNOVATION

Technological innovation (larger and motor powered boats, new and more efficient gear, fishing aids, etc.) designed to increase production and efficiency is essential for fisheries development. However, technology must be adapted to suit the resource base of the region and to improve the present operating conditions of the fishermen. Also, how much additional effort can the resources support? For example, it has been reported in the Barbados press (Barbados Advocate) that the Government of Korea is going to provide St. Vincent and the Grenadines with two 25 m trawlers powered by 1000 hp diesel engines. Demersal trawling needs shallow, level, soft-bottom environments - a popular approach to fisheries exploitation in continental areas. These vessels are unsuitable to the local conditions as there are no known trawling grounds within the area under the jurisdiction of St. Vincent and the Grenadines (including EEZ). Also, to operate the vessels efficiently would require a large budget. It has

also been alleged that a fisheries development project in Antigua/Barbuda has acquired four 44 ft boats, powered by 145 hp engines, without mechanical refrigeration, built in Pascagoula at a cost of U.S. \$165,000 each and designed to work in the Mississippi. These vessels are said to be unsuitable for local Atlantic conditions. Antigua has a boat building tradition and a 40 ft 'Antigua Sloop' built locally for the same purpose would probably cost half that price

A major portion of the region's current fish production is obtained by exploiting the inshore resources. It is generally agreed that the inshore resources are overfished and it is no secret that this inshore fishery depends primarily on healthy coral reef, seagrass and mangrove habitats. Given the present situation, the emphasis should be placed on the conservation of the habitats which sustain the resources. Seagrass beds and mangroves are recognized as important nursery areas for many important commercial species and forage organisms as well as some of the reef species, while the coral reef is known for its diversity and abundance of fish and invertebrate fauna. Coral reef resources do not lend themselves to highly technological nor massive harvesting techniques largely due to its occurrence in the form of small scattered numbers of highly diverse species.

Fisheries development in the region seems to concentrate on the exploitation of individual stocks and efforts to determine their optimum yields. The coral reef fish community is a diverse assemblage of species with complex interactions that does not lend itself to single species management. For example, groupers, wrasses and parrot fishes are protogynous hermaphrodites beginning mature life as females and changing to males when older (Smith, 1965). When fishing effort is directed, as it so often is, to the larger groupers, for example, the result is a reduction of males in the population with an obvious effect on reproduction.

It is unrealistic and possibly seriously misleading to assume that individual stocks can be exploited, studied and managed as though they existed in isolation; environmental, social, population and economic changes make management more complex than setting an optimum yield (Gulland, 1978). This complexity will force fishery managers to make decisions based on greatly increased efforts in research at the community level (Ogden, 1980).

For example, environmental fluctuations would effect spawning, feeding, etc., thereby affecting the standing stock which would indicate that optimum yield should vary as well. The effect of the El Niño phenomenon on the Peruvian anchovy fishery is a well documented example. By 1970, with a catch of over 12 million tons, the exploitation of anchovies appeared to be an example of a well-managed fishery. However, the picture changed in 1972 with the occurrence of a strong El Niño; although recruitment failed, due partly to unfavorable hydrographical conditions, the fishery continued with the same effort. An El Niño in 1976 caused another failure in recruitment from which the stock has not recovered up to 1982 (Arntz, 1983).

In reality, fisheries management in the Lesser Antilles region is far removed from environmental concerns (pollution, coastal erosion, sand extraction, sewage disposal, etc.) that have a direct negative impact on the habitat on which the inshore fishery is based. Management measures to ensure the continued existence of a stable and healthy coastal and marine environment are every bit as important as fishery regulations, yet very little notice is paid to them by resource managers. It is probably more logical, especially with the scarcity of resources in the islands of the Lesser Antilles and the competition for such resources, to look at the integrated management of marine and coastal resources rather than concentrating on any one sector (fisheries, tourism, sand mining etc.). Of course, integrated management would mean deciding on trade-offs from this multiple out-put system. Therefore, the goals and objectives for integrated resources management would need to be carefully defined by each island.

In general, opportunities to increase fish landings in the Lesser Antilles are limited. Local fleets have not expanded noticeably over the years and the percentage of part-time fishermen in the region is very high, which makes it reasonable to assume that the abundance and availability of fish is not there for large-scale expansion. Generally, it is assumed that if onshore service facilities and the necessary technology are provided, most part-time fishermen would engage in fishing full-time. Do part-time fishermen want to fish full-time and is it necessary to convert them? Most self-employed persons in the islands are engaged in a number of income generating activities (fishing, farming, construction, tourism etc.) at one time or another as the opportunity arises. Involvement in a number of activities can be seen as some sort of insurance (not putting all your eggs in one basket), in a region subjected to hurricanes and an unstable job market, or it could be a matter of striving to become self-reliant. Also, some farmers fish part-time for recreation.

There are some possibilities for increased production by fishing the Anguilla, Antigua and St. Vincent shelves and the Saba Bank. However, the presence of ciguatoxic fish in certain areas, especially near the Anguilla and Saba Banks, acts as a deterrent.

The offshore demersal resources are accessible only to larger boats and have been exploited mainly by Antiguan and French fishermen using vessels of 12-17 m, capable of spending up to one week at sea. Most of these areas are outside the territorial limits of the islands. Presently, there are about 50 such vessels operating from Guadeloupe and Martinique (15 more are on order) and 65 (sailing sloops) operating from Antigua. According to Antiguan fishermen, catches are declining and they frequently encounter French boats fishing, with a large number of 'very big' pots, over traditional Antiguan grounds. These claims have serious political implications, but more importantly, may be the cause of numerous conflicts between fishermen that were reported in the press. For example, the Government of Antigua and Barbuda prohibits the catching of

spawning and undersized lobsters only to find that fishermen from the French islands are harvesting these lobsters in Antigua and Barbudian waters (Martin, 1983). The Antiguan and Barbudian fishermen have lodged complaints with their Fisheries Division and made a few 'citizen arrests.'

The pelagic fishery, mainly in the Atlantic Ocean, is probably the only major resource of the Lesser Antilles that can lend itself to expansion. Fishermen have reported sightings of Japanese, Korean and Venezuelan vessels exploiting this resource. However, large scale investment in the ocean pelagic fishery should be approached with caution because a 200 ml EEZ does not mean that the resource is there. The St. Lucian and French fishermen have already demonstrated that this resource is accessible to small-scale technology. The larger French boats and the Antiguan sloops could be adapted to pelagic fishing. The pelagic species are very mobile and the boats will need to follow the movements of the fish. This means that fishing is likely to take place within the EEZ of different islands at different times and hence, conflicts may eventually develop.

SERVICE FACILITIES

Service facilities, such as ice manufacturing, cold storage, fish processing, improved landing sites (docks, wharves), lockers for storing fishermen's gear and equipment, etc., are essential for improving the present operating conditions of the fishermen and modernizing the industry.

In planning the development of service facilities, the linkages that exist at the unofficial (human) level between the islands should also be considered. For example, most of the fish produced in the Grenadines (Chakalall, 1982) and a substantial part from Antigua/Barbuda (Joseph, 1983) is sold to the French islands of Guadeloupe and Martinique because of the lucrative market and higher prices. Generally, fish is sold for about U.S. \$2.00-\$3.00/lb in the French islands and can be bought for U.S. \$1.00-\$1.50/lb in the other islands, which is above the government controlled price. Also, in terms of distance it is often easier for some fishermen to market their catch in other islands rather than landing at the main landing centers in their own islands (usually the capital city). For example, some fishermen from the north of St. Vincent market their catch in St. Lucia, from St. Lucia in Martinique and from Dominica in Guadeloupe. It should be noted that these types of linkages have developed over the decades and not only involve fisheries, but also agriculture.

In the designing of such facilities, however, the fishermen must be consulted and involved as they are the persons who will make such facilities succeed or fail. The construction of such facilities should be based more on satisfying the needs of the fishermen and improving their operating conditions rather than on the assumption that it will increase production, stabilize prices, improve marketing, improve gear and methods and encourage more persons to fish and thereby satisfying the needs

of the fishermen. There is merit in these assumptions, but, is one large centralized facility in the capital city desirable or a number of smaller facilities in the major fishing areas? Most centralized facilities disrupt the marketing and distribution system devised by the fishermen; should a new system be introduced or build on the existing one? For example, in the fishing village of Gros Islet in St. Lucia, with one hundred plus self-employed (in fishing) salespersons, there has never been a marketing problem and little need for cold storage or freezer facilities (Towle, 1984). In the British Virgin Islands, the management of the fisheries complex (ice making, storage, processing, marketing, berthing) has been advertising for sale 'top quality imported frozen fish' which leads one to conclude that the facility has not caused an increase in production and in order to maintain operations it needs to generate income from imports.

TECHNICAL ASSISTANCE

Generally, there are a number of experts/specialists of varying disciplines crisscrossing the region, often creating confusion and overlap. The experts usually provide a technical solution package for the problems they are asked to solve. They have neither the time and probably the training to consider the wider social, environmental and political consequences of their recommendations. They are doing a job and therefore no blame should be attached to them. Development for many appears essentially as something one buys or acquires from elsewhere, hence the importance attached to technical assistance.

Most times the advice of experts ends up as technical reports on shelves awaiting someone to implement them. Most outside experts do not have a sense of belonging and in the majority of cases do not see their reports to fruition. It is futile to assume that the resource management problems of the region can be solved by employing outside experts to the exclusion of local persons. Often local knowledgeable persons are not given the opportunity to use their expertise; this is not to say that outside experts' assistance is not needed.

The WECAFC Committee for the Development of Fisheries in the region at its meeting in St. Lucia, in May 1983, accorded highest priority to the establishing of a sub-regional (Lesser Antilles) fisheries support unit costing \$2.99 Million over a five year period (WECAFC, 1980). The project aims to base a number of 'internationally recruited experts' in one of the islands to provide technical advice on fisheries management, technology and extension to member governments, upon request. Most fisheries divisions/departments of the region lack professionals and are under staffed. Can outside experts operate without local support staff? What will happen when the WECAFC project ends and the experts leave? Communication, especially with fishermen, can also be a problem with outside experts.

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 need to be trained as 'general practitioners' rather than specialists and being supported by 'middle-technicians.' The 'middle-technician' should be involved in basic data collection, research and extension. Everyone agrees that there is a lack of basic data in the region; will the experts' time be efficiently used in the absence of basic data? Once a system for data collection is devised, the 'middle-technicians' will ensure continuity.

Experts may be needed to design and initiate research and interpret the results. Research should be tailored to be site specific and must take into consideration the availability of local resources and all activities should take place within the local fisheries development program. Mention should be made of high risk research (culture of penaeid shrimp, for example) that may not have a guaranteed pay-off. Such work is essential and requires large scale investment and specialized expertise.

Development aid is rarely rejected by the islands and new projects may be accepted even though human resources are over-committed (Goodwin, 1983). The probability of failures is thus increased. Therefore, the aim should be to make the optimum use of available human resources. Aid agencies should therefore place emphasis on the training of 'middle-technicians' and the retraining of fisheries officers as 'general practitioners' and providing them with the necessary inputs to implement the various technical reports.

PARTICIPATION

It should be pointed out that most fishery development plans were elaborated without the active involvement and inputs of experienced fishermen; reference is not made to ad hoc consultations or interviews, but to a program for the continuous involvement of the fisherman in research planning and development. The artisanal fisherman who is bound more closely to his locality has a very intimate knowledge of the habitat and behavior of the species of economic value. Fishermen often know more about the biology, distribution, and life history of these species than most modern scientists. Most fishery officials and experts complain of the inadequate data in the region on which to base decisions and management plans, yet no use is made of the knowledge of experienced fishermen. There never seems to be enough data on which to make decisions but it is normal and logical to use existing information. Traditional harvesting and resource management practices should be documented and, together with the knowledge of experienced fishermen, and available scientific data, decisions can then be made.

Most fisheries officials of the Lesser Antilles agree that fisheries regulations and penalties for protecting the resource and policing, have not been successful as a deterrent nor in upgrading the consciousness of the fishermen to the point where

they understand what needs to be done. Increased understanding is the first step towards voluntary observation of regulations and what better way to do it than by involvement of the persons whom the regulations are designed to affect, in their formulation. Most regulations are directed towards the resource users (fishermen) only; in specific cases (for example with regards to the minimum size of lobsters) regulations should also be directed to consumers (middlemen, hotels, etc.).

Development is people and not resource oriented, thus fishermen should be the locus of all fisheries development plans. Small-scale (artisanal) fishermen are, in principle, more highly motivated toward conservation because they appreciate the value of a sustained harvest at the most profound and elemental levels. Usually, the large-scale fisherman is more mobile and has a wider range of opportunities both in fishing and elsewhere and may be less concerned if a species is overfished. This often forces the small-scale fisherman to deplete tomorrow's stock in order to survive today. Involvement of fishermen can instill in them a conservation ethic and the need to use the resources wisely.

Information is lacking for the same reasons that generally plague fishery divisions/departments in the region; shortage of trained personnel and relatively small financial resources. Experience suggests that fishermen are particularly effective allies in research (Goodwin, 1983; Renard, 1983) even though they are often ignored or viewed as antagonistic to management. Munro (1974) in his study of the Jamaican trap fishery noted that 'about half of the 27 species considered in detail, became catchable well before maturity.' Size at first maturity for every commercial species must be known before intelligent conservation management is possible. The state of sexual maturity is among the easier data to obtain even in a fishery with very little research resources. This data can be obtained by involving fishermen in systematic sampling of the catch landed by the fishery, often at relatively low cost. If the knowledge gained by research is to be effectively used in the management of a fishery it has to be imparted to the fisherman in a way that he can understand. The best way to impart such knowledge is by involvement in all stages of the research.

The experience of the Caribbean Conservation Association, through pilot projects executed by its Eastern Caribbean Natural Area Management Programme and the Marine Resources Management Programme for the Eastern Caribbean, has shown that the participatory approach to research, planning and management makes implementation of policy, plans and management measures relatively easy. However, it is very easy to talk about the involvement of fishermen in the development process but to inspire and achieve participation is very difficult, as fishermen have been alienated for too long. There is the need to rebuild confidence and tactics used to get people involved depend very much on the disposition of the project personnel (Renard, 1983) and would vary according to circumstances; the main point is to get effective participation using whatever

means prove successful. It is a long process, very difficult at times, but the results are worth-while and rewarding.

CONCLUSION

The islands of the Lesser Antilles are individually and collectively different. Approaches to fisheries development should not be seen as a matter of transferring existing technology and methods that have worked elsewhere, but more of adaptation to suit the resource base of the region and to satisfying the needs of the fishermen. The major challenge is the involvement of fishermen in the collective effort to address the development needs of the region. Goals and objectives are more likely to be achieved if they are approved by the fishermen who should have a hand in research planning and implementation.

It seems best to pursue a development approach utilizing small projects which result in incremental advancement and building upon success rather than gambling on large investments that are dependent upon imported technology.

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ANNEX I

Background Data on the Fisheries of the Lesser Antilles

| ISLANDS | NUMBER OF FISHERMEN | NUMBER OF BOATS | | OBSERVATIONS |
|------------------------------|---|---------------------------|--------------------|---|
| | | 5-10 m | 11-17 m | |
| Anguilla | 375 (some part-time) | 334 - licensed by customs | - | Catch mainly exported - lobster and conch; small local market; comparatively extensive shelf area. |
| Antigua/Barbuda | 800 (some part-time) | 185 | 65 | Mainly demersal and reef fishes; exploits offshore resources; catch declining annually since 1981. |
| Barbados | 1500 (some part-time) | 500 | 15 (more on order) | Reef fishery on the decline; mainly offshore fishing for pelagics - flying-fish, dolphin. |
| Dominica | 1700 (majority part-time) | 500 | - | Catch - mainly demersal and reef species, some flying fish; very little shelf area. |
| Grenada | 1470 (350 part-time) | 700 | - | Ministry of Agriculture estimated (1978) 3% of landings demersal species, 97% pelagics. |
| Guadeloupe | 1000 registered; approx. 1000 unregistered | 1,500 | 26 (4 on order) | Littoral resources highly exploited or overfished; catch rates sustained at high levels; fishermen venturing further offshore to maintain catch rates. Association pour la Formation Maritime du Groupe Antille - Guyane (AFPM) involved in full time training, possess training ship. |
| Martinique | 900 registered full-time; unspecified number unregistered | 1,300 | 16 (10 on order) | |
| Montserrat | 165 (about 150 part-time) | 80 | - | Very limited shelf area, artificial reef constructed in 1983 in an effort to increase landings. |
| Netherland Antilles | | 750 | - | Further exploitation of coastal fishery not possible (over-exploited) |
| St. Kitts/Nevis | 900 (about 50% part-time) | 283 | - | In St. Kitts effort concentrated around landing sites as a result nearly all effort is concentrated on eastern side; more evenly distributed in Nevis. Lobster and conch are probably being harvested at levels beyond sustainable yield. |
| St. Lucia | 2000 (50% part-time) | 400 | - | Fishery is exclusively inshore in nature, strongly oriented towards capture of pelagic species (60% of landings) between December and July; narrow shelf area including two 'shallow channels' between St. Lucia and Martinique in North and St. Vincent in South; construction of on-shore cold storage and processing facilities in progress. |
| St. Vincent & the Grenadines | 2050 (majority part-time) | 740 | - | Major part of workforce in Grenadines involved in fishing - 800 fishermen and 305 boats; comparatively extensive shelf area, landings mainly demersal species (includes conch |
| St. Vincent & the Grenadines | 2050 (majority part-time) | 740 | - | and lobster) exported to neighbouring French Islands, Comprehensive fisheries development plan in preparation with assistance from FAO, 1984. |
| Virgin Islands (UK) | 152 (177 part-time) | 150 | - | Total annual catch 600 tons approx.; fish traps dominant fishing device; 1983 built on-shore facility (15 ton storage capacity, 8 ton chill room space and 7 ton deep freezer). |

Sources:

- i) See references
- ii) 'Country Summaries' presented at a workshop on 'Planning for Marine Resources Development' sponsored by the Caribbean Conservation Association, Anguilla, 21-23 June 1982.

ANNEX II

Fish Landings and Demand in the Lesser Antilles

| ISLANDS | AREA * (Square Miles) | POPULATION * | LANDINGS ¹ (¹ '000t) | DEMAND ² (¹ '000t) | LANDINGS ³ (¹ '000t) |
|--|--------------------------|--------------|--|---|--|
| Anguilla | 35 | 8,000 | 0 | 1.1 (includes St. Martin & St. Barthelemy) | 1.4 (includes St. Martin & St. Barthelemy) |
| Antigua/Barbuda | 171 | 74,000 | .94F | 2.0 | 1.3 |
| Barbados | 166 | 253,000 | 3.4 | 4.3 | 3.1 |
| Dominica | 290 | 79,000 | 1.5 | 2.0 | 0.5 |
| Grenada | 133 | 108,000 | 1.8 | - | - |
| Guadeloupe/St. Martin | 687 | 344,000 | 8.8F | 9.1 (includes Marie Galante & Ile des Saints) | 9.5 (includes Marie Galante & Ile des Saints) |
| Martinique | 425 | 326,000 | 4.6F | 9.1 | 3.9 |
| Montserrat | 39 | 13,000 | .12F | 0.3 | 0.1 |
| Netherland Antilles (Aruba, Bonaire, Curacao & St. Martin) | 465 | 260,000 | 1.8F | - | - |
| St. Kitts/Nevis | 101 | 44,000 | 1.8F | 1.4 (includes Saba & St. Eustatius) | 1.0 (includes Saba & St. Eustatius) |
| St. Lucia | 238 | 122,000 | 2.4 | 3.1 | 2.5 |
| St. Vincent & the Grenadines | 150 | 110,000 | .54F | 5.6 (includes Grenada) | 4.7 (includes Grenada) |
| Virgin Islands (UK) | 59 | 12,000 | .31F |) 2.6 |) 1.4 |
| Virgin Islands (US) | 132 | 105,000 | .88 |) |) |

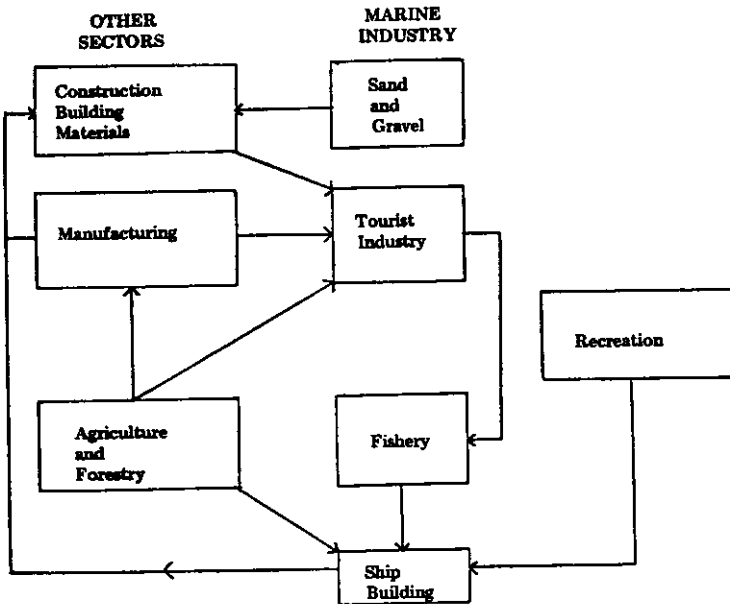
* Extracted from Lowenthal, A. 'The Caribbean', Woodrow Wilson Quarterly, VI, 2, 1982, pp 126 - 127.

(1) FAO 1982, Yearbook of Fishery Statistics Vol. 53. F = FAO Estimate; 0 = less than half metric ton

(2) & (3) Extracted from Olsen, D.A., D.W. Nellis & R.S. Wood. Ciguatera in the Eastern Caribbean. WEAFC/83/Inf.10, 1983.

ANNEX III

A model of an Integrated Marine Industry System



The model is an idealised version of how the various marine industries can complement each other and link up with other sectors in the economic system. The model shows, for example, that in terms of impact and influences, the tourist industry can play an important and pivotal role in development in that it exerts linkages on the major sectors in the economy. Although the government and service sectors are excluded from the figure, which concentrates on productive sectors, they are the major sectors, which are or can be affected by all the marine industries.

Source: Ceryle L. Mitchell and Edgar Gold, The Integration of Marine Space in National Development Strategies of Small Islands States (Halifax, Nova Scotia, Can.: Dalhousie Ocean Studies Programme, 1982).