

# Barbados

## Fisheries management plan

### 2004-2006

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#### SCHEMES FOR THE MANAGEMENT OF FISHERIES IN THE WATERS OF BARBADOS



Fisheries Division  
Ministry of Agriculture and Rural  
Development

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# **Chapter 1**

## **Introduction to the Fishing Industry**

Locally, fish is an important source of protein and food security. Its harvest, handling, processing and distribution provide livelihoods for thousands of Barbadians, earns valuable foreign exchange. This chapter examines the importance of the fishing industry and the need for fisheries management planning.

### 1.1 Location of Barbados

Barbados is the most easterly of the Caribbean islands. It is located at latitude 13° 10' N and longitude 59° 35' W, and is entirely surrounded by the Atlantic Ocean. Barbados is less than 200 nautical miles from neighbouring islands in the north, west and south. Barbados is yet to settle its marine boundaries with neighbouring states.

Barbados has a land area of about 432 square kilometres (km<sup>2</sup>) and a coastline of 95 kilometres. The island has a small shelf of only 320 km<sup>2</sup>.



Figure-1-1 Map of the Caribbean region

### 1.2 Importance of the fishing industry

The local fishing industry is of great economic and social importance. During the past 60 years the fishing industry has made tremendous strides to become an area of significant economic activity with several types of vibrant small businesses, including fish processing, fish retailing and wholesaling, boat building, fish export and fish distribution. These businesses provide employment and income for an estimated 6,000 persons directly and indirectly, many of whom are self-employed. The industry is also an avenue for earning vital foreign exchange through fish exports, in addition to being a major contributor to local food security.

### 1.3 Need for planning

Fisheries contribute to the nutritional, economic and social well being of Barbadians. The local fisheries currently are open-access. All Barbadians have access to the resources and no one person owns the resources. People may have little incentive to conserve the fish resources. Fishers will be inclined to compete with each other to catch as many fish as possible. Fishery resources, though renewable, are not infinite. Consequently, it is imperative that effective management measures be put in place to prevent overexploitation of fisheries resources, to rebuild those that are depleted and to ensure sustainability of the resources for present and future generations of Barbadians. Effective management will require new ways of operating and managing the fisheries. In this new paradigm, management of the local fisheries resources will no longer be solely the dictate of Government. Instead, fisheries management will require collaboration of, and sharing of responsibility by, all stakeholders in the fishing industry. This will be done within the parameters set out in the local legislation and various international conventions and agreements to which Barbados is party since many fisheries resources are shared amongst several countries, it is important that arrangements and organisations for fisheries management are used.

### 1.4 The Fisheries Management Plan

This is the third Barbados Fisheries Management Plan (FMP). This FMP covers the period 1<sup>st</sup> January 2004 to 31<sup>st</sup> December 2006. The FMP contains information on the status of the local fishing industry and the planning processes used in developing the plan. It outlines strategies for the development and management of the fishing industry to ensure its sustainable contribution to the nutritional, economic and social well being of Barbadians. During the plan-period the FMP will form the basis for fisheries policy, management and administration. It will guide the formulation and implementation of fisheries legislation. The FMP may be reviewed and revised at any time during the plan-period.

### 1.5 Implementation strategy

**Vision.** For the purpose of this FMP, the fishing industry is divided into harvest and post-harvest sectors. Visions are defined for each sector. The **Vision** represents the shared hopes and aspirations of the stakeholders for the future of the fishing industry. It identifies what the stakeholders want to be in place at the end of the plan period.

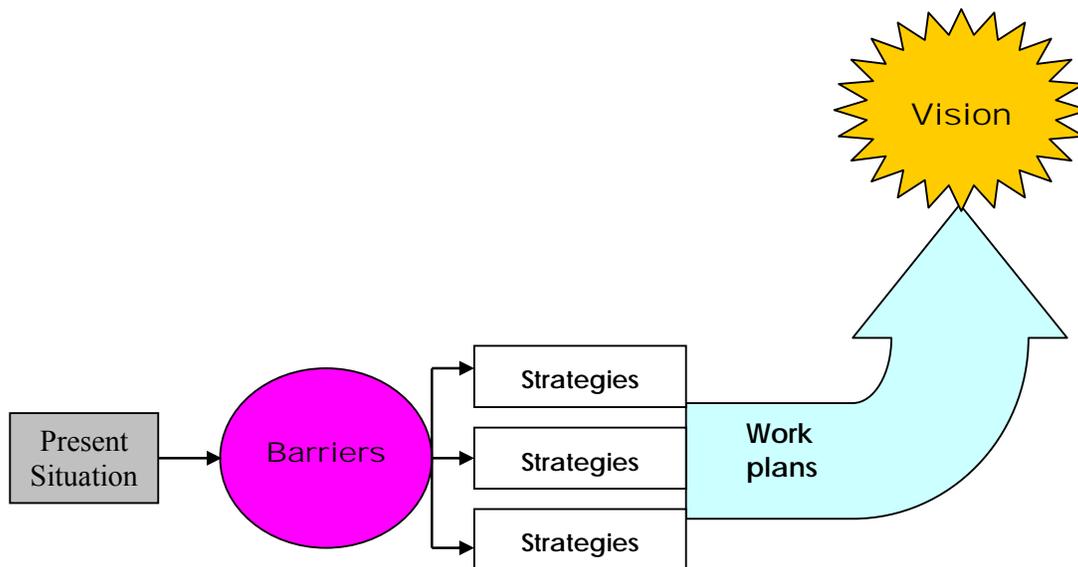
**Barriers to the vision.** The harsh reality of the present situation is that there are several obstacles and irritants, which block stakeholders from realising the vision. Therefore, the barriers standing in the path of each of the above visions are identified.

**Strategies to overcome the barriers.** Strategies to overcome the barriers are developed. The strategies are broad course of actions and programmes that will deal with the barriers and catalyse the movement to the vision, see table 3.1.

**Implementation programme.** Since strategies are broad actions and programmes, several specific actions may emerge to implement the strategies and catalyse the progress towards realisation of the vision. These specific sets of actions are the work-plans for the FMP.

Work-plans are measurable and have specific timeframes for completion. They:

- give clear descriptions of the actions necessary to move from the present situation to where the stakeholders want to be in the future;
- identify the achievements that will result from the action;
- assign roles and resources and; set time lines for activities.



*Figure 1-2. Implementation strategy to achieve the vision*

## 1.6 Legal framework

The Fisheries Act (Cap. 391 section 4) provides the legal authority for this Fisheries Management Plan (FMP) in terms of “schemes for the management and development of fisheries in the waters of Barbados”.

The Chief Fisheries Officer is responsible for developing and keeping such schemes (plans) under review. The Act sets out the mandatory content of the FMP, urges consultation in its preparation and review, and requires that the Minister responsible for fisheries approve the Plan.

## ***Chapter 2***

# **The Local Fisheries Environment**

The local fishing sector does not exist in isolation. It is intricately linked to, and influenced by, other sectors, and economic, social, regional and international factors. These factors combine to create an environment that dictates what, how, when, where and by whom, action can be taken in the fishing sector. This chapter describes the local fisheries planning environment.

## 2.1 National Profile

Government sets the social and economic development policy and planning framework for both agriculture and the fishing industry. The characteristics of the local fisheries are summarised in Chapter 5.

<b>GEOGRAPHY</b>	
<b>Location</b>	13°10' N 59°35' W
<b>Land area</b>	432 km <sup>2</sup>
<b>Coastal areas</b>	Coastline 92 km long; shelf 320 km <sup>2</sup> , with the 180 m depth contour on average 1.8 km from shore
<b>Maritime claims</b>	Under the UN Convention on the Law of the Sea, Barbados is entitled to an EEZ of up to 200 nautical miles from its territorial sea baselines. However, the precise location of the maritime boundaries (including EEZ boundaries) with Barbados' neighbouring States has yet to be delimited. Territorial sea: 12 nautical miles
<b>Climate</b>	Tropical with temperature range 24°C to 30°C; rainy season June to October; annual rainfall from 1200 mm to 1700 mm
<b>Terrain</b>	Relatively flat; highest peak 337 m; northern, western, and southern slopes descend by a series of coral terraces; eastern sections sedimentary
<b>Marine natural resources</b>	Oil, natural gas, fish, beaches, coral, sand.
<b>GOVERNMENT</b>	
<b>Type</b>	Parliamentary democracy
<b>Capital</b>	Bridgetown
<b>Administrative divisions</b>	11 parishes
<b>Independence</b>	30 November 1966 (from UK)
<b>Constitution</b>	30 November 1966
<b>Legal system</b>	English common law
<b>Suffrage</b>	18 years of age; universal
<b>Elections</b>	House of Assembly; elections last held May 2003
<b>Executive branch</b>	British monarch, Governor General, Prime Minister, Cabinet
<b>Legislative branch</b>	Bicameral Parliament consists of an upper house or Senate and a lower house or House of Assembly
<b>Judicial branch</b>	Supreme Court of Judicature
<b>Chief of State</b>	Queen Elizabeth II (since 6 February 1952), represented by Governor General (since 1966)
<b>Head of Government</b>	Prime Minister Rt. Hon. Owen Arthur (since September 1994)

*Table 2.1. The characteristics of the geography, and Government of Barbados*

PEOPLE	
Population	271,300 (2002)
Population growth rate	0.3% (2002)
Infant mortality	14.4 per 1000 births (2002)
Ethnicity	African 87.1%, Mixed 6%, European 5.5%, Indo-Pakistani 1.1%, other 0.3% (2000)
Language	English; Barbadian dialect widely spoken
Literacy	97.6% (Central Bank of Barbados)
Labour force	74,100 male; 69,200 female; 143,400 total (2002); about 2,200 in fish harvest (80% full-time) and up to an additional 3,800 in fisheries - related activities
Unemployment rate	8.7% male; 12.1% female; 10.3% total (2002)
Fish consumed	24-30 kg/person/year
ECONOMY	
GDP	\$4310.4 million at factor cost, includes \$14.6 million from fishing (2002)
GDP by sector	Tourism 10%; Manufacturing 6%; Government 19%; Business and finance 18%; Agriculture 4% (includes Fishing 0.3%) (2002)
Per capita GDP	\$15,900 (2002)
Product real growth rate	0% (2002)
Inflation rate	0.2% on consumer prices (2002)
Exports	\$483.0 million (f.o.b., 2002)
Imports	\$2,141.5 million (c.i.f., 2002)
Main industries	Tourism, sugar, light manufacturing, component assembly for export, petroleum, fisheries
Agriculture	Major cash crop is sugarcane
Exchange rates	Barbadian dollars (Bds\$) per United States dollar (US\$1) = 2.0113 (fixed rate)

*Table 2.2. The characteristics of the people and economy of Barbados. Source Ministry of Finance and Economic Affairs except noted otherwise.*

## 2.2 Guiding Principles for management of fisheries

### 2.2.1 *Code of conduct for responsible fisheries*

The Code of Conduct for Responsible Fisheries occupies a position of prominence among international fisheries instruments. The Code promotes the adoption of practices for the sustainable use, management, development, and conservation of all fisheries and aquaculture through the voluntary compliance of governments, fishing industries, non-governmental organisations and other entities associated with fisheries. Article 6 of the Code sets out general principles that are summarised below and serve as the guiding principles for fisheries management in Barbados.

- Maintain biodiversity and use ecosystem approaches to management;
- Manage fishing capacity and fishing methods to facilitate resource sustainability;
- Use precautionary approaches to sustainable use, management and exploitation;
- Protect and rehabilitate critical fisheries habitats and the environment generally;
- Use post-harvest practices that maintain nutritional value and quality of products;
- Include fisheries interests in all aspects of management planning and development;
- Establish effective mechanisms for monitoring, control and surveillance;
- Collect and provide data including sharing, pooling and information exchange;
- Ensure that fisheries decision-making processes are transparent and that all stakeholders have the opportunity to participate;
- Conduct trade in fish and fishery products according to applicable agreements;
- Cooperate with States in order to prevent disputes or resolve them in a peaceful manner;
- Promote awareness of responsible fishing through education and training;
- Ensure safe, healthy and fair working and living conditions for fishery workers;
- Recognise the contribution of small-scale fisheries to employment, income and food security;
- Promote aquaculture as a means for diversification of income and diet.
- Encourage aquaculture as a means to promote diversification of income and diet.
- Integrate fisheries into coastal area management to ensure that the needs of coastal communities are met without harming fragile coastal ecosystems.

### **2.2.2 Other international instruments**

The Code reflects the provisions of several fisheries-related international instruments including the:

- 1982 United Nations Convention on the Law of the Sea (UNCLOS)
- Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (i.e. 1995 UN Fish Stocks Agreement).
- Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (i.e. 1993 FAO Compliance Agreement).
- The 1992 Rio Declaration on Environment and Development; Chapter 17 in Agenda 21 of the United Nations Conference on Environment and Development (UNCED).

Barbados became party to the following International instruments and Organisations in order to properly manage the resources in the EEZ and to apply appropriate leverage in international circles to secure equitable shares of resource allocations through provisions that recognise the special circumstances of small-island developing states (SIDS).

- UN Fish Stocks Agreement (22 September 2000).
- FAO Compliance Agreement (26 October 2000)
- The Tuna Convention establishing ICCAT (13 December 2000).

Barbados is also party to the following relevant International Instruments:

- The SIDS Plan of Action, Convention on International Trade in Endangered Species (CITES),
- Convention on Biological Diversity (CBD),
- Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention.
- International Convention on the Prevention of Marine Pollution from Ships (MARPOL).

During this plan period it will be essential to ensure that Barbados can properly discharge its regional and international obligations, and receive adequate benefits from these instruments through strategic participation and representation at relevant meetings and alliances. Some changes to legislation and administration will be necessary. Also vitally important is the need to inform the fishing industry about these instruments and their consequences for the local and international fisheries regimes.

## **2.3 Fisheries Profile**

In Barbados, the fishing industry is considered by government to be a sub-sector of agriculture in the category "non-sugar agriculture". The local fishing industry comprises nine main fisheries - shallow-shelf reef fishes, deep slope fishes, coastal pelagic, large pelagic,

flyingfish, sea urchins, turtles, lobsters and conch. The flyingfish and large pelagic fisheries dominate the local industry.

The status of the stocks ranges from under-exploited to over-fished. The fishing gear used varies from hand-lines to sophisticated longline equipment (see chapter 5). Fishing areas range from the inshore coral reef to international waters. Locally, the demand for fish is high with an estimated consumption rate of 24-30 kg/person/year.

The public sector focuses mainly on infrastructure development and institutional strengthening, human resources development, fisheries resource management and legislation. The private sector has traditionally invested in harvest and post-harvest activities.

## 2.4 Stakeholders

Several government, non-governmental organisations, individuals and firms in the private sector are involved in the fisheries sector with various roles and responsibilities. These are called stakeholders since they have a stake or strong interest in the fishing industry. They can therefore influence the development of the fisheries sector. Knowing what each group does, and how they relate to each other, makes it easier to understand the industry. This allows well-informed decisions, avoids unintended negative impacts on fisheries or other sectors, and informs how best to participate in the fisheries planning and management processes.

### 2.4.1 Primary Government Stakeholders

The Ministry of Agriculture and Rural Development has primary responsibility for fisheries mainly through its Fisheries Division and Markets Division. A Fisheries Advisory Committee (FAC) comprised partly of stakeholders advises the Minister. The Projects Unit and Planning Unit are often involved in fisheries matters, as occasionally is the Rural Development Commission. Government stakeholders with direct responsibility for fisheries come under the umbrella Ministry of Agriculture and Rural Development. The responsibilities are distributed among several departments in the Ministry as outlined below.

- The **Fisheries Division** is responsible by law for fisheries management including conservation of resources and development of the fisheries. It also undertakes administration of, and services to the industry. The Division manages secondary and tertiary landing sites. Upgraded sites are usually handed over to the Markets Division. The proposed organizational structure, staffing and responsibilities of the Fisheries Division is presented in Annex 1. The total annual budget typically ranges between \$1.5 million to \$2 million (Bds).
- The **Markets Division** manages public markets including all of the fish markets (Oistins, Bridgetown, Speightstown, Weston, Conset Bay, Paynes Bay, Skeete's Bay and Tent Bay). The Division licenses fish vendors, collects fish tolls (landings tax), provides ice and fish storage facilities, rents lockers, monitors fish quality, maintains some boat repair areas

and the Bridgetown fishing harbour. The Fisheries Division shares jurisdiction over several areas with the Markets Division, and proper discharge of Markets' responsibilities is indispensable for the management of the fishing industry. There are no formal mechanisms for coordination or cooperation between the two agencies except through the Fisheries Advisory Committee and the Permanent Secretary of the Ministry.

- The ***Agricultural Planning Unit (APU)*** compiles some fisheries related statistics, integrates fisheries into agricultural planning where possible; plays various roles in the project cycle including reporting on major capital projects; occasionally conducts fisheries-related surveys; deals with some matters of fisheries economics and trade. The role of the Unit in relation to fisheries is not well defined, and is largely determined by specific tasks or projects.
- The ***Projects Unit*** implements local and foreign-funded capital projects such as improvements to landing site infrastructure. It formulates, appraises, monitors and evaluates such projects with the participation of the Fisheries Division and other agencies. Upon completion, the projects are handed over to the Fisheries Division or Markets Division for operation.
- The ***Meteorological Services Department*** provides forecasts of sea state and storm or hurricane advisories that all mariners should pay attention to. In addition, there is the possibility of oceanographic information such as sea surface temperatures becoming available in the future to help in finding fish.
- The ***Fisheries Advisory Committee (FAC)*** is provided for under the Fisheries Act (Cap. 391) to advise the Minister on all aspects of fisheries development and management. The FAC first met in December 1995, and typically meets at least once a month. Initially, it had by law seven (7) voting members: the Chief Fisheries Officer (*ex officio*), a biologist specializing in fisheries, a representative of the Ministry of the Environment, and four persons engaged in the fishing industry. Currently, the latter four are a fish processor, a boat owner, a fish vendor and a fisherman selected as individual experts rather than representatives of their occupations. An amendment to the Fisheries Act in 2000 added representatives of the Markets Division and a national fisherfolk organisation, bringing the present committee to nine (9) members. Special advisors (non-voting) are invited as required to provide input into the decision-making process.

#### **2.4.2 Secondary Government Stakeholders**

Other government agencies have less regular interaction with the fishing industry, but their activities may influence the fisheries sector.

### 2.4.3 *Non-government stakeholders*

- **Fisherfolk organisations:** there are fourteen locally registered fisherfolk organisations of which only five are active. Active fisherfolk organisations are essential for co-management (the sharing of power and responsibility by the state and fishing industry) and have a critical role to play in fishery management and development. They can promote self-reliance and ensure that stakeholders are adequately represented in interactions with government and the private sector.

Fisherfolk organisations known to be currently active are:

- Barbados Fishing Cooperative Society Limited
- Oistins Fisherfolk Association
- Weston Fisherfolk Association
- Sand Pit Fisherfolk Association
- Barbados National Union of Fisherfolk Organisations
- **Barbados Game Fishing Association (BGFA):** is the sole body representing recreational fishermen, and tournament anglers in particular
- **Bellairs Research Institute of McGill University:** conducts fisheries and environmental teaching at the local marine science station.
- **Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies (UWI):** offers fisheries and environmental research and teaching through undergraduate courses in marine science; graduate degrees.
- **Barbados Marine Trust:** formed in May 2000, is interested in all aspects of marine management and conservation, particularly coastal and nearshore.
- **Barbados National Trust:** occasionally has interest in marine and coastal conservation matters often in relation to physical development and historic sites.

### 2.4.4 *Primary Regional Agencies*

The list of regional and international agencies that can have significant influence on the Barbados fishing industry is long and varied. Only a few of the better known and more important are given below. An asterisk identifies the organisations of which Barbados is a member (\*).

- **The Caribbean Community and Common Market (CARICOM):** The Caribbean Community and Common Market (CARICOM) established through the Treaty of Chaguaramas in 1973, has been amended by a series of Protocols and will become of increasing relevance to fisheries management. The Caribbean Regional Fisheries Mechanism (CRFM) described below is intended to implement Protocol V on agricultural policy as it relates to fisheries. The other Protocols concerning the movement of people and capital, trade policy, subsidies and other elements of governance in the move

towards a Caribbean Single Market and Economy (CSME) will change the fisheries management environment in the region, and its interfaces with the global fisheries regime.

- ***Caribbean Regional Fisheries Mechanism (CRFM)\****: CRFM was launched as a CARICOM organisation in March 2003 as the successor to CARICOM Regional Fisheries Management Programme (CFRAMP). The goal of the CRFM is: "To promote sustainable use of fisheries and aquaculture resources in and among Member States, by the development, management and conservation of these resources in collaboration with stakeholders to benefit the people of the Caribbean region". The six initial priority areas concern regional management of fish stocks, national management of fish stocks, capacity building, international representation, project management and socioeconomic planning. The CRFM has the potential to facilitate or host regional fisheries management arrangements for particular fisheries resources. Barbados is a member of the CRFM.
- ***Organization of Eastern Caribbean States (OECS) and its Environmental Sustainable Development Unit (ESDU)***: provides advice on fisheries matters for its eastern Caribbean member states. Barbados is not a member of the OECS.
- ***The FAO Western Central Atlantic Fisheries Commission\* (WECAFC)***: facilitates consultation on fisheries topics mainly through occasional regional meetings. Barbados has recently re-confirmed its interest in remaining an active member of WECAFC and chaired its ad hoc working group on flyingfish from 1999-2000.

#### **2.4.5 Secondary Regional Agencies**

- ***Intergovernmental Oceanographic Commission Sub-Commission for the Caribbean and Adjacent Regions\* (IOCARIBE)***: is concerned with fisheries oceanography including harmful algal blooms, whales and large marine ecosystems.
- ***Caribbean Conservation Association (CCA)***: facilitates development and implementation of policies, programmes and practises which contribute to the sustainable management of the region's natural and cultural resources.
- ***Gulf and Caribbean Fisheries Institute (GCFI)***: facilitates consultation on technical and scientific fisheries topics mainly through annual meetings, provides technical and scientific literature.
- ***Caribbean Fishery Management Council (CFMC)***: is the regional council for the Caribbean territories of the USA under its system of management councils. The CFMC has important roles to play in managing certain resources such as conch and reef fish, and is an interface with US fisheries policy.

- **Caribbean Environmental Health Institute (CEHI):** assists with the development of pollution monitoring capabilities at the national level. It is looking at marine ecosystem health issues.
- **Institute of Marine Affairs (IMA):** located in Trinidad is recommended to become more regional in its mandate as a CARICOM centre of excellence.
- **Caribbean Natural Resources Institute (CANARI):** is a NGO concerned with participation in governance and resource management including the co-management of fisheries and coastal areas.
- **Caribbean Fisheries Technical Development Institute (CFTDI):** provides training in several aspects of fisheries

#### **2.4.6 International Stakeholders**

- **International Commission for the Conservation of Atlantic Tunas\* (ICCAT):** provides information on the regional management of tunas and tuna-like species following stock assessment and associated research, and determines appropriate management measures for fishery conservation. Barbados contributes catch and effort statistics, and was represented as an observer at ICCAT meetings by CFRAMP. Barbados became a Contracting Party on 13 December 2000 and is now fully entitled to participate in the meeting of the Commission and all other aspects of ICCAT for which the appropriate fees are paid.
- **Food and Agriculture Organization (FAO) of the United Nations\*:** provides technical advice and assistance on a project basis, provides technical and scientific literature, facilitates consultation on fisheries topics mainly through occasional regional meetings.

#### **2.5 Policy on marine jurisdiction**

At the national level, Barbados has yet to develop a comprehensive policy for the utilization of the EEZ that embraces diverse sectors such as fisheries, energy, communications, transport, environment, national security, etc. Barbados has promoted the policy that the maritime boundaries of the CARICOM member states should be delimited, and thereafter the waters within the delimited EEZs should be utilized as a common resource, shared for fisheries exploitation purposes, and managed on a regional basis (i.e., Lesser Antilles) where possible. This 'common sea' concept is proposed as a model for long-term Caribbean development with the achievement of economies of scale and improved efficiency through regional integration, perhaps including trans-national inter-sectoral linkages.

## 2.6 Fisheries Legislation

Legislation is one of the most obvious and important expressions of fisheries policy and planning. This section describes key pieces of legislation.

### 2.6.1 Principle Fisheries Legislation

- ***Fisheries Act (1993, amended 2000)*** includes formulating and reviewing fisheries management and development schemes; the establishment of a fisheries advisory committee; fisheries access agreements; local and foreign fishing licensing; sport fishing; registration of fishing vessels; construction and alteration of fishing vessels; fisheries research; fisheries enforcement and the obligation to supply information. Also specifies conservation measures such as prohibiting the use of any explosive, poison or other noxious substance; closed seasons, gear restrictions, creation of marine reserves. The Act gives the Minister responsible for fisheries the authority to create new regulations for the management of fisheries as and when necessary.
- ***Fisheries (Management) Regulations (1998)***: includes:- mesh size restrictions for seine nets (3.81cm, stretched mesh, minimum size) and fish traps (3.18 cm at narrowest point); the mandatory installation of escape panels and identification marks on fish traps; prohibits the use of trammel nets and other entangling nets; prohibits the capture of lobsters carrying eggs or removing the eggs from lobsters (scrubbing); prohibits the capture, possession or sale of marine turtles, turtle eggs and turtle parts; bans the use of SCUBA for harvesting sea eggs; regulates the sea egg fishery through the designation of closed seasons and closed areas by the Minister responsible for fisheries, prohibits landing tunas of less than 3.2 kg live weight; stipulates that aquatic flora or fish to be used for ornamental purposes may only be fished with the written permission of the Chief Fisheries Officer, stipulates that corals may not be damaged, destroyed or fished without the written permission of the Chief Fisheries Officer. The maximum penalties for breaking of any these regulations are a fine of \$50,000 and/or two years imprisonment. Additional fisheries regulations are being drafted.

### 2.6.2 Fisheries-related legislation

Several pieces of legislation, not under the jurisdiction of the Minister responsible for fisheries or the Chief Fisheries Officer, are also relevant to the management of the fishing industry. Those listed below are only the most directly related. Other existing and planned environmental legislation will also influence fisheries management.

- ***Markets and Slaughterhouses Act (1958)***: registration of fish vendors, operation of fish markets, collection of fish tolls. This Act is expected to be replaced during the plan period.

- *Barbados Territorial Waters Act (1977)*: defines territorial and internal waters
- *Marine Boundaries and Jurisdiction Act (1978)*: defines waters of EEZ
- *Defense Act (1979)*: control and surveillance in the EEZ and territorial waters
- *Shipping Act (1994)*: registration and inspection of large vessels
- *Coastal Zone Management Act (1998)*: coastal resource management and planning
- *Marine Pollution Control Act (1998)*: prevention, reduction and control of marine pollution
- *Health Services (Food hygiene) Regulations (1969)*: food safety

## 2.7 Fisheries research

The Fisheries Division, and departments of the University of the West Indies do fisheries and fisheries-related research in Barbados. Bellairs Research Institute of McGill University has become less significant recently, but has already made a tremendous contribution. The Fisheries Act requires research institutes to be authorised and for the Chief Fisheries Officer informed of completed and planned fisheries research.

By law, the government must be informed about fisheries research activities in the waters of Barbados and give permission for it to be conducted. It is expected that the information resulting from research will improve future management decisions to prevent over-exploitation and facilitate sustainability. In many cases the research is done, and sometimes can only be done, on a regional basis.

Data used to monitor fisheries in relation to management objectives, strategies and targets are routinely collected to predict or plan for the future by evaluating trends and patterns. An important aspect of plan implementation will be to improve on making statistical information more readily available to organisations and individuals that require it, especially in the fishing industry. Listed below are perspectives on some of the areas that are being studied.

### 2.7.1 *Catch and effort statistics*

Fish catches and fishing effort are the statistics recorded daily at fish landing sites. In addition to these, fish prices are recorded at fish markets. Other statistics are collected by sampling or special surveys. The collaboration and co-operation of fisherfolk in supplying the best available data is essential for the success of the statistical programmes associated with management and development. There are also important roles for the industry to play in analysis, interpretation and the decision-making for which the data were collected.

### **2.7.2 Biological and ecological**

This Includes information such as species diversity and distribution; size or age composition of the catch; fecundity; potential yield or maximum sustainable yield; life history and ecology; migration; stock structure catch and landings; fishing effort; catch per unit effort; fishing gear selectivity and efficiency. More attention is being paid to ecosystem and fishery analyses where interactions of all types are taken into account. Much of this research can be undertaken in collaboration with the fishing industry's harvest sector making use of the available local knowledge of fisheries ecology. Integrating the observations of the harvest sector with the explanations of the fisheries scientists is a particularly powerful combination for research.

### **2.7.3 Social and economic**

This Includes information such as age and education of fisherfolk; family and social unit composition; quality of life; social networks and organizations; participation in fisheries management; effects of changes in fishing technology; recruitment into the fishing industry; occupational alternatives; percentage contribution to GDP; fishery enterprise profitability; average fisherfolk incomes and expenses; input cost analysis; fish price analysis; cost-benefit and cost-effectiveness analysis of management measures; employment; trade trends. Again, this research is best undertaken in collaboration with the fishing industry, especially since many details are not directly observable and properly understanding them requires having dealt with them as livelihood experiences.

## **2.8 Disaster management**

Each year the Fisheries Division prepares or revises national hurricane preparedness plans given its responsibility under the Central Emergency Relief Organisation (CERO) for the safety of the fishing fleet.

*Table 2.3 The Fisheries Division's annual hurricane preparedness cycle*

January	Period of relative inactivity
February	
March	Pre-season servicing of equipment
April	Procure supplies for hurricane season
May	Formulate hurricane preparedness plan
June	Preparedness exercises and tests
July	
August	Maintain state of preparedness
September	Activate plan as necessary
October	Hurricane season evaluation
November	Post-season servicing of equipment
December	

## 2.9 Services and incentives

The Government through the Fisheries Division offers the following services and incentives:

- Tax and duty concessions on marine fuel, boats, engines and spare parts, fishing gear, fish handling equipment and other related supplies
- Payment of water and electricity at boatyards and landing sites.
- Non-commercial fees for the tractor service used in small vessel haul-out
- Free registration, licensing, inspection and other statutory services
- Maintenance and upgrade subsidy of up to \$2000 per boat per year
- Development funds for technical assistance and loan financing
- Grants to fishing industry organisations for approved projects
- Free accommodation for umbrella fisherfolk organisation.

# **Chapter 3**

## **The Harvest Sector**

The harvest sector is the foundation of the fishing industry. It comprises the fishers, fishing vessels, fishing gear and supporting facilities for fishing.

Here numerous factors such as the quantity of catch, catch rate and catch value determines productivity in the fishing industry. The treatment of the catch is the first step in determining the quality of the products received by the consumers and responsible fishing practices will ensure the sustainable utilisation of the fisheries resources.

This chapter examines the fisheries resources, fishing vessels and gear, landing facilities, stakeholders, visions for the sector, barriers to the visions and strategies to overcome the barriers in the harvest sector

### 3.1 Fisheries Resources

The target species of each fishery are listed below. More detailed descriptions of the fisheries are given in Chapter 5.

**Shallow-shelf reef fishes:** hinds, parrotfishes, grunts, surgeonfishes, triggerfishes.

**Deep-slope and Bank reef fishes:** snappers, groupers and small tunas.

**Coastal pelagics:** jacks, herrings, silversides, anchovies, ballyhoo, robins/scads, barracuda, garfish, small tunas and the young of large tuna such as yellowfin.

**Large pelagics:** tunas, wahoo, kingfish (billfishes), dolphinfish, swordfish, mackerels

**Flyingfish:** four-winged flyingfish.

**Sea urchins:** white sea urchin.

**Lobsters:** Caribbean spiny lobster.

**Conch:** Target species – Queen Conch.

**Turtles (CLOSED SINCE 1998):** hawksbill turtle, Green turtle, leatherback turtle loggerhead turtle.

### 3.2 Fishing Vessels

The local fishing vessels range from small open rowboats (less than 6m) that fish at nearshore reefs to well-equipped inboard-engine powered longliners (over 22m) that target tunas and swordfish as far as 200 miles offshore.

A two-tiered system is used to classify local fishing vessels. Vessels are first classified by length as **class 1** [less than 6 m], **class 2** [greater than 6 m but less than 12 m] and **class 3** [greater than 12 m]. Each length class is also sub-divided into types: **moses**, **dayboats/launches**, **iceboats** and **longliners** based on their physical structure or the type of gear carried.

**Moses** (approx. 485). Moses are open boats 3-6 m in length (figure 3.1); constructed of either wood or glass reinforced plastic [GRP]; propelled either by oars or 10-40 hp outboard engines; used primarily for reef and coastal fisheries. Gear commonly used includes hand and trolling lines, fish traps and cast nets. Moses may also be used as tenders to bigger vessels and for transporting seine nets and diving gear.



Figure 3-1 Barbadian fibreglass moses

**Dayboats/Launches**(approx. 250). Dayboats are mostly wooden vessels 6-12 m in length fitted with a cabin (figure 3.2); propelled by inboard diesel engines from 10-180 hp; used primarily for harvesting flyingfish and large pelagics on day trips; carry navigation, communication and safety equipment. Gear commonly used includes hand and trolling lines, gill nets and hoop nets. Also used for tending set nets and transporting divers.



Figure 3-2 Barbadian dayboat or launch

**Iceboats** (approx. 190). Iceboats are characterised by being fitted with insulated ice holds; carry a cabin; usually greater than 12 m in length; propelled by inboard diesel engines; carry navigation, communication and safety equipment (figure 3.3); used primarily for harvesting flyingfish and large pelagics on trips of 5-10 days. Gear commonly used includes hand and trolling lines, gill nets and hoop nets



Figure 3-3 Barbadian iceboat

**Longliners** (approx. 30). Longliners are greater than 12 m in length; fitted with insulated ice holds; propelled by inboard diesel engines; carry navigation, communication and safety equipment (figure 3.4); used primarily for fishing tunas and swordfish, with a by-catch of large pelagics, on trips usually of 12-28 days. Pelagic longline gear is the mainly used, but some may carry all of the other gear associated with iceboats.



Figure 3-4 Barbadian longliner

### 3.3 Fishing Gear

Fishing gear varies from hands to sophisticated longline equipment. However, the local fishing gear falls into three categories – nets, lines and hooks and traps - but the type of gear used depends on the target species.

**Nets.** Barbadian fishers mainly use four types of nets. Gillnets and dipnets are common in the flyingfish fishery; seine nets are used in harvesting reef fishes, and; cast-nets are commonly used to capture of jacks, pilchards and frays.

**Hook and Line.** Hooks and lines are very common fishing gear. The type of line used depends on the target species:

- *brim lines* are used to harvest snappers;
- *guineaman line* are used to harvest barracuda garfish and flyingfish;
- *pillar sticks* are used on to harvest sappers and other demersal;
- *blowgoat lines* are used to harvest coastal tunas and bonitos;
- *trolling lines* are used to harvest in coastal waters to harvest tunas, marlins, kingfish and dolphinfish;
- *rod and reels* used harvest a wide ranger of reef, coastal and pelagics species and;
- *longline* is used to harvest swordfish and tunas.

The lines are usually made monofilament and braided nylon, but stainless steel wire, cable and twisted rope are not uncommon. Hooks also vary considerably in their size, shape, and tensile strength.

**Traps.** Fish traps locally known as “pots” are used to harvest fish near the coral reefs. Traps are named according to their shape. Therefore, they are Z, S, A, Rectangle and Square traps.

### 3.4 Landing Facilities

There are about 30 fish landing sites around the island with varying types of facilities, these are categorised as primary (markets), secondary (sheds) and tertiary (beaches) based on the type of physical infrastructure present at the site.

**Primary Landing Sites.** Processing and retail areas and facilities such as chill or cold storage, ice, lockers and haul-out area characterizes primary sites. Fish tolls, catch and effort, and price statistics, are collected at these fish markets managed by the Markets Division. The majority of catches are landed at the primary sites.



*Figure 3-5 View of the fishing harbour of the Bridgetown Public Market*

The primary landing sites are:

- Bridgetown Public Market in St. Michael;
- Oistins Fish Market in Christ Church;
- Skeete's Bay Fish Market in St Philip;
- Conset Bay Fish Market in St. John;
- Payne's Bay Fish Market in St. James;
- Weston Fish Market in St James;
- Speightstown Fish Market in St Peter.

**Secondary Landing Sites.** Secondary landing sites are characterized by the presence of a shed and a slab for cleaning and cutting fish. Caretakers are employed by the Fisheries Division to clean the sheds and collect catch and effort statistics. There are three secondary landing sites at:

- Pile Bay fish in St. Michael
- Half Moon Fort in St. Lucy
- Martins Bay in St. John.



*Figure 3-6 Fishing shed at Half Moon Fort, St. Lucy*

**Tertiary Fish Landing Sites.** There are several open beaches scattered along the coast. The most active is at Six Mens Bay in St. Peter.

### 3.5 Stakeholders

The primary stakeholders of the harvest sub-sector are fishermen and boat owners. Fishermen dominate the harvest sector. Fishermen comprise 63% of the primary stakeholders while boat owners account for 37%. In all 78% of the primary stakeholders (including boat owners) are active fishers. The majority of fishermen and boat owners are males. Males account for 99% of the fishermen and 91% of the boat owners. Males in the age group 45-49 are in the majority among both fishermen and boat owners.

The secondary stakeholders are boat builders, ice suppliers, fuel suppliers and ancillary service providers.

**Primary stakeholders Organisations:** Fisherfolk organisations, Fisheries Division, Markets Division.

**Secondary stakeholders:** Coast Guard, Police, Coastal Zone Management Unit, The National Conservation Commission (NCC), individual hotels, Town Planning Department.

### **3.6 Vision of the harvest sector**

The vision stated below represents the shared vision of the stakeholders, for the harvest sector.

1. Trained and well-informed fishers and fisherfolk organizations playing an active and vital role in the sustainable management of the fisheries resources and in quality assurance of seafood.
2. Well-maintained and designed vessels complying with national legislation and standards for design, construction, safety at sea and hygienic storage and handling of fish.
3. Fishers using responsible fishing practices and not engaged in activities that undermine the effectiveness of any accepted national, regional or international fisheries management measures.
4. Modern and appropriate infrastructure that supports the loading of supplies, sanitary offloading of catch, and construction or repair of vessels.
5. Fishers supporting and benefiting from social services which contribute to their well being in times of need.
6. Local and regional fisheries stakeholders working together to manage national and shared fisheries resources.

### 3.7 Strategies for overcoming the barriers to the vision

Table 3-1 Barriers and Strategies for Vision 1

<b>Vision 1:</b> Trained and well-informed fishers and fisherfolk organizations playing an active and vital role in the sustainable management and development of the fisheries resources and in quality assurance of seafood.	
<b>Barrier</b>	<b>Strategies</b>
Useful and user-friendly fishery resource and sustainable management information is not readily available to fishers and other stakeholders	Prepare a compendium of existing information/data on each of the local fisheries
	Work with fishers to transform existing fisheries data into user-friendly information in the form of videos, posters, brochure, newsletters
	Distribute information via radio, television, seminars, training courses, exhibitions and extension
Ineffective participation of fishers and fisher organisations in fisheries management and development	Investigate why existing fisherfolk organisations are not functioning effectively
	Work with stakeholders to strengthen fisherfolk organisations and foster wider cooperation in the harvest sector
	Work with stakeholders to implement, monitor and review the agreed strategies for enhancing stakeholders participation
Poor awareness of regional and international fisheries issues	Hold seminars, workshops and site meetings on regional and international issues impacting on local fisheries
Weak harvest sector legislation	Strengthen harvest sector legislation by amendment and re-drafting
	Develop compliance guidelines
History of poor compliance and enforcement of fisheries legislation	Develop public awareness programmes for legislation
	Sensitise the enforcement agencies on the importance of enforcing fisheries management regulations
	Strengthen the monitoring and surveillance capabilities of appropriate enforcement agencies
	Involve fishers in monitoring and enforcement programmes
Insufficient resources allocated to the management of the harvest sector	Source Government and non-Government funding and assistance for major projects
Weak linkages between fishers and government	Build trust between fishers and Government by working closely with fishers on major fisheries issues
Fishers do not demand or seek training	Assess the harvest sector training needs of fishers
	Collaborate with other local training institutions and fishers to develop training courses to meet the harvest sector's needs
	Have courses certified and recognised at the national level
	Sensitise fishers to the benefits of training
	Institute mandatory training for boat captains in safety at sea, navigation and fish handling

*Table 3-2 Barriers and Strategies for Vision 2*

<b>Vision 2:</b> Well-maintained and designed vessels complying with national legislation and standards for design, construction, safety at sea and hygienic and handling storage of fish	
<b>Barrier</b>	<b>Strategies</b>
No legislated national standards for fishing vessel safety	Finalise the draft legislation safety and fish handling
	Prepare guidelines on compliance with legislation
	Work with fishers in implementing and enforcing standards
Poorly managed and maintained vessels	Mandatory training of fishers in vessel maintenance, basis engine care, fishing vessel management, safety at sea
	Provide user-friendly information, extension and training materials
	Promote the use of maintenance plans by boat owners and captains
	Conduct frequent spot inspections of vessels by Authorised Officers
	Improve the Government hurricane preparedness plans and include mitigation measures, recovery and rehabilitation.
	Encourage boat owners to prepare hurricane preparedness plans
Inadequate boat design and construction	Conduct disaster management workshops for stakeholders
	Provide training in boat design, construction, inspection, certification and safety at sea
	Work with existing boat builders to improve design, construction and methods
	Encourage experienced and approved boat builders to offer apprenticeships in boat building
Poor fish handling techniques	Develop strategies to recruit young people to careers boat building
	Ensure that onboard fish storage facilities are appropriately designed and properly maintained
	Provide mandatory training in handling of catch at sea and offloading at landing sites
	Work with fishers to improve their fish handling techniques

*Table 3-3 Barriers and Strategies for Vision 3*

<b>Vision 3:</b> Fishers using responsible fishing practices and not engaged in activities that undermine the effectiveness of any accepted national, regional or international fisheries management measures	
<b>Barrier</b>	<b>Strategies</b>
Fishers engage in irresponsible fishing practices	Identify existing irresponsible fishing practices
	Educate fishers about the dangers of irresponsible fishing practices through promotion of the Code of Conduct for Responsible Fisheries
	Update existing legislation and develop new legislation from time to time to counteract existing and new in irresponsible fishing practices
	Put systems in place to monitor fishing and enforce legislation
	Work with regional counterparts to promote the use of responsible fishing practices throughout the region
Information about new fishing technology is not readily available to fishers	Acquire journals, literature and videos of new fishing technology and techniques for the Fisheries Division library
	Make the material accessible to stakeholders through the Fisheries Division's library and via the internet
	Where necessary convert material into user-friendly information for dissemination to stakeholders
Fishers not motivated to invest in new fishing technology	Use the Fisheries Division's vessel to demonstrate the use and advantages of the new fishing technology and techniques
	Conduct cost benefit analyses to demonstrate the effectiveness of the new fishing technology and techniques
	Promote beneficial new fishing technology and techniques
Fishing capacity is not managed	Evaluate local fishing capacity
	Develop an action plan for managing local fishing capacity

*Table 3-4 Barriers and Strategies for Vision 4*

<b>Vision 4:</b> Modern and appropriate infrastructure that supports the loading of supplies, sanitary offloading of catch, and construction or repair of vessels.	
<b>Barrier</b>	<b>Strategies</b>
Inadequate and poorly maintained landing facilities	Continue to work with stakeholders to assess the existing loading and offloading facilities and identify the needs
	Review the management and operation of landing facilities and upgrade as necessary
	Put measures in place to ensure the proper maintenance of fish landing facilities and delivery of services to the stakeholders
Limited boatyard facilities	Peruse the construction of boatyards facilities in Bridgetown and the north of the island
	Remove derelict and unused vessels from active boatyard areas
	Ensure the proper management and upkeep of existing and new boatyards

*Table 3-5 Barriers and Strategies for Vision 5*

<b>Vision 5:</b> Fishers supporting and benefiting from social services that contributes to their well being in times of need.	
Barrier	Strategies
Fisher folk are not contributing to National Insurance Scheme other insurance plans	Sensitise fisherfolk on the benefits of contributing to the National Insurance Scheme, pension plans and other personal insurance schemes
	Work with National Insurance Scheme, insurance companies and fishers to develop strategies to that will enable fishers to contribute to and benefit from social programmes.

*Table 3-6 Barriers and Strategies for Vision 6*

<b>Vision 6:</b> Local and regional fisheries stakeholders working together to manage national and shared fisheries resources.	
Barriers	Solutions
There are no regional fisherfolk organisations	Assist local fishers in seeking funding for projects that will bring regional fishers together to discuss their common interests and set up channels of communication to facilitate ongoing discussion
	Support regional initiatives to set up regional fisherfolk organisation
Weak regional fisheries management organisation	Work with other countries to develop and strengthen the Caribbean Regional Fisheries Mechanism
There is no regional fisheries policy	Promote the need for a regional fisheries policy.
	Work with local and regional fisheries stakeholders to draft a regional fisheries policy and identify the necessary mechanisms and resources to put such a policy in place
Inadequate linkages and cooperation among regional fisheries institutions	Support regional efforts to set up better linkages among regional fisheries institutions.

# **Chapter 4**

## **The Post-harvest sector**

The post-harvest sub-sector encompasses those persons, activities and infrastructure involved in handling the fish after it is landed until it reaches the consumers. The persons involved in handling the fish are the vendors, processors, hawkers, boners, skimmers, scalers and exporters. The activities include handling, processing, wholesaling, retailing, distributing and marketing. The processing infrastructure includes processing areas at the public markets and processing plants owned by the private sector.

The private sector has substantial investments in post-harvest activities. The sub-sector supports several small businesses that provide employment and income for many self-employed persons. The harvest sector is also an avenue for earning vital foreign exchange through fish exports.

This chapter examines the marketing of fish from landing to the final consumer, the roles of the many stakeholders, visions for the post-harvest sector, barriers to the visions and strategies to overcome the barriers in the post-harvest sector.

#### 4.1 Distribution channels

Once the fish are off-loaded, they are distributed through several channels to consumers. Each channel starts when the fisherman, boat owner or agent of the boat sells the fish at the landing site. The fish may be sold directly to vendor/hawker, processors, exporters, hospitality sector or the consumers. See Box 4.1 for a description of the various roles of stakeholders in the post-harvest sector.

<b>Box. 4.1</b>	
<b><u>Stakeholder roles in the Post-harvest sector</u></b>	
<b>Boner:</b>	cleans and de-bones mainly flyingfish
<b>Consumer:</b>	eats the fish
<b>Hawker:</b>	retail whole, package fillets or steak products away from the landing site
<b>Hospitality sector:</b>	hotels, restaurants and government institutions
<b>Processor:</b>	prepares vacuum packed, frozen and/or value added products for local and overseas markets
<b>Exporter:</b>	exports chilled tuna and swordfish
<b>Scaler:</b>	scales fish
<b>Skinner:</b>	skins, de-bones and/or steak large fish
<b>Vendor:</b>	retails whole, package fillets or steak products at the landing site

The path taken by the fish and the level of processing depends on who buys the fish. The level of processing varies from simple scaling and gutting to the more complicated production of value-added products such as salted fish and fish burgers. Locally, there are five main distribution channels as outlined below, see figure 4.1.

**The Vendor Channel.** The vendor channel is the major distribution channel. It is estimated that 53% of the fish landed pass through this channel. The vendors purchase fish directly from the boat [fisherman, boat owner or agent] at the landing site or from the processor, usually outside of the landing site. Wherever the fish are purchased, they may pass through one of the following routes to the consumer. The vendor may:

- sell whole fish to the consumer.
- clean [wash, scale, and remove guts and fins], fillet [de-bone] or steak fish before sale to the consumer.
- hire a scaler, boner or skinner to clean, fillet or steak the whole fish and package them for the vendor to sell to the consumer.
- sell whole, filleted or steak fish to the hospitality sector where fish are prepared for

the consumer.

- thaw, package or repackage, for sale to the consumer, frozen fish purchased from the processor or importer.

The routes of the fish bought by hawkers are similar to those described above for vendor. However, the hawker differs from the vendor in the following two ways.

- Hawkers, unlike vendors, do not sell fish at landing sites. They distribute the fish inland from vehicles.
- Hawkers do not clean or fillet fish. They hire boners or skimmers to prepare the fish.

**The Processor Channel.** The processor channel is the second largest distribution channel. It is estimated that 30% of the fish landed are distributed via the processor channel. The processor either purchases fish from the iceboat at the landing site or imports frozen fish.

Fish purchased at the landing site are transported to the processing plant or the processing area at the major markets where they are cleaned, filleted, steaked, vacuum packed and frozen. Some processors also prepare value-added products such as burgers, salted-fish or breaded fish product. The processors employ workers to clean and process the fish and prepare value-added products. These products are either distributed locally, to the consumers, supermarkets, vendors and the hospitality sector or are exported. Imported fish follow the same path as outlined above for fish purchased by the processor at the landing site.

**The Consumer Channel.** The consumers may obtain fish directly from the boat or the vendor at the landing site. It is estimated that 9% of the fish landed is distributed through this channel. The consumers may either clean, fillet or steak the fish themselves or hire boners or skimmers to clean and prepare the fish for them.

**The Hospitality Channel.** The hospitality sector, including restaurants, hotels and institutions may obtain fish directly from the landing site. It is estimated that 2% of the whole fish leaving the landing site are purchased directly by the hospitality sector.

**The Exporter Channel.** The exporters are a small group of fishers that focus primarily on exporting large pelagics. The exporters obtain large tunas and swordfish from the longline vessels. The fish are graded and packaged in ice for export. The exporters take approximately 6% of the fish from the landing sites.

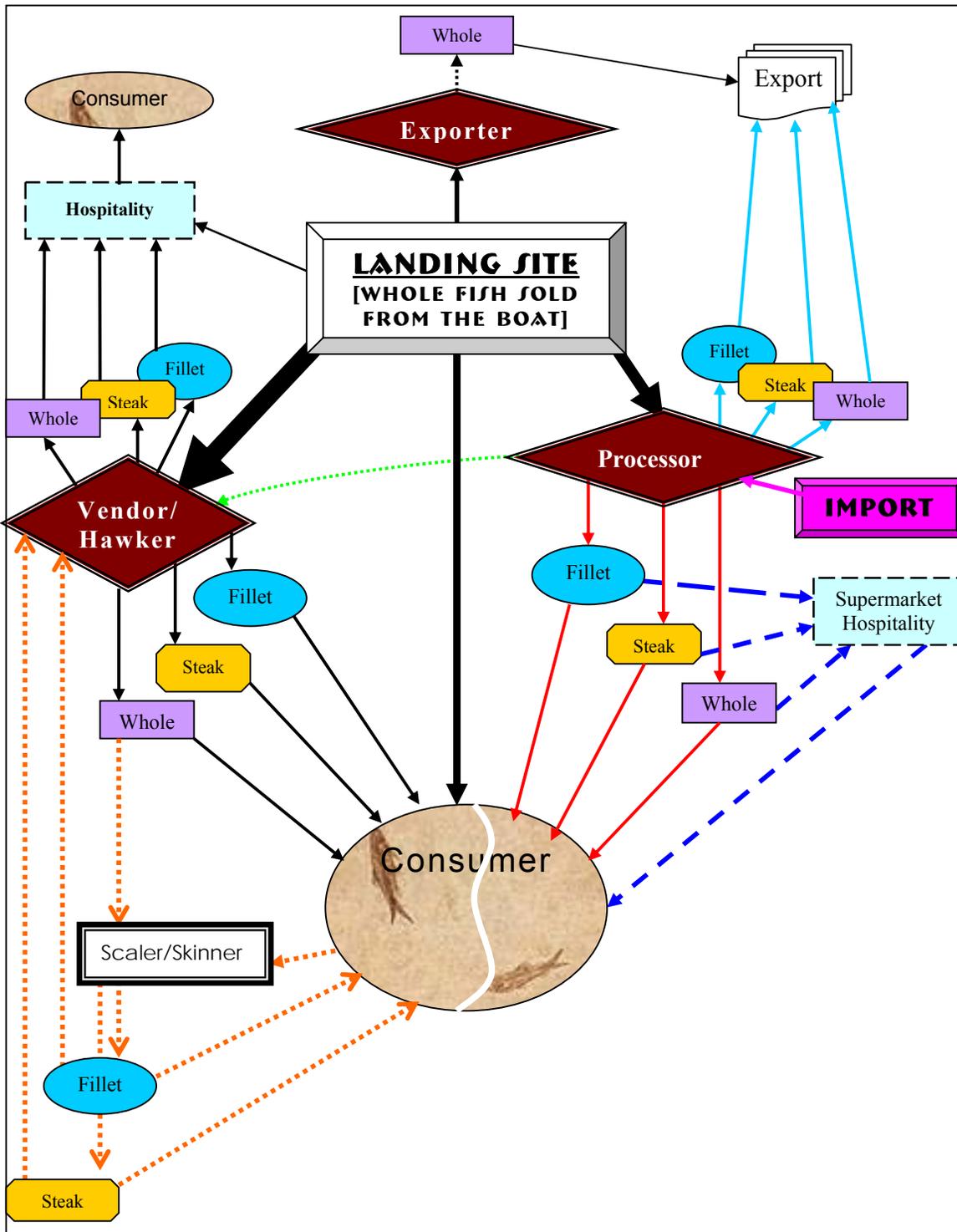


Figure 4-1 Post-harvest fish distribution channels. Arrow size from landing site indicates the amount of fish flowing through that channel. Amount of fish along other paths need to be identified.

## 4.2 Primary Stakeholders

The vendors and boners make up the majority of the primary post-harvest stakeholders. The post-harvest group comprises vendors (37%), boners (39%), hawkers (8%), skinner (8%), scalers (6%), processors (1%) and exporters (1%).

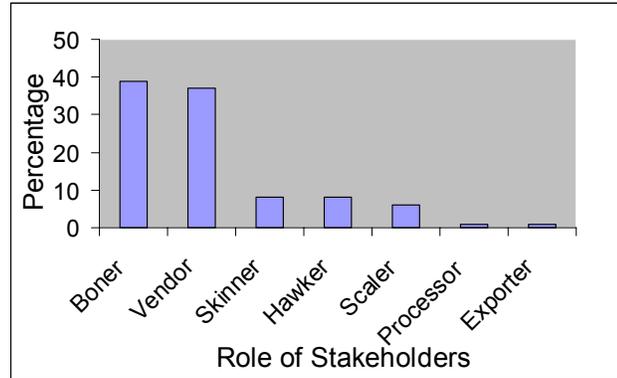


Figure 4-2 Roles of primary post-harvest stakeholders

**Sex.** Females make up the majority of the post-harvest sector. They account for 63% of the primary post-harvest stakeholders. The majority of vendors (60%), boners (77%) and scalers (70%) are female. Males account for 37% of the total primary post-harvest stakeholders but are in the majority among the processors (100%), exporters (100%), hawkers (62%), and skimmers (51%).

**Age.** Stakeholders in the age group 50-59 years are in the majority among primary post-harvest stakeholders.

Most males are 40-44 years of age while most females are between 45 and 49 years old.

Males tend to enter the fishing industry between the ages of 15 and 19 years, while the females enter at later age, between 20 and 24 years of age.

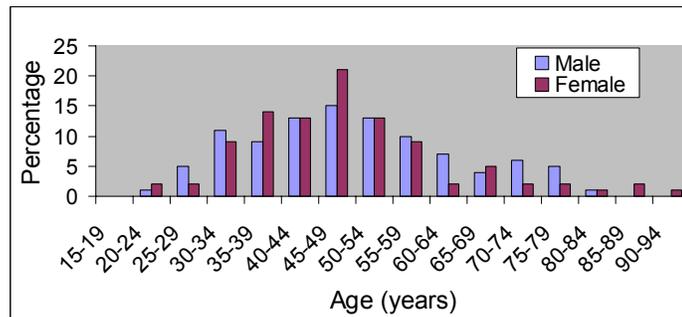


Figure 4-3 Age distribution of primary post harvest stakeholders by sex

## 4.3 Vision of the post-harvest sector

1. Trained fishers, informed fisherfolk organisations and other stakeholders playing an active role in fish quality assurance, food safety and small business enterprises.
2. Adequate National seafood legislation and standards with systems and procedures in place to ensure compliance
3. Individuals and agencies producing and marketing quality value-added seafood products.

#### 4.4 Strategies for overcoming the barriers to the vision

Table 4-1 Barriers and Strategies for Vision 1

<b>Vision 1:</b> Trained fishers, informed fisherfolk organisations and other stakeholders playing an active role in fish quality assurance, food safety and small business enterprises	
<b>Barrier</b>	<b>Strategies</b>
Many stakeholders not knowledgeable in proper fish handling techniques and operating small business enterprises	Assess the post-harvest stakeholders training needs
	Collaborate with other local training institutions and stakeholders to develop training courses and extension programmes to meet the post-harvest needs
	Have courses certified and recognised at the national level
	Institute mandatory training for primary post-harvest stakeholders
	Provide signage on fishing handling at the markets
Inadequate extension resources in the Fisheries Division	Build the institutional capacity necessary to deliver the training courses and extension programmes
Insufficient resources for training in the post-harvest sector	Source Government and non-Government funding and assistance in local and overseas training of government and non-government stakeholders
Information on handling of fish and operating of small business enterprises are not readily available to stakeholder	Work with stakeholder to develop user-friendly information on the handling of fish and the operation of small business enterprises, in the form of videos, posters, brochures, newsletters
Fishers do not demand or seek training	Institute mandatory training in fish handling for primary post-harvest stakeholders
Weak stakeholder organisation	Investigate why existing fisherfolk organisations are not functioning
	Work with fisherfolk to strengthen their organizations
	Seek international assistance in the fisherfolk organisations
Inadequate collaboration between stakeholders and Government on post-harvest issues	Work closely with stakeholders in decision-making on post-harvest issues
	Involve stakeholders in implementation, monitoring of post-harvest standards.
Insufficient human resources to ensure quality assurance	Source suitable training for fisheries and market staff
Public is not sensitised on how to identify quality fish and fisheries products	Develop and disseminate user-friendly material to sensitise the public on fish quality issues
	Place appropriate quality assurance signage at strategic locations in the market place

*Table 4-2 Barriers and Strategies for Vision 2*

<b>Vision 2:</b> Adequate national seafood legislation and standards with systems and procedures in place to ensure compliance	
<b>Barrier</b>	<b>Strategies</b>
Weak fish quality assurance legislation and inadequate standards	Finalise fish quality and inspection legislation and standards
	Prepare compliance information
Inadequate for enforcement and monitoring	Work with stakeholders to implement, enforce and monitor compliance
	Set up an enforcement unit with trained inspectors
	Develop clear enforcement and monitoring procedures and guidelines.
	Provide local and overseas training for inspectors
Ineffective communication among stakeholders	Develop stakeholder and public awareness programme
	Conduct training workshops for stakeholders
	Post appropriate signage at strategic location

*Table 4-3 Barriers and Strategies for Vision 3*

<b>Vision 3:</b> Individuals and agencies producing and marketing of quality value-added seafood products.	
<b>Barrier</b>	<b>Strategies</b>
Limited technical, marketing information on potential valued-added products using local fisheries resources	Seek technical assistance to identify economically viable valued-added products using local fish
	Prepare technical information package on the production of valued-added items
	Put systems in place to encourage investment in the production of valued-added items (including incentive and financial support)
Few persons are involved in the production of value-added products	Provide technical and training assistance to stakeholders
	Promote the production of valued-added production
	Strengthen the Fisheries Division's capability to conduct extension and technical training in the production of value-added products



## ***Chapter 5***

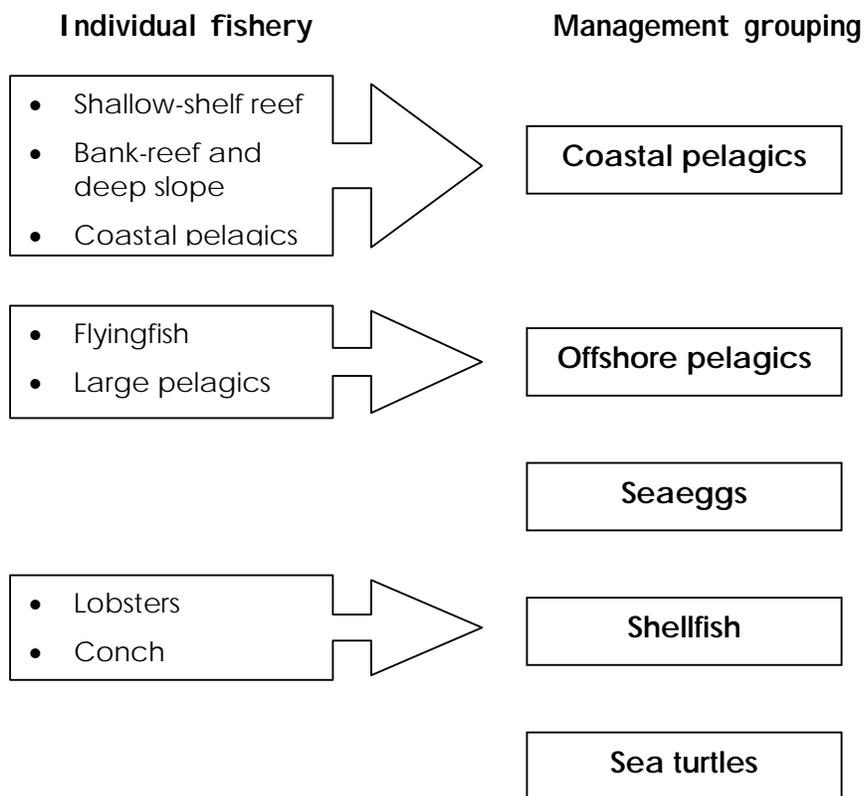
# **The Main Fisheries of Barbados**

The local fishing industry comprises eight key fisheries where the target species vary from inshore reef fish to offshore pelagics. This chapter sets out the management plans for the eight fisheries in Barbados and the conservation strategies for sea turtles, which are no longer legally fished.

### 5.1 Introduction

Following are brief descriptions of each of the main fisheries of Barbados, visions for the fishery and strategies for overcoming the barriers to achieving each vision. For conciseness, some of the fisheries that have similar problems and solutions have been grouped together (see below).

For more technical and scientific details further reading and research will be necessary. The reference literature section that follows may assist. Detailed implementation work plans are not included in this document.





## 5.2 The Coastal Fisheries

### 5.2.1 Descriptions of the fisheries

#### 5.2.1.1 The shallow-shelf reef fishery

<b>Location</b>	This fishery occurs on near shore coral reefs
<b>Target species</b>	Hinds (Serranidae); Parrotfishes (Scaridae); Grunts (Haemulidae); Surgeonfishes (Acanthuridae); Triggerfishes (Balistidae)
<b>By-catch</b>	Squirrelfishes (Holocentridae) and other reef fish species; Lobsters (Palinuridae); Moray eels (Muraenidae)
<b>Ecology</b>	<p><b>Distribution</b> - seagrass beds (juveniles); coral reefs (adults).</p> <p><b>Growth</b> - up to 50 cm (many species).</p> <p><b>Life span</b> - 4-6 years (most species).</p> <p><b>Reproduction</b> - varies by species, but most broadcast eggs into the plankton.</p>
<b>Fishing methods</b>	<p><b>Vessel type:</b> Mainly small, open, outboard-powered boats (moses) are used.</p> <p><b>Fishing gear and methods:</b> Fishing is most intense during the period July - October when pelagics are scarce, but reef fishes are captured year round at some sites. Mainly fished using traps of various shapes (Z, A, S, and rectangular) and of various sizes. S-traps and rectangular traps are not common. Z-traps are prevalent on the south coast, and A-traps on the west. Hexagonal wire mesh 1.25 inch (3.18 cm) is most commonly used to make traps, and the 1 inch (2.5 cm) mesh previously in limited use has been illegal since 1998. These mesh sizes retain juveniles of several species. The traps are often baited with macerated fish or black sea urchins (<i>Diadema antillarum</i>) and hauled every 2-3 days. Reef fishes are also taken by traps and handlines fished at various depths down to about 50 m.</p>
<b>Economics</b>	<p><b>Economic importance:</b> Economic links to tourism are perhaps as important as dollar value of food fishery.</p> <p><b>Employment:</b> Important to part-time fishers year-round and full-time fishers upon conclusion of flyingfish season.</p> <p><b>Catch and effort trends:</b> Estimated annual landings of pot fish range between 7 and 16 MT for 1994-2003 (Source: Fisheries Division). Information on effort is only available as numbers of vessels and numbers of trap fisheries registered with the FD.</p>
<b>Resource status</b>	<p>Areas of reef are believed to be overfished, particularly on the south and west coasts, where fishermen have reported reduced catch per unit effort and fish size.</p> <p>The potential yield is unknown due to lack of accurate local catch and effort data over time, or reasonable estimates of production extrapolated from similarly fished and ecologically comparable reef areas elsewhere.</p>
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Presence of large fish satisfies both fishery for food, and non-food (recreation and tourism), developments.</li> <li>• Aquarium fish export trade for particular (often non-food) species if populations are carefully managed under the existing regulations.</li> <li>• Marine reserves and protected areas serving recreational and tourism purposes may act as population reservoirs for adjacent fished areas.</li> </ul>
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Increased exploitation is not recommended.</li> <li>• Low fish populations due to habitat degradation and overfishing of diminished stocks in some areas.</li> <li>• User and use conflicts with tourism and coastal recreation.</li> <li>• Approaches require difficult trade-offs e.g. between food and non-food use.</li> </ul>

<b>Present data collection</b>	Catch and effort statistics routinely collected at primary and secondary landing sites. Statistics only occasionally collected at tertiary landing sites. This is a major problem when assessing this fishery as a substantial portion of the catch is landed at tertiary sites.
<b>Current legislation</b>	<p><i>Fisheries Act:</i> Use of dynamite, poisons and noxious substances is prohibited</p> <p><i>Fisheries (Management) Regulations:</i></p> <ul style="list-style-type: none"> <li>• Minimum mesh size 1.25 inches (3.18 cm) in traps</li> <li>• Trap fitted with escape panel of approved size and design to reduce ghost fishing</li> <li>• Trap marked for identification in an approved manner</li> <li>• Prohibition of trammel and any other entangling nets</li> <li>• Fishing is prohibited in no-take marine reserves.</li> </ul>
<b>Management unit(s)</b>	Island shelf for juveniles and adults; distribution may be wider for early life stages due to egg and larval drift in ocean and coastal currents.
<b>Possible additional management measures</b>	<ul style="list-style-type: none"> <li>• Increase minimum mesh sizes in traps.</li> <li>• Implement a permit system for the use of spear guns.</li> <li>• Prohibit SCUBA-assisted spearfishing, to reduce effort and depth range of harvest.</li> <li>• Co-management arrangements in the context of integrated coastal area management. This requires an integrated, participatory approach to reef fish management, involving all of the stakeholders and most of the management approaches above to deal with the complex issues surrounding this fishery. Essential for marine protected areas.</li> </ul> <p>For these approaches to succeed, habitat protection through the Coastal Zone Management Unit (CZMU) and associated agencies is essential.</p>

### 5.2.1.2 The deep-slope and bank reef fishery

<b>Target species</b>	Snappers ( <i>Lutjanidae</i> ), mainly queen snapper ( <i>Etelis oculatus</i> ), silk snapper ( <i>Lutjanus vivanus</i> ), and vermilion snapper ( <i>Rhomboplites aurorubens</i> )
<b>By-catch</b>	Unidentified groupers ( <i>Serranidae</i> ); Large jacks ( <i>Carangidae</i> ) etc.
<b>Ecology</b>	<p><b>Distribution</b> - juveniles prefer shallow waters; adults in deeper waters.</p> <p><b>Growth</b> - greater than 100 cm in length (most species); slow-growing</p> <p><b>Life span</b> - long-lived</p> <p><b>Reproduction</b> - groupers may form large spawning aggregations; several species are hermaphroditic; eggs presumed planktonic.</p>
<b>Fishing methods</b>	<p><b>Vessel type:</b> Dayboats (fishing launches) are used.</p> <p><b>Fishing gear and methods:</b> Mainly fished by handlines which target queen snapper and vermilion snapper. Traps target silk snapper and some vermilion snapper. Most of the catch is taken from July to October when the availability of large pelagics declines. Each vessel may have crews of several fishers each tending a line.</p>
<b>Economics</b>	<p><b>Economic importance:</b> Unknown. Preliminary assessment of fishery show potential for increased investment in harvest.</p> <p><b>Employment:</b> Most significant during the period when pelagics are scarce (July - October)</p> <p><b>Catch and effort trends:</b> Annual estimated catches between 1994-2003 ranged from around 12 to 44 tonnes (Source: Fisheries Division). No information is available on effort.</p>
<b>Resource status</b>	The resource may be fully exploited in some areas, but not in others. Potential yield estimates for the Barbados shelf range from 18 to 80 tonnes/year (Source: FAO Fish. Tech. Pap. No. 313). A precautionary approach is warranted since some species are extremely vulnerable to over-exploitation due to their life history and ecology.
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• High demand local market exists for high-priced luxury product</li> <li>• Unfished and not fully exploited areas are believed to exist</li> </ul>
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Resource easily overfished, so management of capacity is essential</li> <li>• Present harvest methods are difficult and labour intensive</li> <li>• Requires investment in fishing equipment to increase yield</li> </ul>
<b>Present data collection</b>	Catch and effort statistics routinely collected at primary and secondary landing sites. Statistics only occasionally collected at tertiary landing sites. This is a major problem when assessing this fishery as a substantial portion of the catch is landed at tertiary sites.

<p><b>Current legislation</b></p>	<p><i>Fisheries Act:</i></p> <p>Use of dynamite, poisons and noxious substances is prohibited</p> <p><i>Fisheries (Management) Regulations:</i></p> <ul style="list-style-type: none"> <li>• Minimum mesh size 1.25 inches (3.18 cm) in traps</li> <li>• Trap fitted with escape panel of approved size and design to reduce ghost fishing</li> <li>• Trap marked for identification in an approved manner</li> <li>• Prohibition of trammel and any other entangling nets</li> <li>• Declaring closed areas and seasons for species and fishing methods is provided for.</li> <li>• Coastal Zone Management Act:</li> <li>• Fishing will be prohibited in no-take marine reserves.</li> </ul>
<p><b>Management unit(s)</b></p>	<p>Separate stocks may exist on the Barbados shelf given its relative isolation from other island shelves.</p>
<p><b>Possible additional management measures</b></p>	<p>Same as for shallow-shelf reef fisheries</p>

### 5.2.1.3 The coastal pelagic fishery

<b>Target species</b>	Jacks (Carangidae); Herrings (Clupeidae); Silversides (Atherinidae); Anchovies (Engraulidae); Ballyhoo (Hemiramphus spp.) - 2 species; Robins or scads (Decapterus spp.); Barracuda (Sphynaena spp.); Garfish - three species; Small tunas and the young of large tuna such as yellowfin, may also be caught.
<b>By-catch</b>	Juvenile shallow-shelf reef fish
<b>Ecology</b>	<p><i>Distribution:</i> mainly fished within 2 km from shore.</p> <p><i>Growth:</i> little information available. Varies with species.</p> <p><i>Life span:</i> little information available. Varies with species.</p> <p><i>Reproduction:</i> jacks probably spawn offshore throughout the year; most species may have planktonic early life history stages</p>
<b>Fishing methods</b>	<p><i>Vessel type:</i> Both mooses and dayboats are used.</p> <p><i>Fishing gear and methods:</i> Mainly caught by three different methods: boat seines, cast nets, and trolling. Fishing in the vicinity of reefs may result in undesirably high by-catches of juvenile reef fish which are discarded.</p>
<b>Economics</b>	<p><i>Economic importance:</i> A considerable quantity is used as bait for other fisheries although some are used as food.</p> <p><i>Employment:</i> Not yet quantified.</p> <p><i>Catch and effort trends:</i> Annual estimated catches of jacks and small tunas from 1994-2003 ranged from about 8 to 33 tonnes (Source: Fisheries Division). No information is available on effort.</p>
<b>Resource status</b>	Not yet assessed. Lack of information precludes the estimation of potential yield. Qualitative reports on abundance from fishers are inconclusive.
<b>Opportunities</b>	Possible expansion of baitfish fishery.
<b>Constraints</b>	Harvest sector conflicts with other coastal users.
<b>Present data collection</b>	Catch and effort statistics routinely collected at primary and secondary landing sites. Statistics only occasionally collected at tertiary landing sites. This is a major problem when assessing this fishery as a substantial portion of the catch is landed at tertiary sites.
<b>Current legislation</b>	<p><i>Fisheries Act:</i></p> <ul style="list-style-type: none"> <li>• Use of dynamite, poisons and noxious substances is prohibited</li> <li>• Fisheries (Management) Regulations: <ul style="list-style-type: none"> <li>• Minimum mesh size for seines 1.50 inches (3.81 cm)</li> <li>• Prohibition of trammel and any other entangling nets</li> <li>• Declaring closed areas and seasons for species and fishing methods is provided for.</li> </ul> </li> <li>• Coastal Zone Management Act: <ul style="list-style-type: none"> <li>• Fishing will be prohibited in no-take marine reserves.</li> </ul> </li> </ul>
<b>Management unit(s)</b>	Island shelf for juveniles and adults, but distribution may be wider for early life stages due to egg and larval drift.

<b>Possible additional management measures</b>	<ul style="list-style-type: none"><li>• Permit cast netting in the marine reserve, but improve monitoring and surveillance to ensure other fishing is not also taking place.</li><li>• Prohibit seining and cast netting near reefs.</li><li>• Research and data collection, particularly through co-management arrangements.</li><li>• Protect fish habitat through integrated coastal zone management.</li><li>• Given an overlap of issues, it may be prudent to incorporate this fishery into the integrated coastal area management approach suggested for the shallow-shelf reef fishery</li></ul>
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### ***5.2.2 Visions for the coastal fisheries***

1. Coastal fish resources are sustainably utilised and managed
2. Coastal conflicts that impair fisheries management are reduced or absent

### 5.2.3 Strategies for overcoming the Barriers

Table 5-1 Barriers and Strategies for Vision 1

<b>Vision 1:</b> Coastal fish resources are sustainably utilised and managed	
<b>Barrier</b>	<b>Strategies</b>
Degradation and destruction of coastal habitats	Work with CZMU and stakeholders to implement, enforce and monitor coastal zone management legislation
	Work with fishers and government agencies to develop strategies to stop the use of dynamite and noxious substances in fishing
	Monitor the use of spear guns and fishing gear and publicise their detrimental effects to the fishery
	Discourage cast netting or seining on or near reefs
	Research the need for seasonal closure of seine fishery
	Strict control of fishing by permit in marine protected areas
	Promote measures that will prevent pollution of the near shore marine environments
	Increase public information on coastal habitat conservation
	Encourage stakeholders and the public to get involved in marine environmental awareness and conservation activities - brochures, videos, TV programme
Overfishing due to high mortality of juvenile and adult reef fish occurs	Publicise the fishery regulations
	Work with stakeholders to enforce existing gear regulations
	Monitor compliance with regulations
	Set up mechanisms for registering and marking fishing gear
	Research feasibility of further gear and vessel restrictions
	Assess the need for additional management measures
Inadequate fishery information and statistics are available for planning and management	Review and improve sampling scheme for catches and map their locations
	Work with fishers to develop better means of measuring fishing effort on reefs
	Improve the collection of biological, economic and social data
	Collaborate on data collection with fishers and students
	Conduct stock assessments
	Collate existing information and data, and use the results to inform further research and produce user-friendly material for stakeholders

<b>Vision 1:</b> Coastal fish resources are sustainably utilised and managed	
	Work closely with the UWI and fishers to collect necessary scientific information on all local fisheries.
The institutional arrangements for managing this fishery have not been fully developed	Explore possible institutional arrangements in collaboration with all stakeholders in data collection, implementation, management, monitoring and decision-making
	Implement the preferred arrangement(s) as pilot projects for trial, and evaluate to improve
Shortage of trained staff	Provide suitable training for staff where possible and continue lobbying for additional appropriately trained staff

*Table 5-2 Barriers and Strategies for Vision 2*

<b>Vision 2:</b> Coastal conflicts that impair fisheries management are reduced or absent	
<b>Barrier</b>	<b>Strategies</b>
Conflicts among stakeholders in the coastal zone	Formally integrate fishing into coastal zone planning and management
	Establish and maintain means for fisherfolk and other coastal zone users to meaningfully participate in planning and management
Not enough attention is paid to development of sustainable solutions to conflicts	Conduct more research on stakeholder analysis and solutions to conflicts
	Use GIS and facilitation to help identify and develop solutions
Economic linkages with tourism are not optimised for fishermen	Research and develop linkages that provide more economic opportunities for fishermen in tourism-related activities on the inshore reefs

### 5.3 The Pelagic fisheries

#### 5.3.1 Descriptions of the fisheries

##### 5.3.1.1 Large pelagics

<p><b>Target species</b></p>	<p>Tunas (Scombroidei); Wahoo (<i>Acanthocybium solandri</i>) – called “kingfish” locally; Billfishes (Istiophoridae); Dolphinfish (<i>Coryphaena hippurus</i>); Swordfish (<i>Xiphias gladius</i>); Mackerels (Scombermorous spp.)</p>
<p><b>By-catch</b></p>	<p>Sharks (Elasmobranchii)</p>
<p><b>Ecology</b></p>	<p><b>Distribution</b> - Most species are highly migratory. Stocks that are probably contained within the Caribbean region are dolphin, kingfish, wahoo, and blackfin tuna. Stocks believed to extend throughout the Atlantic are bigeye tuna, yellowfin tuna, skipjack tuna, billfishes, and swordfish. Determinants of local distribution include temperature, bottom topography, salinity, prey abundance and currents.</p> <p><b>Growth</b> – Growth rate is highly variable among species. Tunas, sharks and billfish can grow 2-4 metres in length.</p> <p><b>Life span</b> – Except for dolphinfish, which has a lifespan of between 3 and 5 years, most species are relatively long-lived.</p> <p><b>Reproduction</b> – Spawning areas are poorly known for most species.</p>
<p><b>Fishing methods</b></p>	<p><b>Vessel type:</b> Longliners and iceboats</p> <p><b>Fishing gear and methods:</b> Most large pelagics, but mainly dolphin and wahoo, are usually harvested on the same dayboat and iceboat fishing trips, often together with flyingfish. Fishing methods include trolling and lurk-lining. With range being proportional to size, local boats fish within national waters and on the high seas amongst international fleets.</p>
<p><b>Economics</b></p>	<p><b>Economic importance:</b> Longlining has become the major recent harvest sector investment area in Barbados, with high capital and operating costs, and potentially high returns from export of good quality fish (grades 1 and 2). Also, some USA flagged vessels trans-ship tunas through local fish processors. Longliners target tunas and swordfish, with by-catches mainly of billfishes (blue marlin, white marlin, sailfish) and shark. This fishery is very important to recreation and tourism through local game fishing tournaments and the small charter boat industry.</p> <p><b>Employment:</b> Becoming increasingly important for more skilled fishers</p> <p>Illegal foreign fishing is suspected but has not been verified or quantified.</p> <p><b>Catch and effort trends:</b> Annual estimated catches of large pelagics between 1994 and 2003 varied between about 740 and 1200 tonnes (Source: Fisheries Division). No trends are apparent. Fishing effort directed at large pelagics has increased due both to an increase in the number of iceboats and the growth of the longline fleet in number and average size of vessel.</p>
<p><b>Resource status</b></p>	<p>While ICCAT reports many large tuna species to be fully exploited or over-exploited for the Atlantic in general, the status of most other tuna and tuna-like species in the western Atlantic and Caribbean is uncertain. Based on crude estimates of potential yield from hypothetical EEZs, it is believed that some stocks are adequate to allow for expansion of the fishery.</p> <p>The potential annual yields for important ocean-wide species within the marine area of Barbados are: yellowfin – 767 metric tons (MT); albacore –</p>

	115 MT; bluefin tuna – 19 MT; skipjack – 223 MT; bigeye tuna – 182 MT (Singh-Renton and Neilson, 1993).
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Possible scope for increased effort on some resources within the EEZ.</li> <li>• International agreements make special case for assisting developing countries to attain equitable shares of fishery resources.</li> <li>• Export markets exist, especially for tunas and swordfish.</li> <li>• High local demand for dolphin and other regionally distributed species.</li> <li>• Controlled use of fish aggregating devices (FADS) to increase catches or catch rates of selected species</li> </ul>
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Eastern Caribbean countries have been reluctant to address sub-regional management.</li> <li>• Large tunas and billfishes may be fully exploited or overexploited</li> <li>• Increasing conservation by international agreements and organizations is likely.</li> <li>• Substantial investment is required for harvest by large longliners.</li> <li>• Fishing harbour and port facilities are not suited to large fishing vessels.</li> </ul>
<b>Present data collection</b>	Catch and effort statistics routinely collected at primary and secondary landing sites. Occasional statistics collected at tertiary landing sites. Landings statistics for this fishery are believed to be the most accurate of all the Barbadian fisheries since the vast majority of large pelagics are landed at market sites that are continually monitored.
<b>Current management regulations</b>	<p><i>Fisheries (Management) Regulations:</i></p> <ul style="list-style-type: none"> <li>• Prohibit landing of yellowfin tuna and bigeye tuna less than 3.2 kg live weight</li> <li>• Prohibit use of a pelagic drift net greater than 2.5 km in length</li> </ul>
<b>Management unit(s)</b>	<p>The eastern Caribbean is considered to be the minimum management unit for the regional large pelagics, which are shared between the islands.</p> <p>For most tunas, billfish and swordfish, ICCAT uses the western Atlantic or the entire Atlantic Ocean as the management unit, and these stocks are shared or straddling.</p>
<b>Possible additional management measures</b>	<p>It may be necessary to implement some new legislation to comply with ICCAT. These may include:</p> <ul style="list-style-type: none"> <li>• Catch quotas</li> <li>• Minimum size-at-capture restrictions</li> <li>• Gear restrictions</li> <li>• Restrictions on the number of fishing vessels</li> <li>• Special requirements for exporting fish such as issue of export certificates</li> </ul>

## 5.3.1.2 Flyingfishes

Target species	Four-winged flyingfish ( <i>Hirundichthys affinis</i> ) comprise over 90% of the flyingfish catch
By-catch	The margined flyingfish or guineaman ( <i>Cypselurus cyanopterus</i> ), a large species, occurs occasionally. Other species are too rare or small to be commercially important. Ocean triggerfish ( <i>Canthidermis</i> sp.) locally called turpits
Ecology	<b>Distribution:</b> Tropical Atlantic, including the Caribbean Sea, Gulf of Mexico and south American continental shelf; coastal and ocean surface waters; determined by surface water temperatures (25°C isotherm). <b>Growth:</b> Maximum size about 30 cm, but common to 20 cm; rapid growth; embryonic phase 96 hours; reach 15 mm in 7-10 days; full size and sexual maturity attained in 12 months (monthly growth rate of about 16.4 mm) <b>Life span:</b> Live for about 1 - 1.5 years with heavy post-spawning mortality <b>Reproduction:</b> October to August with peaks in December and May; typically spawn on floating material; males slightly smaller than females at each maturity stage; minimum size at maturity 18 cm; multiple spawners (maybe 3-4 times during life span); females may release about 6500 eggs each time; males mature earlier than females
Fishing methods	<b>Vessel type:</b> Primarily dayboats and iceboats. <b>Fishing gear and methods:</b> They are captured with surface gillnets, handlines and dipnets after being lured near boats with tethered fish-attracting devices (screelers) and chum. Bait baskets are also used to attract these fish.
Economics	<b>Economic importance:</b> Flyingfish account for almost two-thirds of total landings in most years. <b>Employment:</b> Over 2000 fishermen and 500 hundred vendors are seasonally employed in the fishery. In addition to this, over 200 persons find employment at fish markets as scalers/boners. Approximately 125 persons are employed at fish processing plants. Flyingfish accounts for a large percentage of the production of these plants. A fishery for large pelagics (which prey on flyingfish) is carried out in conjunction with the dayboat and iceboat flyingfish fishery. The fishing season extends from November to July, with a major peak in May and a minor peak in November/December. <b>Catch and effort trends:</b> Annual estimated catches of flyingfish between 1994 and 2003 ranged from about 1500 to 2600 tonnes. No clear trends are seen during this period, but over longer time series a periodicity of about 4 years between very good or very poor seasons has been suggested. The cause is unknown. The effort directed at flyingfish increased throughout the 1980's, but in recent years it may have levelled off due to a slowing of fleet expansion and conversion of some iceboats into longliners.
Resource status	Inter-annual variability is probably due to a combination of factors: abundance of spawners, environmental factors or predation mortality. High probability of low recruitment at low stock size suggests that overfishing in years of low abundance could cause stock collapse.
Opportunities	<ul style="list-style-type: none"> <li>• Offal could be principal component for fish silage production.</li> <li>• Export niche markets exist in North America and Europe.</li> <li>• Unfished resource believed to exist beyond range of present vessels</li> <li>• Use of roe as caviar-substitute and potential for other value-added products.</li> <li>• Transfer of technology to neighbouring countries</li> </ul>

<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Regional fleet expansion may lead to overfishing or increased variability.</li> <li>• Marked seasonality within areas currently fished.</li> <li>• Local exports not cost competitive with those from other islands or regions.</li> <li>• Absence of fishing access agreements to harvest resource that seems under-utilised in neighbouring countries.</li> </ul>
<b>Present data collection</b>	Catch and effort statistics routinely collected at primary and secondary landing sites. Occasional statistics collected at tertiary landing sites. Landings statistics for this fishery are believed to be fairly accurate as the majority of the islands flyingfish catch is landed at the continually monitored primary and secondary sites.
<b>Current legislation</b>	None in national waters.
<b>Management unit(s)</b>	Tagging studies suggest a single stock within the southeastern Caribbean area (Dominica to Trinidad and Tobago). Preliminary results from genetic analyses suggest that the Caribbean stock is separate from stocks around Brazil and Curacao.
<b>Possible additional management measures</b>	<ul style="list-style-type: none"> <li>• Promote the establishment of a regional organization or arrangement for making management decisions concerning shared resources.</li> <li>• Cooperate and collaborate with Caribbean states to assess and manage the resources.</li> <li>• Promote collaboration and cooperation between government and the fishing industry in the management of this resource.</li> <li>• Possibly control increases in fishing effort by adopting a precautionary approach to licensing new vessels.</li> </ul>

### 5.3.2 Vision for the fishery

1. Regional cooperation in the management and sustainable utilization of these shared resources

### 5.3.3 Strategies for overcoming the barriers

Table 5-3 Barriers and Strategies for Vision 1

<b>Vision:</b> Regional cooperation in the management and sustainable utilization of these shared resources	
<b>Barrier</b>	<b>Strategies</b>
Inadequate fishery information and statistics for planning and management.	Promote and collaborate in the development and implementation of a harmonised regional data collection and recording programme
	Collaborate with fishers and students in fisheries research
	Engage in joint regional fisheries research especially stock assessments for example the CRFM working groups on large pelagics and the FAO ad hoc flyingfish working group.
	Increase participation in ICCAT data collection and assessments
No agreed regional policies for utilisation and management of shared pelagic resources	Promote the concept of a common regional fishing zone
	Where necessary, negotiate fishing access agreements with neighbouring states
	Develop mechanisms to facilitate local stakeholder inputs into regional and international management decisions
	Assist in the formation and work of viable regional decision-making and management mechanisms for regionally shared fishery resources such as flyingfish and dolphinfish
	Play a more active role in formulation of policies and management measures for internationally shared large pelagic stocks at appropriate international forums such as ICCAT
	Implement the provisions of regional and international agreements that facilitate management of shared stocks

## 5.4 The seaegg fishery

### 5.4.1 Description of the fishery

Target species	White sea urchin or sea egg ( <i>Tripneustes ventricosus</i> )
By-catch	None
Ecology	<p><b>Distribution:</b> Adults live on sea grass beds and coral rubble. Juveniles appear to settle in same areas as adults. The sea urchin is particularly vulnerable to overfishing because it occurs close to shore, is virtually immobile, and is harvested for its gonads. Natural or man-made changes in marine habitats are concerns.</p> <p><b>Growth:</b> Varies according to environmental conditions. Gonads ripen seasonally.</p> <p><b>Life span:</b> 2-3 years (max).</p> <p><b>Reproduction:</b> Sexually mature by one year; eggs and larvae are planktonic for several weeks.</p>
Fishing methods	<p><b>Vessel type:</b> When vessels are used, the launch is common, but the moose is also used. The occasional ice-boat is observed. Alternatively, fishers who swim out to the sea urchin ground will often carry a floating log from which bags of harvested urchins will be suspended until returning to shore</p> <p><b>Fishing gear and methods:</b> Sea urchins are harvested close to shore by skin divers using mask, snorkel and fins and by SCUBA divers. The sea urchins are removed from the bottom by hand or metal scraper and are collected in a net bag.</p>
Economics	<p><b>Economic importance:</b> Revenue from the sea urchin fishery is an important part of some fishermen's income. Significant inter-annual variation in stock size occurs such that catch size is limited mainly by stock size at low abundances but is effectively only limited by fishing effort at high stock abundances. While researchers differ on their estimates of the mean income per fisher from the seaegg harvest (largely due to differences in estimates of effort), there is little doubt that, when abundant, Barbadian seaeggs are the basis of a very valuable fishery.</p> <p><b>Employment:</b> It is estimated that over 300 fisher-divers (part-time and full-time) are involved in this fishery. In addition, many other people crack, clean and sell sea eggs.</p> <p><b>Catch and effort trends:</b> No regularly recorded landings statistics are available. Catch and effort fluctuate with highly variable abundance. No clear trends.</p>
Resource status	High demand has led to over-exploitation of the resource and the stock was considered to be in a collapsed state for most of the period between the mid-1980's to 2000. During this period two multi-year harvesting moratoria (1987-1989 and 1998-2001) were implemented to allow the depleted stocks to recover. Seaeggs returned in abundance in 2001 and stock levels had remained relatively high in 2002 but with some decline in 2003.
Opportunities	<ul style="list-style-type: none"> <li>• Market exists for high-priced luxury products, high demand.</li> <li>• Low harvest and post-harvest investment required.</li> </ul>

<p><b>Constraints</b></p>	<ul style="list-style-type: none"> <li>• Seasonal, unpredictable abundance.</li> <li>• Low populations due to overfishing and possible habitat degradation.</li> <li>• Absence of community organisation to facilitate co-management by area.</li> <li>• Failure at the attempt to sustain an island-wide fisherfolk divers association.</li> </ul>
<p><b>Present data collection</b></p>	<p>Fisherfolk in collaboration with the Fisheries Division and BARNUFO conduct annual stock abundance surveys just prior to the commencement of the fishing season and the results are used in part to determine the length and timing of the fishing season.</p>
<p><b>Current management</b></p>	<ul style="list-style-type: none"> <li>• The designation of annual fishing seasons has been used as a management tool for the fishery since 1879.</li> <li>• Moratorium from 1987 to 1989 when harvesting sea eggs was not allowed.</li> <li>• Since 1989, closed season, from 1 January to 31 August. During the open season from 1 September to 31 December it was against the law to:             <ul style="list-style-type: none"> <li>• Leave the shell or offal of sea eggs on any bank or in shallow water</li> <li>• Wilfully or wantonly destroy or injure any sea egg</li> </ul> </li> <li>• However, due to inadequate enforcement and absence of social sanctions, illegal harvesting often started as early as July.</li> </ul> <p><b><u>Fisheries (Management) Regulations:</u></b></p> <ul style="list-style-type: none"> <li>• Provision for closed seasons and areas</li> <li>• Prohibition of harvest with the assistance of SCUBA</li> <li>• Illegal to have, sell, expose for sale or purchase sea eggs during the closed season unless the sea eggs were obtained with the permission of the Chief Fisheries Officer.</li> <li>• Cannot wantonly injure or destroy any sea eggs.</li> </ul> <p><b><u>Fisheries (Sea Eggs Closed Season) Notices:</u></b></p> <ul style="list-style-type: none"> <li>• Closed season from 1 August 1998 to 31 July 2001.</li> <li>• In 2001, the closed season was extended to August 31<sup>st</sup> and harvesting was permitted from October 1<sup>st</sup> to November 30<sup>th</sup></li> <li>• In 2002, harvesting was initially permitted from September 1<sup>st</sup> to 31<sup>st</sup> but the open season later extended to end on October 31<sup>st</sup>.</li> <li>• In 2003, harvesting was permitted from September 15<sup>th</sup> to October 15<sup>th</sup>.</li> </ul>
<p><b>Management unit(s)</b></p>	<p>A discrete stock probably exists on the Barbados shelf given its relative isolation from other island shelves.</p>
<p><b>Possible additional management measures</b></p>	<p>Co-management measures to be subsequently considered include:</p> <ul style="list-style-type: none"> <li>• Licensing harvesters</li> <li>• Closed seasons</li> <li>• Setting total allowable catches.</li> <li>• Improved monitoring and management information systems involving harvesters</li> </ul>

### 5.4.2 Vision of the seaegg fishery

1. Optimum annual harvests that earn maximum economic benefits while conserving the resource

### 5.4.3 Strategies for overcoming the barriers

*Table 5-4 Barriers and Strategies for Vision*

<b>Vision:</b> Optimum annual harvests that earn maximum economic benefits while conserving the resource	
<b>Barrier</b>	<b>Strategies</b>
Stocks usually low, highly variable, and extremely vulnerable to overfishing.	Maintain stocks at a level which can sustain fishing
	Improve co-management for monitoring and harvest
	Eliminate illegal fishing during the closed season/moratorium
Poor track record of compliance with and enforcement of conservation regulations.	Find more innovative ways to enforce fishery regulations
	Public education on sea egg conservation and management
	Implement a "coast watch" type of public surveillance system
Inadequate fishery information and statistics for planning and management.	Improve estimation of catch and effort
	Collect more biological, economic and social data
	Improve collaboration on data collection and monitoring with fishers
	Conduct more stock assessments in collaboration with university
Possible habitat degradation and destruction and water pollution.	CZMU to implement legislation for coastal zone management
	Collaborate closely with CZMU and environmental agencies on habitat surveys, pollution etc.
The institutional arrangements for managing this fishery have not been fully developed.	Explore possible institutional arrangements in collaboration with all stakeholders. The formation of a seaegg management council comprising representatives of the seaegg fishing communities, government and scientists is recommended
	Implement the preferred arrangement(s) as pilot projects for trial, and evaluate to improve.

## 5.5 The shellfish fisheries

### 5.5.1 Brief description of the fisheries

#### 5.5.1.1 Lobsters

<b>Target species</b>	Caribbean spiny lobster ( <i>Panulirus argus</i> ) the most abundant of the four local species. Spotted spiny lobster ( <i>P. guttatus</i> )
<b>By-catch</b>	Smoothtail spiny lobster ( <i>P. laevicauda</i> ). Unidentified species of slipper lobster.
<b>Ecology</b>	<p><b>Distribution:</b> Juveniles inhabit shallow coastal habitats such as seagrass, mangrove and coral rubble in protected bays. As they grow older and larger they move gradually into deeper water, and offshore reef habitats. Adults are restricted to the shelf and slope habitats. Lobsters are commonly found among the rocks and coral rubble in depths of about 4 to 20 m, but maximum depth is unknown.</p> <p><b>Growth:</b> Lobsters grow by moulting. The length of the intermoult period averages 60 to 90 days in <i>P. argus</i>. Males grow about 3 cm per year and females at about half this rate due to egg production and care. Near maximum size is reached by both sexes in about 10 years.</p> <p><b>Life span:</b> Over 10 years.</p> <p><b>Reproduction:</b> Spiny lobsters move to the edge of the shelf to spawn. In the Caribbean, berried females occur in all months. Larvae have a long planktonic stage (6 months) during which they may be dispersed between islands.</p>
<b>Fishing methods</b>	<p>Vessel type: Boats may or may not be used to transport and support divers using SCUBA. Animals caught in traps are usually landed by moses, and occasionally dayboats.</p> <p>Fishing gear and methods: Free or SCUBA diving using spears or gloves for capture along the east coast. By-catch in fish traps occasionally on the south coast.</p>
<b>Economics</b>	<p><b>Economic importance:</b> Minor fishery with potential for increased importance through links to tourism.</p> <p><b>Employment:</b> At least 20 divers reportedly engaged in regular harvest.</p> <p><b>Catch and effort trends:</b> There are no catch and effort data available. Anecdotal information suggests a possible increase in abundance recently.</p>
<b>Resource status</b>	Lack of information precludes the estimation of potential yield.
<b>Opportunities</b>	<p>Market exists with high demand and prices due to tourism.</p> <p>Harvest investment is low.</p> <p>Natural abundance may be increasing.</p> <p>Use of artificial habitats (e.g. casitas) may improve yields.</p>
<b>Constraints</b>	<p>Populations may be naturally small, perhaps limited by habitat availability.</p> <p>Landings are difficult to monitor since lobsters may not be landed or sold at fish markets, and often sales are pre-contracted.</p>
<b>Present data collection</b>	None

<p><b>Current management</b></p>	<p>The lobster fishery was not regulated prior to the Fisheries (Management) Regulations, 1998.</p> <p><b>Fisheries (Management) Regulations:</b></p> <p>Illegal to possess, sell, expose for sale, purchase or harm any lobster carrying eggs</p> <p>Prohibits removing eggs from a lobster.</p>
<p><b>Management unit(s)</b></p>	<p>Management units for lobster should be considered at two levels.</p> <ul style="list-style-type: none"> <li>- The island shelf which relates to the distribution of demersal juveniles and adults.</li> <li>- The wider Caribbean wider relates to the <u>likely</u> interaction of regional stocks through planktonic early life history stages.</li> </ul> <p>NB. Barbados does not share a shelf with others. Stock discreteness should be determined.</p>
<p><b>Possible additional management options</b></p>	<p>Prohibit the harvesting of moulting lobsters</p> <p>Closed season for harvesting lobsters</p> <p>Gear restrictions such as prohibiting use of impaling gear (spears).</p> <p>Closed areas including marine reserves and protected areas.</p> <p>Co-management arrangements, particularly for data collection.</p>

### 5.5.1.2 Conch

<p><b>Target species</b></p>	<p>Queen conch (<i>Strombus gigas</i>). Occasionally West Indian fighting conch (<i>S. pugilis</i>) and milk conch (<i>S. costatus</i>).</p>
<p><b>By-catch</b></p>	<p>None</p>
<p><b>Ecology</b></p>	<p><b>Distribution:</b> Live in many marine habitats but mainly in sea grass beds and on hard-bottom communities, often also found on sandy bottom and coral rubble, rarely found on living reefs. Found mainly between depths of 2 and 20m, but some also reported at much greater depths. The conch is vulnerable to overfishing because of its preference for shallow near-shore habitats, especially for spawning, and it's sluggish life style. Natural or man-made changes in marine habitats are also concerns.</p> <p><b>Growth:</b> Takes over 2 ½ to 3 years to reach adulthood.</p> <p>Life span: 2-3 years (max).</p> <p><b>Reproduction:</b> Sexual maturity is not reached until after 2 ½ to 3 years old, indicated by the complete development of the characteristic flared lip of the shell. Mating occurs in shallow sandy areas behind reefs. Spawning may occur as many as 8 times per season. Fertilisation is internal. Strings of fertilised egg masses encapsulated in gelatinous material are extruded onto the sea floor. Planktonic veligers emerge after 3 to 5 days. The larval phase lasts around 21 days and following settlement another week is needed for the shell to develop.</p>
<p><b>Fishing methods</b></p>	<p><b>Vessel type:</b> Moses and day-boats are mainly used if transportation by a vessel is required.</p> <p><b>Fishing gear and methods:</b> Conchs are harvested by skin divers using mask, snorkel and fins and by SCUBA divers. The conchs are collected by hand.</p> <p>Catch and effort trends: No regularly recorded landings statistics are available.</p>

<b>Economics</b>	<p><b>Economic importance:</b> Conchs are now mainly harvested in Barbados for their shells, which are polished and sold as curios mostly to tourists. The meat is usually consumed by the harvester or sold privately and not openly at markets.</p> <p><b>Employment:</b> Unknown. Although some divers tend to target conchs, most are taken opportunistically. Both established souvenir retail stores and itinerant salesman are involved in the sale of conch shells.</p>
<b>Resource status</b>	Largely unknown. Anecdotal information suggests that local conch populations are typically much smaller than those of neighbouring islands.
<b>Opportunities</b>	<p>Market exists for high-priced luxury products, high demand for shells in the tourism market.</p> <p>Landings are difficult to monitor since conchs may not be landed or sold at fish markets.</p> <p>Low harvest and post-harvest investment required.</p>
<b>Constraints</b>	<p>Unpredictable abundance.</p> <p>Small population size.</p> <p>Absence of community orientation to facilitate co-management by area.</p>
<b>Present data collection</b>	None
<b>Current management</b>	<p>The fishery is presently unregulated.</p> <p>A permit is required for export of conch shells to CITES member countries. The Ministry of the Environment is responsible for the issue of export permits.</p>
<b>Management unit(s)</b>	Discrete stocks probably exist on the Barbados shelf given its relative isolation from other island shelves.
<b>Additional management options</b>	<p>Co-management measures to be subsequently considered include:</p> <ul style="list-style-type: none"> <li>- Licensing of harvesters and vendors</li> <li>- Closed areas and seasons</li> <li>- Minimum shell size and/or thickness of flared lip.</li> <li>- Total, individual or area allowable catch quotas.</li> </ul>

### 5.5.2 Vision for the shellfish fisheries

1. Optimum annual harvests that earn maximum economic benefits while conserving the resource

### 5.5.3 Strategies for overcoming the barriers

Table 5-5 Barriers and Strategies for the Vision

<b>Vision:</b> Optimum annual harvests that earn maximum economic benefits while conserving the resource	
<b>Barrier</b>	<b>Strategies</b>
Habitat degradation and destruction	CZMU to implement legislation for coastal zone management
Stocks usually low, highly variable, and extremely vulnerable to overfishing	Develop and implement fishery regulations to conserve and if necessary rehabilitate stocks
	Public education on conservation and management
	Discourage use of spearguns and encourage use of non-impaling gear such as loops to allow live release of juvenile and berried female lobsters
	Implement system of co-management
Inadequate fishery information and statistics for planning and management	Improve estimation of catches and effort
	Collect biological, economic and social data
	Collaborate on data collection with fishers and students
	Conduct stock assessments
Conch exploitation and trade is subject to CITES restrictions	Implement proper CITES systems for documentation
	Inform vendors and visitors about trade restrictions
The institutional arrangements for managing this fishery have not been fully developed	Explore possible institutional arrangements in collaboration with all stakeholders
	Implement the preferred arrangement(s) as pilot projects for trial, and evaluate to improve

## 5.6 The turtle fishery (closed)

**NOTE:**

The capture of turtles has been illegal in Barbados since 1998. However, turtles are still occasionally taken illegally and the recovery of the stocks relies on continuing conservation efforts. This section therefore highlights the plans for protecting these animals.

### 5.6.1 Brief description of the fishery(now closed)

<b>Local species</b>	Hawksbill turtle ( <i>Eretmochelys imbricata</i> ); Green turtle ( <i>Chelonia mydas</i> ); Leatherback turtle ( <i>Dermochelys coriacea</i> ); Loggerhead turtle ( <i>Caretta caretta</i> )
<b>Ecology</b>	<p><b>Distribution</b> - Atlantic Ocean.</p> <p><b>Growth</b> - Relatively slow growing.</p> <p><b>Life span</b> - Long-lived and very late maturing relative to most other exploited marine resources in this region. Some species may take 20-30 years to mature.</p> <p><b>Reproduction</b> - Most species nest 3-5 times in a season, with each mature female nesting in 2-3 year intervals. At each nesting, a turtle lays 80-200 eggs.</p>
<b>Resource status</b>	Stocks are severely overexploited, and in some cases threatened with extinction. All require conservation.
<b>Opportunities</b>	None for a fishery, but scope for conservation education and training.
<b>Constraints</b>	<p>Conservation and protection requirements preclude fishery development.</p> <p>Poaching continues as a demand still exists for turtle meat for personal consumption</p> <p>Enforcement of the moratorium is difficult due to need for night-time surveillance</p>
<b>Present data collection</b>	The Barbados Sea Turtle Project of the University of the West Indies with support from the Fisheries Division monitors sea turtle nesting activity in Barbados in addition to conducting other first-rate research relevant to the conservation of sea turtles.
<b>Current management</b>	<p>Barbados is party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), requiring commercial trade in turtles and turtle products to be restricted or prohibited.</p> <p><b>Fisheries(Management) Regulations:</b></p> <p>Illegal to possess, sell, expose for sale or purchase any turtle or part or turtle eggs.</p> <p>Fishing for or ensnaring turtles is prohibited</p> <p>Illegal to disturb or endanger any turtle nest or remove any turtle eggs</p>
<b>Management unit(s)</b>	The appropriate unit for management may vary with species, but in all cases should be at least the wider Caribbean.
<b>Possible additional management options</b>	<p>Prohibition of selling turtle products under the provisions of CITES</p> <p>Public education, monitoring and rescue under the Barbados Sea Turtle Project.</p> <p>Conservation oriented changes to coastal development and recreation.</p>

**5.6.2 Vision for marine turtles**

1. Turtle stocks returned to and maintained at satisfactory levels of abundance

**5.6.3 Strategies for overcoming the barriers**

*Table 5-6 Barriers and Strategies for the Vision*

<b>Vision:</b> Turtle stocks returned to and maintained at satisfactory levels of abundance	
<b>Barrier</b>	<b>Strategies</b>
Habitat degradation and destruction	CZMU to implement legislation for coastal zone management
	Expand marine protected areas after consultation
	Improve turtle conservation provisions in coastal physical development legislation
Vulnerability of stocks to illegal fishing	Implement and strictly enforce indefinite harvest moratorium in the fishery regulations
	Public education on conservation and management
	Prohibit harvest and sale of turtle products
Inadequate information and statistics for planning and management	Collect data on nesting sites and forage areas
	Estimate nesting population and seasonality
	Participate in tagging and tracking programmes
	Implement a "coast watch" type of public surveillance system with coastal residents to obtain information and compliance
Sea turtles are subject to CITES trade restrictions	Meet obligations under CITES
	Inform vendors and visitors about trade restrictions
The institutional arrangements for managing this fishery have not been fully developed.	Explore possible institutional arrangements in collaboration with all stakeholders
	Implement the preferred arrangement(s) as pilot projects for trial, and evaluate to improve



# **Selected Reading**

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