Caribbean Regional Fisheries Mechanism
(CRFM)

Study on the Formulation of a Master Plan on the Sustainable Use of Fisheries Resource for Coastal Community Development in the Caribbean

Country Report
(Appendix of the Final Report)

March 2012

JAPAN INTERNATIONAL COOPERATION AGENCY（JICA）
IC Net Limited

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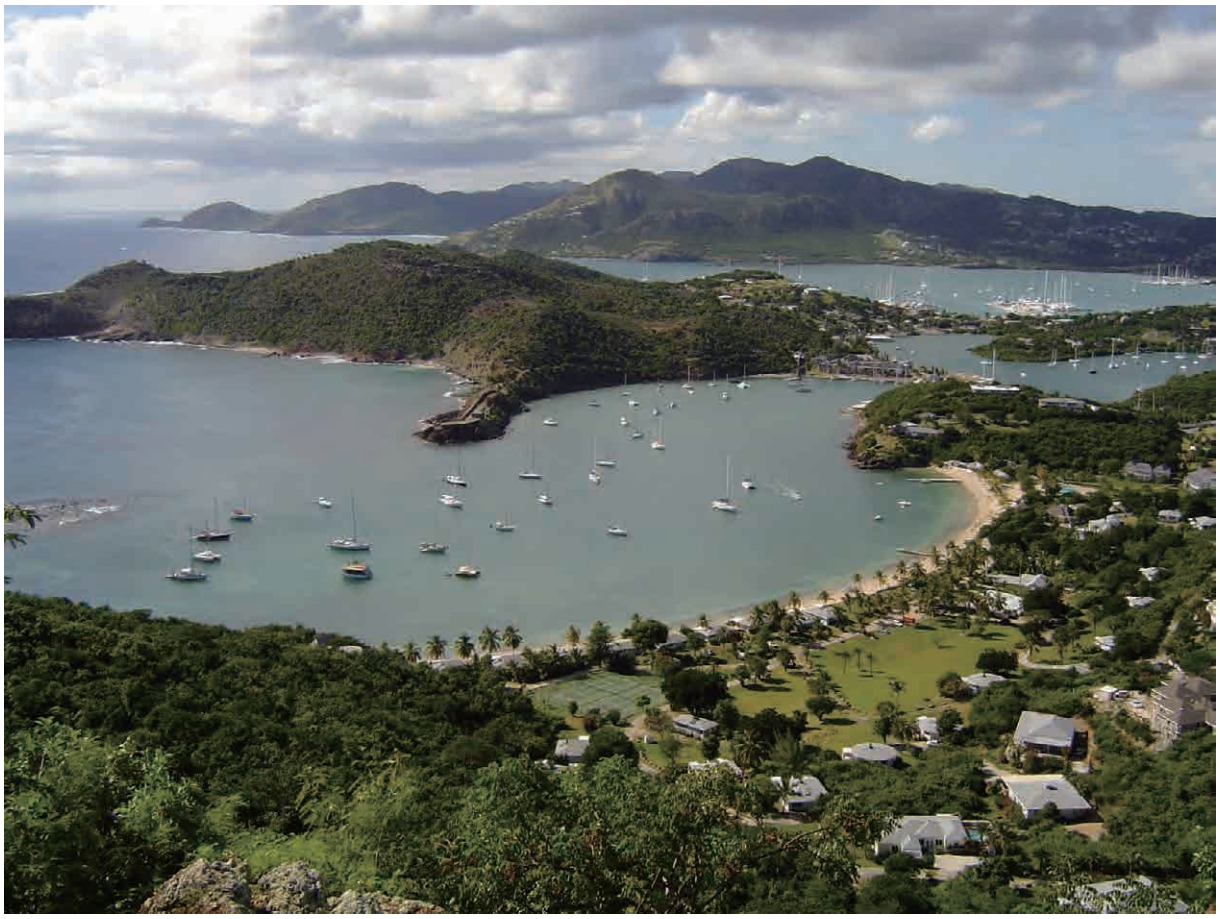
FINAL COUNTRY REPORT: ANTIGUA AND BARBUDA



October 2009

Antigua and Barbuda

Country Profile

Geographic coordinates	17° 03' N, 61° 48' W
Total area	442.6 sq km (Antigua 280 sq km; Barbuda 161 sq km)
Land area	442.6 sq km
Water area	0 sq km
Length of Coastline	289 km
Shelf Area	2,145 sq km
Territorial Sea	7,147 sq km
Claimed EEZ	102,867 sq km
Highest point (m)	399 m Boggy Peak (now named Mount Obama)
Climate	tropical maritime; little seasonal temperature variation
Natural hazards	hurricanes and tropical storms (July to October); periodic drought
Population	85,632 (July 2009 est.)
Annual Population Growth Rate	1.303% (2009 est.)
Life Expectancy at birth	total population: 74.76 years
Languages	English (official), local dialects
Ethnic Mix	black 91%, mixed 4.4%, white 1.7%, other 2.9% (2001 census)
Work force	30,000 (1991)
Unemployment	11% (2001 est.)
GDP (PPP)	$1.639 billion (2008 est.)
GDP Growth rate	2.8% (2008 est.)
GDP per Capita (PPP)	$19,400 (2008 est.)
Currency Unit	East Caribbean dollars (XCD) US dollar 1 = EC$2.7
Area of Mangrove Forests	
Percent of Mangrove Forests Protected	
Per Capita Food Supply from Fish/Fishery Products (2000)	55 kg/person
Exports	$84.3 million (2007 est.); petroleum products, bedding, handicrafts, electronic components, transport equipment, food and live animals

Sources: CIA World Factbook – Antigua & Barbuda (2009); EarthTrends Country Profiles – Antigua-Barbuda

Abbreviations and Acronyms

ABSAR	Antigua and Barbuda Search and Rescue
CARICOM	Caribbean Community
CARIFIS	Caribbean Fisheries Information System
CFO	Chief Fisheries Officer
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programme
CIA	Central Intelligence Agency
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CRFM	CARICOM Regional Fisheries Mechanism
EAG	Environmental Awareness Group
EC$	Eastern Caribbean Dollar
ECCB	Eastern Caribbean Central Bank
EEZ	Exclusive Economic Zone
EU	European Union
FAD	Fish Aggregating Device
FAO	Food & Agriculture Organization of the United Nations
FAC	Fisheries Advisory Committee
FD	Fisheries Department
FMP	Fisheries Management Plan
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GOAB	Government of Antigua and Barbuda
ICCAT	International Commission for the Conservation of Atlantic Tunas
IHHN	Hypodermal Hematopoietic Necrosis
IUU Fishing	Illegal, Unreported and Unregulated Fishing
JICA	Japan International Co-operation Agency
MPA	Marine Protected Area
MSY	Maximum Sustainable Yield
NEMMA	North East Marine Management Area
mt	Metric Ton
OECS	Organization of Eastern Caribbean States
SGD	St. George's Declaration of Principles for Environmental Sustainability in the OECS
TIP	Trip Interview Program
TSV	Taura Syndrome Virus
UNDP	United Nations Development Program
USAID	United States Agency for International Development
US$	United States Dollar

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1. INTRODUCTION

Antigua and Barbuda is located in the Leeward Islands, part of the Lesser Antilles, east of St. Kitts and Nevis and northeast of Montserrat. The twin-island nation established itself as an archipelagic state in 1982 with a 12 nautical mile territorial sea, an Exclusive Economic Zone (EEZ) and a Fishery Zone of 200 nautical miles. The full extent of the EEZ is unknown since negotiations with neighbouring states have not been completed.

1.1 Antigua and Barbuda Fishery Resources

It is estimated that Antigua and Barbuda has a total shelf area of 3,568 kilometres^2. This includes the Antigua and Barbuda shelf (3,400 km^2), South Bank (40 km^2), a section of Anguilla shelf (7 km^2), Redonda shelf (98 km^2), Havers Shoal (5 km^2) and a section of St. Christopher and Nevis shelf (18 km^2). The Antigua and Barbuda shelf that both islands emerge from is one of the largest in the Eastern Caribbean. These relatively extensive fishing grounds support a substantial demersal resource of reef fish, Gastropoda (e.g., Queen conch) and Crustacea (e.g., Caribbean spiny lobster). Based on the most conservative of estimates from various sources including the Fisheries Division, these resources could provide an annual sustainable yield of between 3,409 and 6,585 metric tons, Current production is line with the fore mentioned maximum sustainable yield estimates; in 2008, the demersal resource yielded 3,357 tonnes and accounted for 93% of the total ex-vessel value of production (EC$49.22 million or US$18.23 million). For the same period, the fisheries sector contributed to 52% of the agricultural GDP of EC$84.88 million (US$31.44 million) or 2% of the national GDP (in current prices) (Eastern Caribbean Central Bank [ECCB], 2009).

In addition to these demersal resources, seasonal large pelagic species, (e.g., tunas, dolphinfishes, wahoos and billfishes) pass through the waters of Antigua and Barbuda. Preliminary estimates indicate that these migratory fish could yield an additional 3-4,000 metric tons annually. Even though the extent of these resources is not fully known, the consensus of opinion is that most are not fully utilised. In 2008, production of large pelagics was estimated at 103 metric tons. The large pelagics not only offer great potential for the expansion of the capture fishery, but also the sports fishing or recreational fishery. There are about 65 private sports fishing vessels operating in Antigua and Barbuda, including 10 commercial charters. The Antigua and Barbuda Sport Fishing Association sponsors an international billfish tournament annually, which attracts about 30 to 40 participants from neighbouring islands. To-date no valuation of the contribution of the sport fishery has been conducted.

Figure 1 summarises the trend in capture production of fishery resources over the past fourteen years. Note that the decline in production of finfish and spiny lobster in 2008 was attributed to a decline in demand from the tourism sector as a result of the economic downturn experienced with respect to overnight visitor arrivals. Tourism is one of the main drivers of the national economy and has a significant impact on the demand for fish and fishery products.

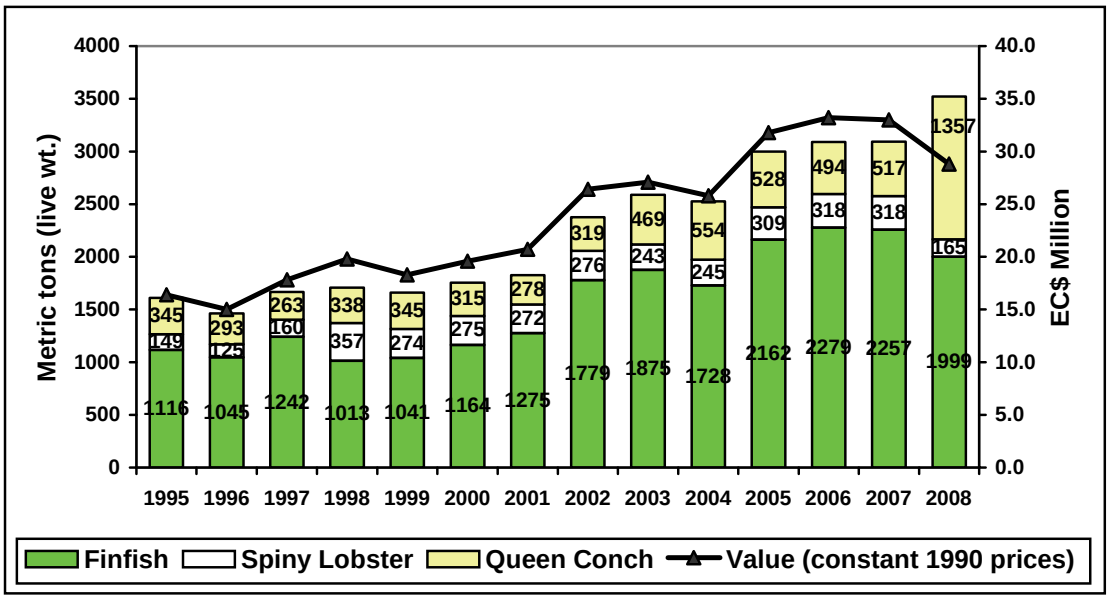


Figure 1. Trend in capture production of fishery resources for Antigua and Barbuda (Source: Fisheries Division, Antigua and Barbuda).

1.2 Employment and Role of the Fisheries Sector

At the end of 2008, there were 1,335 registered fishers engaged in the sector, with 632 (approximately 47%) classified as full-time. Of the registered fishers, 872 were actively fishing, which is about 2% of the national labour force. An additional 50 individuals were employed in an underdeveloped processing sector. The high energy cost associated with processing and storage, and inadequate access to capital has curtailed the development of this area. In terms of employment, values should be taken as conservative estimates since the fisheries sector acts as a "safety-net" for other economic activities; a large proportion of fishers are also employed in the construction and tourism sector. Thus, downturns or upturns in the fore mentioned areas of employment can impact on fishing effort and ultimately the status of fishery resources. For this reason, the Fisheries Division conducts an annual census of active fishing vessels from since 2001. The Division is also looking at schemes for limited fishing effort to ensure the long term sustainability of fishery resources, given the role the sector plays in the national economy.

Since 1992, the overall growth in the number of active fishers has been marginally positive (Figure 2). However, the linear trend line did not provide a good fit to the data since the coefficient of determination, R^2, was only 0.297, indicating that the linear model only accounted for 29.7% of the variability in the number of active fishers over time. As mentioned previously, upturns or downturns in the construction and tourism sectors can impact on fishing activity.

With respect to the registration of fishers (Figure 2), the process started in 1995 with the registration of mainly vessel owners and was extended in 1997 to crew and other fisherfolks. The high rate of growth experienced in the early years was therefore due to the "registration drive" initiated in 1997 to capture all fishers. After 1997, the rate of growth of registered fishers slowed considerably. Table 1 provides a breakdown of registered fishers by work status and sex. Note that the number of part-time and occasional fishers was at least 36% of the registered fishers in 2008.

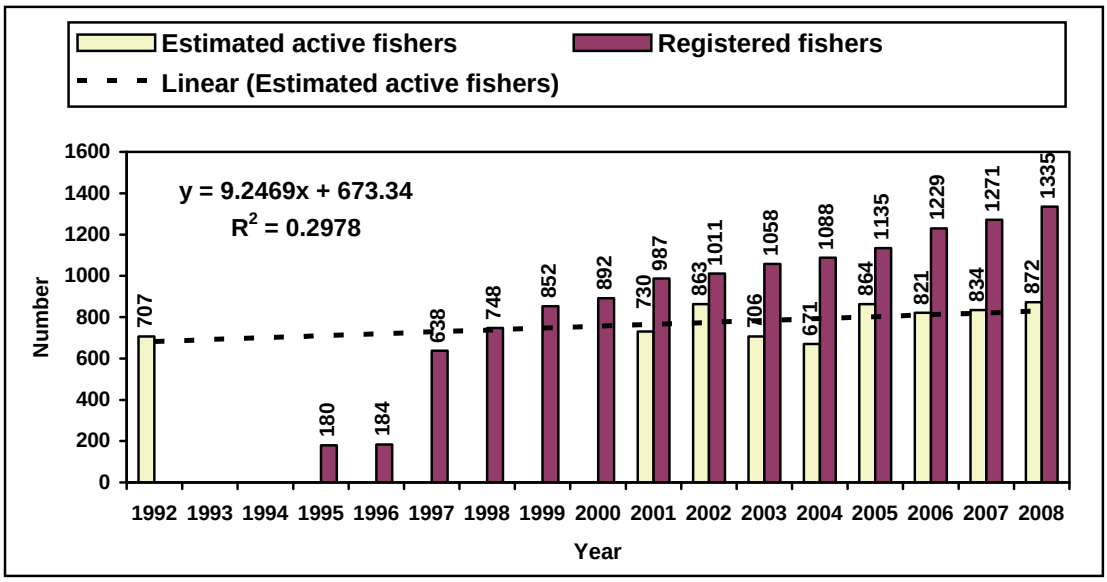


Figure 2. Number of registered fishers and estimated active fishers at year-end in Antigua and Barbuda; active fishers are estimated from annual vessel census (Source: Fisheries Division, Antigua-Barbuda).

Table 1. Registered fishers in Antigua and Barbuda by work status and sex (Source: Fisheries Division, Antigua-Barbuda).

Work Status	Sex	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Full time	M	392	412	444	449	472	489	509	549	574	611
	F	8	12	12	12	12	13	14	20	20	21
	Total	**400**	**424**	**456**	**461**	**484**	**502**	**523**	**569**	**594**	**632**
Part time	M	197	240	268	282	298	318	337	367	383	408
	F	3	3	3	3	4	4	4	6	6	7
	Total	**200**	**243**	**271**	**285**	**302**	**322**	**341**	**373**	**389**	**415**
Occasional	M	43	43	51	57	57	60	65	66	66	65
	F	0	0	0	0	0	0	0	0	1	0
	Total	**43**	**43**	**51**	**57**	**57**	**60**	**65**	**66**	**67**	**65**
Status Unspecified	M	209	182	209	208	215	203	204	214	213	215
	F	0	0	0	0	0	1	2	7	8	8
	Total	**209**	**182**	**209**	**208**	**215**	**204**	**206**	**221**	**221**	**223**
Total by Sex	M	841	877	972	996	1042	1070	1115	1196	1236	1299
	F	11	15	15	15	16	18	20	33	35	36
Grand Total	**Total**	**852**	**892**	**987**	**1011**	**1058**	**1088**	**1135**	**1229**	**1271**	**1335**

1.3 Fishing Fleet and Primary Gear

Over the past 35 years, the fishing fleet of Antigua and Barbuda has undergone significant modernisation. Most of the wooden sloops and dories that dominated the sector in the 1970s have been gradually replaced by modern fibreglass launches and pirogues with the latest fishing equipment (global positioning system, depth sounder, etc) (Figures 3 and 4). While there have been significant improvements, in terms of vessel construction and fishing technology, traps or "fish pot" used to target the demersals remain the dominant gear. In 2008, trap setters comprised 42% of the active fishing fleet of 382 vessels (Figure 5), followed by troll liners (17%), gill netters (16%), hand liners (13%) and SCUBA divers (6%). Whilst trolling is the second most common primary gear, vessels operated primarily on a recreational or occasional basis, with

about 10 offering sport fishing charters. Typical investment in a trap setting unit, including vessel, gear and equipment, ranges from EC$45,000 (US$16,667) for a 22-foot fibreglass pirogue to EC$210,000 (US$77,777) for a 38-foot fibreglass launch.

Figure 6 summarises the trend in active fishing vessels in Antigua and Barbuda since 1992. Overall growth in the number of active vessels has been slightly positive, with the linear model only accounting for 18% of the variability in the number of active fishers over time. Other sources of variability were attributed to factors such as the upturns and downturns in the construction and tourism sector. In terms of registration of vessels, the programme was initiated in 1995 with most of the vessels being registered by 1997.Hurricane Luis in 1995 swayed many owners to register their vessels since disaster aid was provided mainly to owners of registered vessels.

Figure 3. Typical fishing unit in Antigua and Barbuda.

Figure 4. Traditional (left) and modern (right) trap-fishing launches.

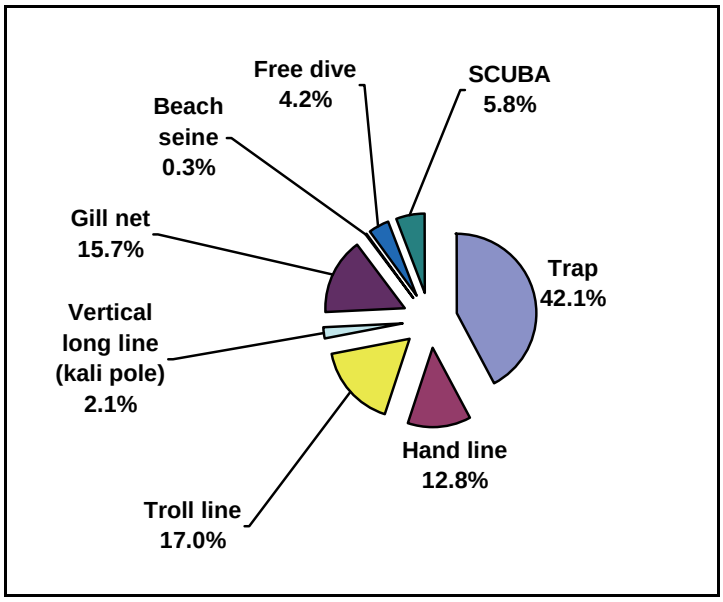


Figure 5. Composition of active fishing fleet in Antigua and Barbuda by primary gear in 2008 (N = 382) (Source: Fisheries Division, Antigua and Barbuda).

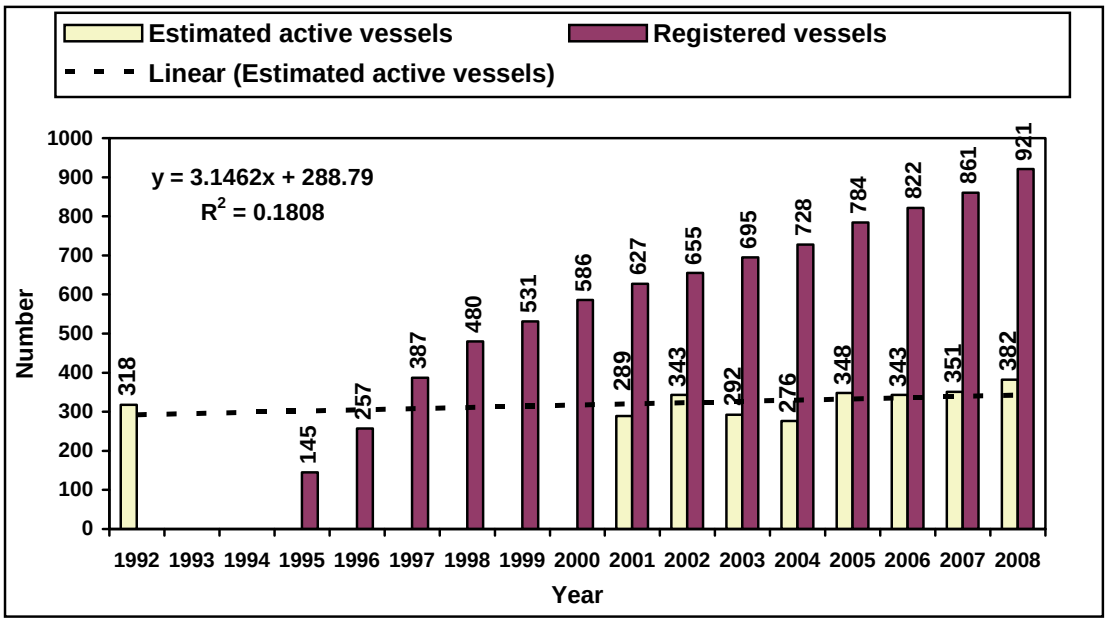


Figure 6. Number of registered vessels and estimated active vessels at year-end in Antigua and Barbuda; active vessels are estimated from annual census (Source: Fisheries Division, Antigua Barbuda).

1.4 Fish Landing Sites and Infrastructure

Table 2 provides a breakdown of the number of active fishing vessels by primary gear type for each landing site in 2008. The site in Antigua with the largest number of active fishing vessels was Point Wharf, followed by Market Wharf, Parham and Urlings. The largest site in Barbuda was Codrington Wharf, followed by Pearl Harbour. In Antigua and Barbuda, traps were the dominant gear at most landing sites. Some of the main exceptions included Falmouth Harbour, Jolly Harbour and Shell Beach; these sites were predominantly sport-fishing sites, hence trolling was the dominant method.

Landing sites range from rural beaches, with limited or no infrastructure (Figure 7), to fisheries complexes, with potable water, ice-making and chill storage facilities (Figure 8). At present, only 4 of the 32 landing sites meet the European Union (EU) standards required for export of fishery products; the EU is the main destination for domestic fishery exports. Sites approved for exports were the Japanese funded fisheries complexes. Figures 9 and 10 provide the location of the various landing sites in Antigua and Barbuda.

Table 2. Distribution of active fishing vessels by landing site and by primary gear in 2008 (Source: Fisheries Division, Antigua Barbuda).

Landing Sites (Antigua)	**Primary Gear**								**Total**
	Trap	Troll line	Gill net	Hand line	SCUBA	Free dive	Vertical long line (kali pole)	Beach seine	
Beachcomber	2	1	1	1	0	0	1	0	**6**
Carlisle Bay	4	0	0	0	0	0	0	0	**4**
Crab Hill	2	0	0	0	0	0	0	0	**2**
Crabbs Marina	0	0	1	0	0	0	2	0	**3**
Dickenson Bay	0	0	0	0	0	0	0	0	**0**
Dredge Bay	0	0	2	0	0	0	0	0	**2**
English Harbour	4	6	1	3	0	0	0	0	**14**
Fitches Creek	2	1	1	0	0	0	0	0	**4**
Falmouth Harbour	5	11	1	2	0	0	0	0	**19**
Five Island	0	0	0	0	0	0	0	0	**0**
Gaynors	0	0	0	0	0	0	0	0	**0**
High St. Wharf	0	0	0	0	0	0	0	0	**0**
Johnson Point	0	0	0	0	0	0	0	0	**0**
Jolly Harbour	3	14	5	2	0	1	1	0	**26**
Keeling Point	17	0	1	5	0	0	0	0	**23**
Mamora Bay	0	5	0	0	0	0	0	0	**5**
Morris Bay	1	0	0	1	0	0	0	0	**2**
Mill Reef	3	1	0	0	1	2	0	0	**7**
Market Wharf	24	0	5	16	0	0	0	1	**46**
Parham	8	4	16	7	1	0	1	0	**37**
Point Wharf	40	2	3	7	1	0	1	0	**54**
Royal Bay	3	1	0	0	0	0	0	0	**4**
Shell Beach	4	12	3	2	0	0	0	0	**21**
Seatons	4	5	3	2	0	1	0	0	**15**
Urlings	11	2	4	0	11	2	2	0	**32**
Valley Church	0	0	0	0	0	0	0	0	**0**
Willoughby Bay	0	0	1	0	0	0	0	0	**1**
Willikies	6	0	4	1	0	0	0	0	**11**
Sub Total	**143**	**65**	**52**	**49**	**14**	**6**	**8**	**1**	**338**
Landing Sites (Barbuda)									
Coco Point	0	0	0	0	0	0	0	0	**0**
Codrington Wharf	9	0	5	0	2	7	0	0	**23**
Pearl Harbour	4	0	3	0	3	2	0	0	**12**
River Wharf	5	0	0	0	3	1	0	0	**9**
Sub Total	**18**	**0**	**8**	**0**	**8**	**10**	**0**	**0**	**44**
Grand Total	**161**	**65**	**60**	**49**	**22**	**16**	**8**	**1**	**382**

Figure 7. Rural fishing landing site (Mill Reef) in Antigua.

Figure 8. Urlings Fisheries Complex in Antigua.

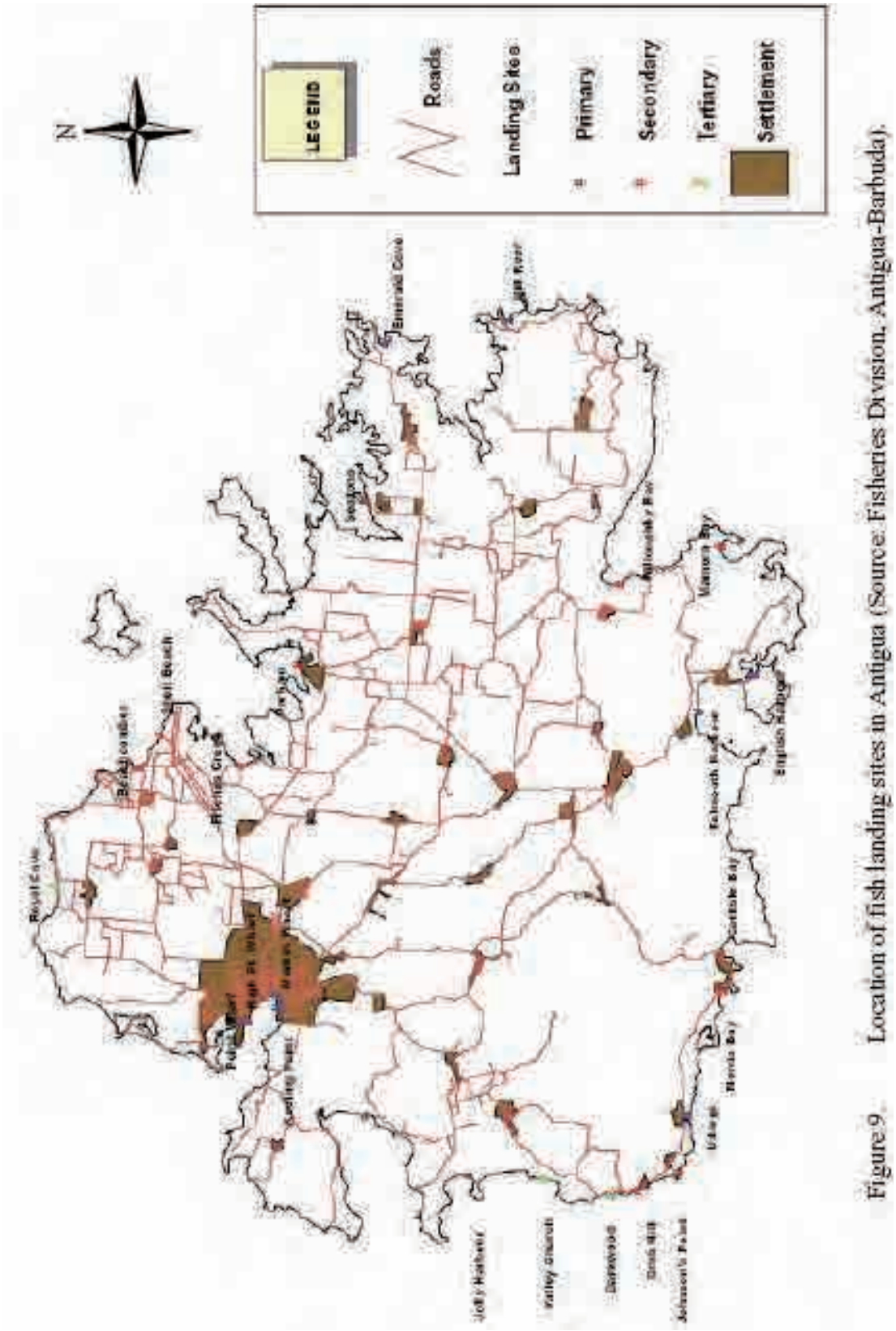


Figure 9. Location of fish landing sites in Antigua (Source: Fisheries Division, Antigua-Barbuda).

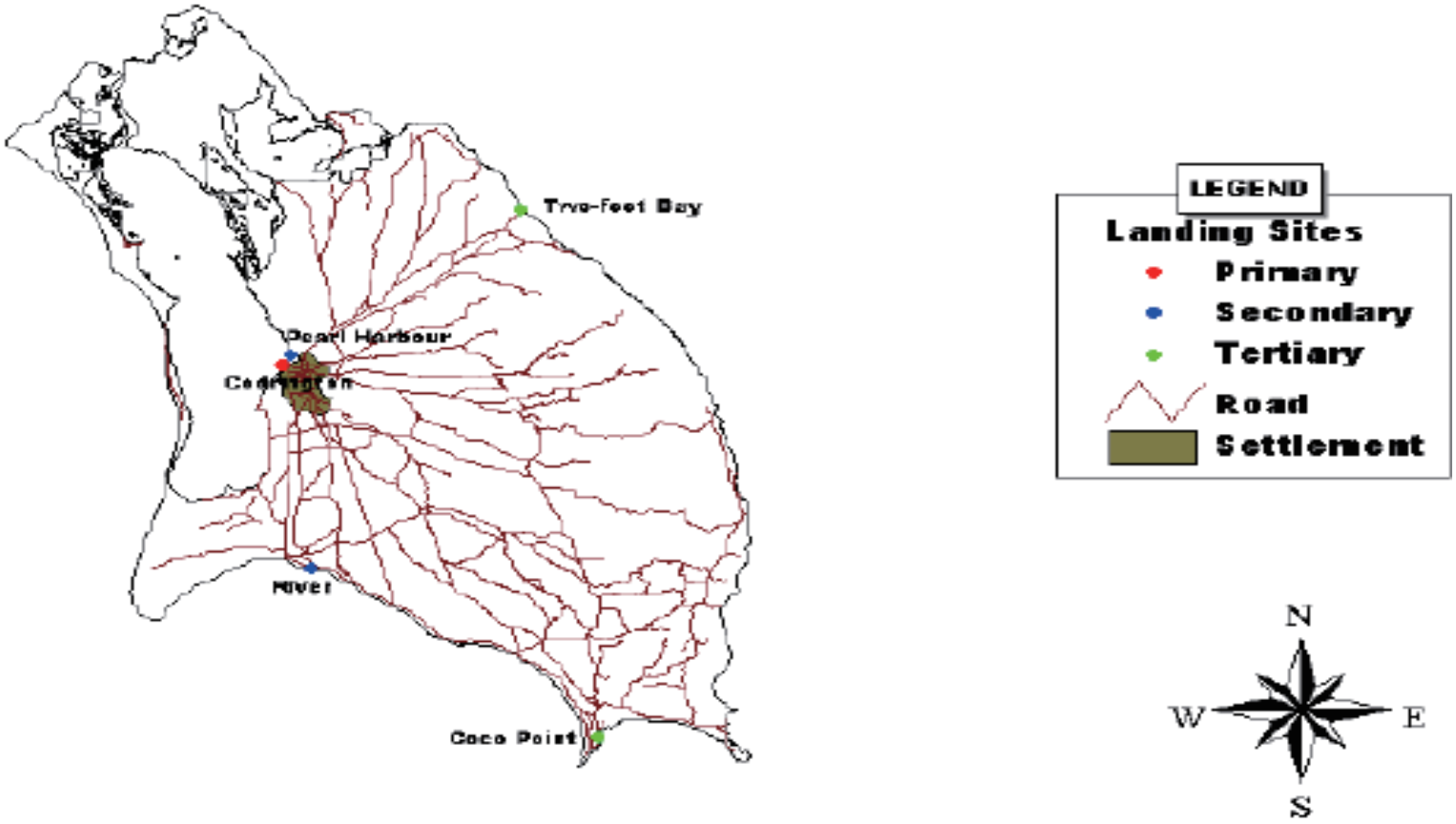


Figure 10. Location of fish landing sites in Barbuda (Source: Fisheries Division, Antigua-Barbuda).

1.5 Fish Exports

In terms of exports, the contribution of the fisheries sector to foreign exchange earnings has decreased significantly since the formation of the single European market in January 1993, when legislation governing the production of food were harmonised throughout the European Community. The key to European Food Law is the principle of quality management and process-oriented control throughout the production chain (from fishing vessel to the consumer's table). The stringent technical standards, the need for accompanying legislation and infrastructure, make the process an arduous task for most developing countries. These changes have drastically affected the export sector. In 1990, domestic export of seafood from Antigua and Barbuda was 183 metric tons and valued locally at EC$3.0 million (US$1.11 million) (Figure 11). This has decreased to 126 metric tons or EC$2.1 million (US$0.8 million), in 2007 (based on constant 1990 prices).

In 2008, the slowdown and subsequent contraction in the French economy caused domestic exports to plummet to 89 metric tons or EC$1.3 million (US$0.5 million) (based on constant 1990 prices). Despite the decline in exports, the European Union remains the main market, with as much as 84% of the lobsters landed in Barbuda being shipped to the French territories in the region (Horsford, 2004a). High retail value for seafood due to relatively high cost of production has limited the viability of alternative markets such as the United States and Canada. Within the Caribbean Community (CARICOM), there are few viable options for domestic exporters due to unfavourable market prices.

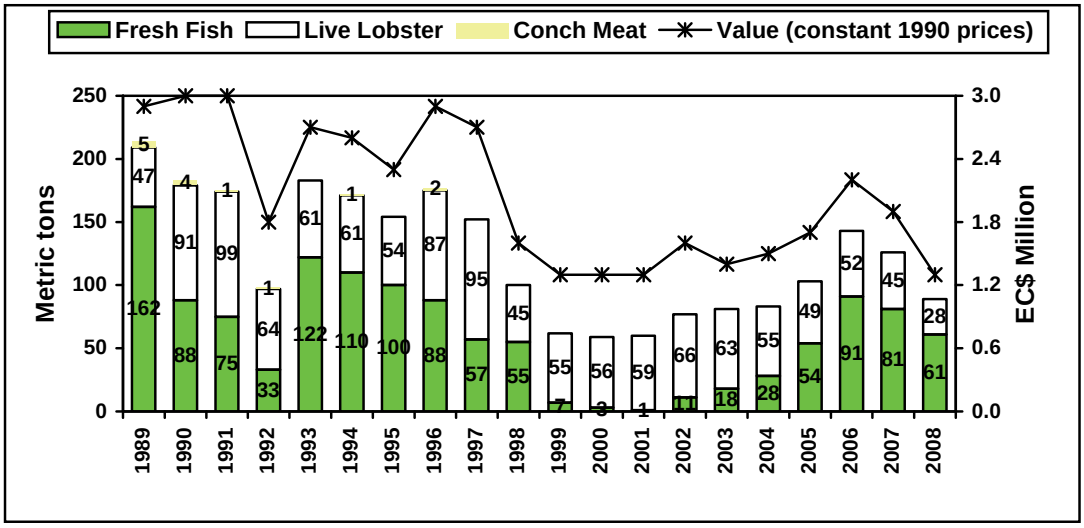


Figure 11. Domestic export of fishery products from Antigua and Barbuda (Source: Fisheries Division, Antigua Barbuda).

1.6 Food Security

According to the Food and Agriculture Organization of the United Nations (FAO), per capita fish consumption for Antigua and Barbuda was 48.3 kg per year in 2004. This is significantly greater than per capita fish consumption in 2003 for industrialised countries (29.7 kg), Europe (19.9 kg), Central America and the Caribbean (9.4 kg) (FAO, 2007). While the level of

consumption appears relatively high it has to be viewed within the context of the demands of the tourism sector which drive fish imports. If the contribution of imports to food supply is ignored, per capita consumption for Antigua-Barbuda would be 13.8 kg, which is less than that of Europe (19.9 kg) but greater than the regional average (9.4 kg). This value is well above the 8.7 kg per year, for low-income food deficit countries (excluding China) (FAO, 2007). Within this context, under or moderately exploited fisheries such as the coastal and large pelagics offer great potential for future development under the proper management regime.

2. FISHERIES GOVERNANCE COMPONENT

2.1 Institutional Framework

Governmental Agencies

The Fisheries Division within the Ministry of Agriculture, Lands, Housing and the Environment is the lead governmental agency responsible for fisheries management and development. The Division is headed by the Chief Fisheries Officer, who reports directly to the Permanent Secretary, Ministry of Agriculture. The mission of the Fisheries Division is:

> *To ensure that development in the fisheries sector occurs in a manner which is sustainable and capable of contributing its full potential to the overall development of the national economy.*

Whilst the Fisheries Division is the primary management authority, the *Barbuda Local Government Act (1976)*, gives the local council of the island of Barbuda, authority to manage its fisheries. Barbuda Fisheries is the implementing arm of the local council. The *Fisheries Act, No.14 of 1983*, which provides for the management and development of fisheries, also makes provision for the designation of local fisheries management authority. An organigram of the Fisheries Division is attached (Figure 12).

In terms of monitoring, control, surveillance and enforcement, the Fisheries Division collaborates with the Antigua and Barbuda Defence Force Coast Guard and the Royal Police Force of Antigua and Barbuda. In addition to enforcing domestic fisheries regulations and patrolling EEZ waters, the Defence Force Coast Guard participates in search and rescue as well as assists the Fisheries Division, with respect to inspecting fishing vessels, environmental monitoring and training of fishers in areas such as vessel safety, navigation, and engine repairs. The Royal Police Force assists with the enforcement of fisheries regulations pertaining to land based activities.

Other governmental agencies that collaborate with the Fisheries Division include:

- The Department of Marine Services and Merchant Shipping – which provides technical support in the area of vessel inspection, registration and marine survey, where necessary.
- The Environment Division – assists in the area of pollution monitoring and protection of endangered species; the Environment Division is the local management authority responsible for implementing the provisions of the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES).
- The Development Control Authority – is responsible for coastal zone planning.
- The Central Board of Health – assists in the area of water quality monitoring, seafood safety and quality assurance.
- The Customs and Excise Division – is responsible for controlling the flow of trade in fish and fishery products.

Figure 12. Organisational chart of the Fisheries Division (Source: Fisheries Division, Antigua-Barbuda).

Non-governmental Organisations

In the area of fisheries management, conservation and environmental education, the Fisheries Division collaborates with the Environmental Awareness Group (EAG). EAG is a voluntary, not-for-profit, non-governmental organisation formed in 1989 to promote public awareness for support of conservation initiatives.

The Fisheries Division also collaborates with Antigua and Barbuda Search and Rescue (ABSAR), a voluntary organisation dedicated to saving lives in Antigua and Barbuda and the surrounding waters. ABSAR has provided assistance to the fisheries sector in the area of search and rescue as well as donating safety equipment.

Fisherfolk Organisations

There are currently four fisherfolk organisations functioning in Antigua:

- Antigua and Barbuda Fishermen Co-operative Society Ltd. (formerly the St. John's Fishermen Co-operative Society Ltd).
- Antigua and Barbuda Sport Fishing Association – the body representing pelagic sport fishers.
- Antigua and Barbuda Fisheries Alliance Inc. – basically an umbrella organisation that deals with major issues affecting the sector.
- South Coast United Fisherfolk Cooperative – is a fledgling organisation that represents the interests of fishers from Antigua's south coast.

In Barbuda, the Barbuda Fishermen Co-operative Society Ltd. and the Barbuda Fishermen Association are no longer functioning.

2.2 Current Legislative Framework

The *Fisheries Act, No.14 of 1983* and the *Fisheries Regulations, No.10 of 1990*, are the primary legislative basis for fisheries management and development. The Act and Regulations make provision for: the establishment of a Fisheries Advisory Committee; fisheries access agreements; fishing licensing (local and foreign); fisheries research; fish processing establishments; and fisheries enforcement. Conservation measures such asprohibiting the use of certain fishing methods, gear and species-size restrictions, closedseasons; and the creation of marine reserves are also regulated. Under the Act, the Minister responsible for Fisheries has the authority to create new regulations for management and conservation as and when necessary.

Other fisheries-related legislation include:

- the *Barbuda Local Government Act (1976)* – which gives the Barbuda Council (local governing body of no less than nine elected and two *ex officio* members) authority over its fisheries including the right to retain taxes on exported seafood;
- the *National Parks Act (1984)* – for the designation of any land area or water as a national park;
- the *Marine Areas (Preservation and Enhancement) Act (1972)* – for the declaration of marine protected areas; and
- the *Beach Control Ordinance (1991)* – for the control of sand mining.

2.3 Proposed Legislative Framework

In 2003, the Fisheries Division sought assistance from the Food and Agriculture Organization of the United Nations (FAO), with respect to bring the *Fisheries Act (1983)* and the *Fisheries Regulations (1990)*, in line with development in current international fisheries law and related environmental agreements. The following draft legislations were produced:

- Draft amended Fisheries Act;
- Draft amended Fisheries Regulations;
- Draft Seafood Regulations;
- Draft Live Lobster Standards;
- Draft High Seas Fishing Act and
- Draft High Seas Fishing Regulations.

Consultation with relevant government authorities and stakeholders on the draft legislation took place in May 2004. The *Fisheries Act, No. 22 of 2006*, was passed in the Lower and Upper House of Parliament and is currently awaiting a date of enactment.

In terms of overall evolution of the fisheries legislation, there has been a shift in paradigm from *"optimal utilisation"* towards a more *"holistic and sustainable approach"* regarding fisheries management. *"Ecosystem based approaches"* to fisheries management and the *"precautionary principle"* are the cornerstones of the *Fisheries Act (2006)* and the pending draft legislation.

The Fisheries Division is in the final stage of updating the fisheries regulations, which improves on the current 1990 regulations, by transitioning the sector from an *"open access"* to *"limited entry"* management regime through the use of special permits for certain fishery resources (e.g., Caribbean spiny lobster and Queen conch). Other improvements in the proposed fisheries regulations include:

- legal requirement for representation by the Barbuda Council on the Fisheries Advisory Committee;
- legal requirement for record of local fishers;
- provisions for suspension and revocation of local fisher licence;
- legal requirement for registration of local fishing vessels;
- provisions for introduction of non indigenous fish and import of live aquatic organisms;
- provisions for marking of fishing gear;
- new and amended gear specifications;
- provisions for designation of landing sites; and
- revision of maximum fines.

2.4 National Principles for Sustainable Development

The *St. George's Declaration of Principles for Environmental Sustainability in the OECS* (SGD) was signed by the OECS Ministers of Environment, including Antigua and Barbuda, in April 2001. The Declaration, which is based on the *Barbados Programme of Action for the Sustainable Development of Small Island Developing States*, sets out 21 principles for environmental sustainability in the OECS region. *Antigua and Barbuda Environmental Management Strategy and Action Plan (2004 to 2009)*, seeks to address the following core principles of the SGD; this approach was adopted given the limited capacity:

Principle 1. Foster improvement in the quality of life.

Principle 2. Integrate social, economic, environmental considerations into national development plans, policies and programs.

Principle 3. Improve on legal and institutional frameworks.
Principle 4. Ensure meaningful participation by civil society.
Principle 5. Ensure meaningful participation by private sector.
Principle 6. Use of economic instruments for sustainable environmental management.
Principle 7. Foster broad-based environmental education, training and awareness.
Principle 9. Manage the impacts of disasters.
Principle 11. Ensure the sustainable use of natural resources.
Principle 13. Protect and conserve biological diversity.
Principle 16. Manage and conserve energy.
Principle 17. Negotiate and implement multilateral environmental agreements.

2.5 Participation and Devolution of Governance

Over the past decades there has been a gradual shift in fisheries governance from one that is "top-down" and centralised to one that is "participatory" and devolved. This shift in governance by the Fisheries Division comes from a recognition that involvement of stakeholder in the decision-making process can lead to:

- increase understanding of management decisions;
- improve compliance by user groups;
- mitigate user conflicts;
- improve relationship with stakeholders; and
- increase effectiveness of fisheries governance.

In Antigua and Barbuda, expansion of involvement of stakeholders has been at the following levels:

1) consultation, where the views of individuals or organisations who are interested in or could be affected by management decision are solicited;
2) formal representation of stakeholders on Fisheries Advisory Committee; and
3) devolution of governance to local council or local fisheries management authority.

2.6 Fisheries Advisory Committee and Participatory Based Fisheries Management

The shift in governance to a more "participatory" approach towards management began in 1983 with legislative provisions for stakeholder participation in the fisheries management decision-making process. Under the *Fisheries Act, No.14 of 1983*, the Chief Fisheries Officer is required to consult with stakeholders in the preparation and review of the fisheries management and development plan. The Act also made provisions for a Fisheries Advisory Committee to advise the Minister on the management and development of fisheries. It should be noted, however, that the legislation does not require the establishment of the Committee, but merely empowers the Minister to appoint one.

The first Fisheries Advisory Committee was established in 1985 and appointed members served for a period of normally two years. Between 1985 and 1990, the composition of the Committee (in terms of numbers) varied widely, due to the problem of finding appropriate representation of professional fishermen; the local fisherman's association lacked sufficient members to legitimise its views as the views of most fishermen. For this reason, representation of professional

fishermen was not limited to the fisherman's association. With the passage of the *Fisheries Regulations, No.10 of 1990,* the composition and the functioning of the Committee was elaborated. According to Section 3(2) of the Regulations, the Committee shall consist of the following:

a) a Chairman, who shall be appointed by the Minister;
b) a Deputy Chairman, who shall be appointed by the Minister;
c) the Chief Fisheries Officer or his representative, who shall be the secretary;
d) three persons nominated by professional fishermen and appointed by the Minister to represent the views of professional fishermen;
e) two other persons one of whom shall be a woman to be appointed by the Minister.

The functioning of the Committee under Section 4 of the Regulations included advising the Minister on:

- fisheries management and development (including review of any plan);
- the need for any amendment to the Act or any Regulations;
- any proposals for access agreements, joint venture or development projects;
- any initiative for regional harmonisation of fisheries regimes;
- on coordination of the policies and activities with respect to any of the fore mentioned;
- on conditions to be imposed and the fees to be paid for any licence under the Regulations; and
- any other matter the Minister may assign.

The Fisheries Advisory Committee functioned until the 31 December 1995, when the last set of appointments to the Committee expired. Since 1995, the Chief Fisheries Officer on a number of occasions, have solicited nominees from various fisherfolk organisations in an attempt to reactivate the Committee. There seems to be a general lack of political will in this regards despite pressure from fisherfolk organisations; the Antigua and Barbuda Fishermen's Alliance strongly suggested that the Government reactivates the Committee following its General Meeting of 27th March, 2001.

Figures 13 and 14 summarise the former and current fisheries management and development decision-making process. In the absence of the Fisheries Advisory Committee (Figure 14), nominees from the pubic review are selected to an ad hoc fisheries focus group for a final review of the draft before submission to the Minister. The current process appears to be favoured by fisherfolk organisations and NGOs (e.g., Environmental Awareness Group), in that, input is sort earlier in the decision-making process and consultation is more comprehensive. This process was first adopted for the FAO sponsored review of the draft fisheries legislation in 2004.

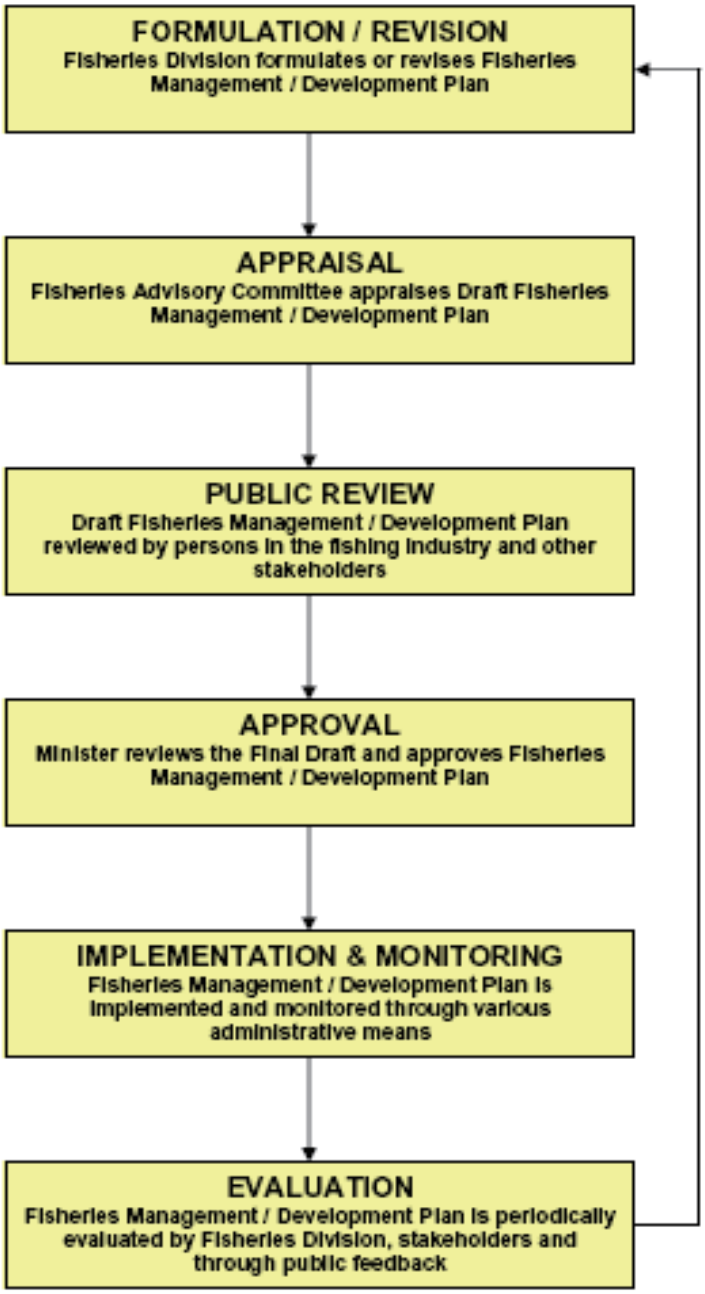


Figure 13. Former fisheries management and development decision-making process (Source: Fisheries Division, 1998).

Figure 14. Current fisheries management and development decision-making process (Source: Fisheries Division, Antigua-Barbuda).

In 2008, the Fisheries Division took a major step in the devolution process by having Cabinet approve the management plan (and management structure) for the North East Marine

Management Area (NEMMA). The NEMMA was declared a marine reserve in 2005 under the *Fisheries Act, No.14 of 1983*. The vision for the NEMMA (Jackson, 2007), is to achieve:

> *"A self-financing, multiple use (yachting, fishing, tourism, conservation, recreation) protected area that maintains and enhances the natural beauty and unique biodiversity of the area, both terrestrial and marine, supported by an efficient legislative framework and ongoing awareness program".*

Figure 15 highlights that the approved management structure of the NEMMA, the NEMMA Management Partnership, comprises of stakeholders from government agencies and statutory bodies (Fisheries Division, Environment Division, Forestry Division, National Parks Authority, Development Control Authority, etc), hotel association, tour operators, the Environmental Awareness Group, Antigua and Barbuda Fisheries Alliance Inc., community groups and other appropriate interests. The NEMMA Management Partnership is expected to function as a not-for-profit, statutory body with members functioning as "shareholders" of the Management Partnership (Jackson, 2007). To achieve self-sufficiency in the long term, the NEMMA Management Partnership is expected to charge user fees for various activities in the area (kayaking, snorkelling, SCUBA diving, camping, mooring, vending, etc).

If this approach to management of marine protected areas proves to be successful (particularly in the areas of financing and governance), the Fisheries Division hopes to apply a similar management structure to other marine reserves in Antigua and Barbuda.

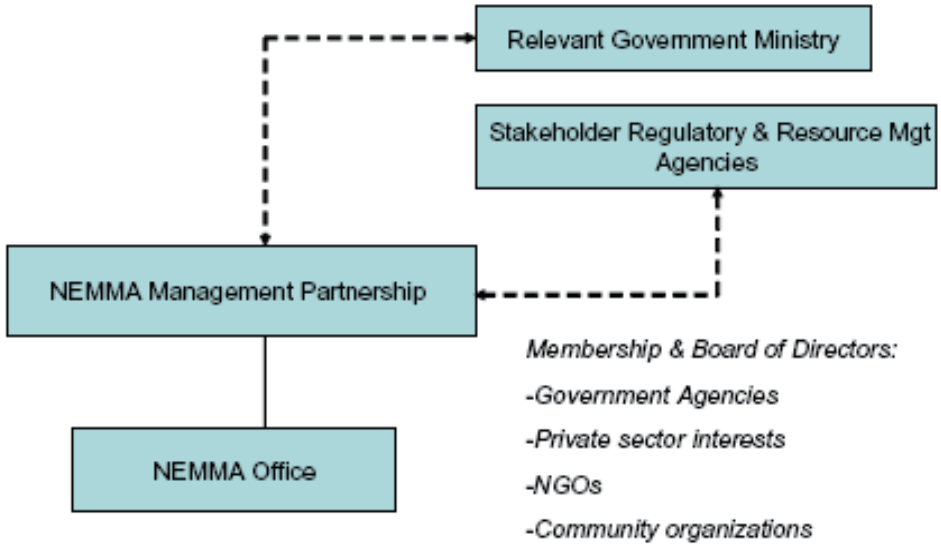


Figure 15. Management structure for the North East Marine Management Area (Source: Jackson, 2007).

2.7 Coastal Communities and Level of Dependency on Fishing

Tables 3 and 4 provide the level of dependency on fishing for the main, traditional, fishing communities in Antigua and Barbuda; values ranged from as low as 5% of the population of Parham to as high as 26% (one in four persons) for Codrington, Barbuda. The transition over the years from an agricultural based economy (mainly sugar), to one that is driven by tourism, saw a

shifts in employment to the lucrative tourism sector. With this shift in employment, the importance of fishing to coastal communities in Antigua declined to serve more as an economic "safety net". The urban community of Grays-Green and the rural community of Round South may be exceptions to the rule, however most coastal communities have seen major shift in the level of dependency. In the case of Parham, of the 33 fishers operating from the site in1999 only 17 (51%) resided in the community. The building of the Parham Fisheries Complex in 2002 resulted in some level of revitalisation from 22 active vessels in 1999 to 37 active vessels in 2008 (Table 2); much of this revitalisation came from outside of the community.

Unlike Antigua, fishing is one of the main economic activities in Barbuda; the others being tourism, sand mining and employment by the local council. In a study done by Van der Meerin (1998), the export-driven lobster fishery offered the highest per capita earnings for the single community in Barbuda (Codrington). In 2008, retail value of lobster production was EC$974,000 (US$360,740). This is approximately EC$13,500 (US$5,000) for each active fisher in Codrington; 2008 was one of the worst years for lobsters exports due to the slowdown and subsequent contraction in the French economy (the main export market).

Table 3. Level of dependency on fishing in traditional fishing communities in Antigua and Barbuda in 1999 (Source: Horsford, 1999). Landing sites: CW = Codrington Wharf; PL = Pearl Harbour; CP = Coco Point; RV = River Wharf; SP = Spanish Point; UL = Urlings; CH = Crab Hill; CB = Carlisle Bay; and MB = Morris Bay.

Community and Landing sites	**Population of the village(s)**	**No. of fishers**	**No. of dependants**	**No. of fishers residing in the village(s)**	**No. of dependants for fishers residing in the village(s)**	**% of the village population directly dependent on fishing**
Codrington, Barbuda						
CW		57	153		153	
PL		3	14		14	
CP		4	24		24	
RV		6	39		39	
SP		1	5		5	
Total	**1000-1200**	**71**	**235**	**71**	**235**	**26%-31%**
Round South, Antigua						
UL	806	41	107	Urlings:22 Old Rd:12	80	
CH	186	5	0	Crab Hill:5	0	
CB (Old Rd)		12	20	Old Rd:10	12	
MB (Old Rd)	1029	10	22	Old Rd:9	21	
Total	**2021**	**68**	**149**	**58**	**113**	**9%**
Parham, Antigua	**1171**	**33**	**92**	**17**	**40**	**5%**

Table 4. Level of dependency on fishing in traditional fishing communities in St. John's, Antigua, in 2001 (Source: Horsford, 2005).

Community	Population (2001)	No. of fishers residing in the community	Mean no. of dependants per fisher	No. of dependants residing in the community	Population directly dependent on fishing
Grays-Green (Antigua)	4597	116	3.0	348	**10%**
Point-Villa (Antigua)	3768	60	3.4	204	**7%**

2.8 Community Based Fisheries Management

Community based natural resource management, in this case fisheries, tends to be associated with approaches where the focal unit for joint natural resource management is the local community (Danida, 2007). In practice, community based natural resource management is about ways in which the state can share rights and responsibilities regarding natural resources with local communities. This can range from community participation to as far as devolution of ownership of natural resources from the state to communities. Note the use of term community is not limited to a geographical community but could be used to define a community of fishers with common interest (e.g., a cooperative).

The legislative framework for community based fisheries management was established in Barbuda with the passage of the *Barbuda Local Government Act of 1976*, prior to Antigua and Barbuda gaining independence from the United Kingdom in 1981. These legal provisions were maintained after independence. According to the *Barbuda Local Government Act*, the elected council of nine members and two parliamentary representatives have the authority:

- to administer fisheries (Part V, Section 4c); and
- to make by-laws concerning fishing and fish intended for human consumption (Part V, Sections 19[1][xxxii] and [viii]).

By-laws made and duly published in the *Gazette* shall have full force and effect in Barbuda and shall only operate in addition to and not in derogation of any other law of Antigua and Barbuda. Barbuda has a long history of community based natural resource management dating back to the communal land rights of the *Barbuda Act of 1904*. Land in Barbuda is held in trust by the Council and subject to their by-laws, thus individuals may not hold title to any land in Barbuda.

In her assessment of the management and decision-making process in Barbuda, Van der Meerin (1998) highlighted that although open house sessions were regularly held by the Council, management decisions should involve active consultation with the village through a series of meetings. She suggested a system of sub-committees comprised of representatives of the Council and other relevant stakeholders. This has since been implemented (Figure 16).

In respect to management of marine protected areas in Barbuda, Codrington Lagoon was declared as a national park in 2005 under the *National Parks Act (1984)*. The lagoon is vital to Barbuda's fisheries and tourism sector, since it serves as a nursery area for juvenile lobster and fish populations as well as an eco-tourism site. It houses one of the largest breeding colonies in the Caribbean for the frigate bird (*Fregata magnificens*). The *National Parks Act*, which is currently the legal basis for the Park, will be amended shortly by the *Barbuda Lands Act*. Once

this is done, a corporate body, the National Parks (Barbuda) Authority, will be created to guide management and development of parks in Barbuda (Environment Division & Barbuda Council, 2009). In the interim, a stakeholders committee has been established by the Barbuda Council and the Environment Division. This committee is made up of representatives from the following groups:

- Barbuda Council
- Barbuda Fisheries
- Planning Office, Barbuda
- Environment Division, Antigua and Barbuda
- Small Businesses Association
- Sea Taxis Association
- Land Taxis Association
- Fishermen Association
- Lobster Exporters Association

The National Parks (Barbuda) Authority, once established, will have the same make up of the existing stakeholders committee (Environment Division & Barbuda Council, 2009). The following entities will have observer status on the National Parks (Barbuda) Authority:

- Fisheries Division;
- Development Control Authority; and
- The Environmental Awareness Group.

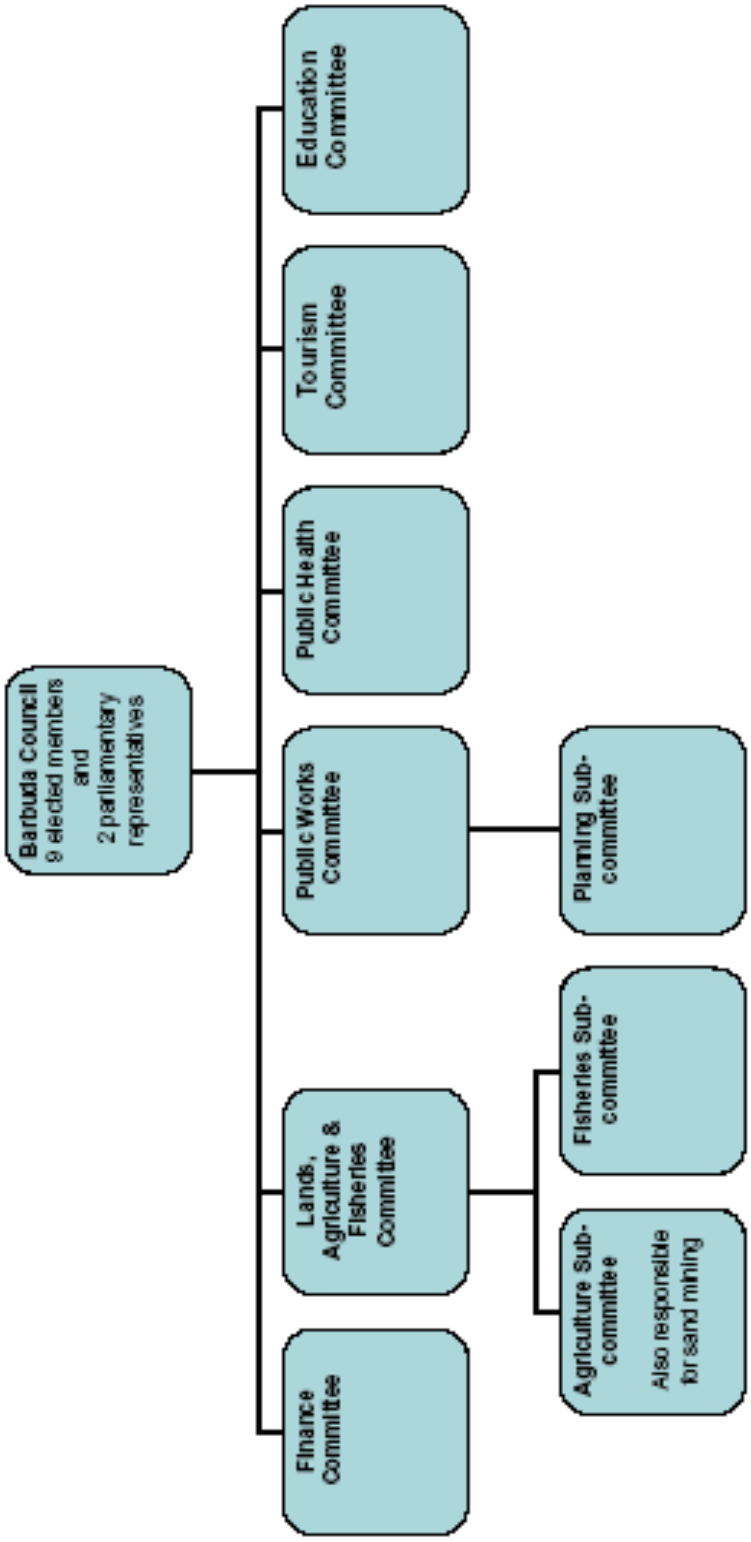


Figure 16. Current management and decision-making process with respect to Barbuda (Source: Barbuda Council).

2.9 Efficiency of Participatory Based and Community Based Fisheries Management

Table 5 examines the efficiency of participatory based management in Antigua versus community based management in Barbuda. Using the level of compliance as a measure of the effectiveness of management, Barbuda Council spent three times more than the national authority on fisheries management per vessel, yet the level of compliance with respect to licensing of vessels was half that of Antigua (53% in Antigua as opposed to 25% in Barbuda). Cost of fisheries management per fisher in Barbuda was also five times that of Antigua. In either case, great effort has to be made to improve overall fisheries compliance with the regulations.

Table 5. Cost efficiency of fisheries management by central government and local council in Antigua and Barbuda (Data source: Budget Department, Ministry of Finance). Note the cost of fisheries surveillance and enforcement by the coast guard was not included since activities covered the entire marine jurisdiction.

	Fisheries Management Approach	
	Participatory Based (Antigua) National Governance	**Community Based (Barbuda) Local Governance**
Management authority	**Fisheries Division**	**Barbuda Council**
No. of active fishing vessels in 2008	338	44
No. of active fisher in 2008	800	72
Cost of fisheries management in 2008	EC$392,882 (US$145,512)	EC$178,249 (US$66,018)
Cost of fisheries management per active vessel in 2008	**EC$1,162 per vessel (US$430 per vessel)**	**EC$4,051 per vessel (US$1,500 per vessel)**
Cost of fisheries management per active fisher in 2008	**EC$491 per fisher (US$182 per fisher)**	**EC$2,476 per fisher (US$917 per fisher)**
Level of compliance with respect to licensing of vessel in 2008	**53%**	**25%**

2.10 Critical Issues Affecting Fisheries Governance

The critical issues affecting participatory based management in Antigua are as follows:

- Lack of political will with respect to reactivating the Fisheries Advisory Committee; note the Draft Amended Fisheries Regulations broadens the membership of the Committee to include a representative of the Barbuda Council.
- In the past, individuals selected to the Fisheries Advisory Committee did not represent the broader views of the sector (i.e., they lacked legitimacy).
- The absence of strong and efficient cooperatives makes it difficult for the Fisheries Division to devolve its authority further (e.g., in the case of managing the fisheries complexes).

In the case of community based management in Barbuda, the issues are as follows:

- insufficient local technical capability; with an estimated population of 1,400 and few individuals trained in fisheries or natural resource management the local council is heavily dependent on central government.
- with such a relatively small community, fisheries enforcement can be problematic due to the fact that individuals may be related (e.g., family, friend or neighbour)

- the short length of appointment of council members can impact on the continuity of policy or affect their political will with respect to making difficult decisions; council members are elected for a period of two years.

At the national level the following issues impact on fisheries governance:

- Lack of a well defined fisheries policy to guide management and development.
- The expansive nature of Antigua and Barbuda shelf and more critically Antigua and Barbuda's declared Exclusive Economic Zone (EEZ); Antigua and Barbuda's marine jurisdiction is approximately 232 times its land mass (Earth Trends, 2003)
- Delimitation of maritime boundaries with neighbouring states.
- The issue of illegal unreported and unregulated (IUU) fishing; unauthorised fishing by foreign vessels is perhaps the most important aspect of IUU fishing for Antigua and Barbuda given the magnitude.
- The multiple roles of Fisheries Division and its personnel; the Division has obligations for marine pollution, seafood safety and quality assurance, beach and wetland monitoring, review of environmental impact assessments, multilateral environmental agreements, marine research, vessel inspection, etc.
- Limited human and financial resources; government austerity measures have impact on the Division's work programme.
- The general decline in community structure and institutions of local governance; in the pre and post independence era of Antigua and Barbuda, the importance of village councils have declined as power shifted from local to central authority. Other factors such as migration (both inflow and outflow) have impacted on the cohesiveness of communities. In 2010, immigrants accounted for 23.6 % of the total population (United Nations, Department of Economic and Social Affairs, Population Division, 2009), and the International Monetary Fund (2005) estimated that total losses due to high-skill emigration was 13.2% of GDP.

2.11 Actions Taken to Improve Fisheries Governance

Actions taken by the Fisheries Divisions to improve fisheries governance include:

- The updating of the fisheries legislation; as mentioned previously FAO sponsored a comprehensive review in 2003. The primary legislation, the *Fisheries Act, No. 22 of 2006*, was passed and should be enacted, along with the Draft Amended Regulations in 2010.
- The drafting of a comprehensive National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing; consultation on the Draft took place in 2009 and the Final Draft is currently before the Minister responsible for Fisheries.
- Collaborating with the Environmental Awareness Group, the National Development Foundation and the coast guard in the areas of conservation awareness, basic business management and record keeping, and safety at sea. With the implementation of the Draft Amended Regulations, fishers will have to undergo mandatory training in the fore mentioned areas as a condition for registration.

With respect to strengthen cooperatives, the Fisheries Division and the Department of Cooperatives have collaborated in terms of mobilizing and organising fishers. The Division assisted former members of the St. John's Fishermen Co-operative Society Ltd., in terms of re-establishing themselves under the new entity called the Antigua and Barbuda Fishermen Co-operative Society Ltd. In 2008, a dedicated officer was assigned to this section of the Fisheries Division's work programme.

Training in the following areas at the national and community level can also strengthen fisheries governance:

- conflict mediation or management;
- leadership training; and
- stakeholder analysis.

3. PELAGIC FISH RESOURCE MANAGEMENT AND DEVELOPMENT COMPONENT

3.1 Fisheries Management and Development Plans

There is no recent fisheries management and development plans for the fisheries sector. A draft development plan was initiated in 2005 (*draft Antigua and Barbuda Development Plan [2006 – 2010]*), however it was placed on hold pending the completion of the legislative reform. A framework for management of the Queen conch was developed in 2006 (Horsford, 2006), but was not elaborated for similar reasons. In the absence of current management plans, the Fisheries Division is guided by the management strategies outlined in the *Fisheries Act (1983)* and the *Fisheries Regulations (1990)*, mainly provisions for: registration and licensing of vessels (local and foreign); fisheries research; fish processing establishments; and fisheries enforcement. Also conservation measures such as: prohibiting the use of certain fishing methods; gear and species-size restrictions; closed seasons; and the creation of marine reserves.

With regards to development strategy, the Fisheries Division is guided by the *OECS Fisheries Management and Development Strategy and Implementation plan* of October 1999. Although outdated, the same issues remain; the plan outlined four main aims, namely:

I. Improved management of national fisheries industries.
II. Market diversification within the fisheries sector.
III. Diversified and sustainable production base.
IV. Improved regional capability for fisheries management.

3.2 Legislative Framework

Based on the nature of Antigua and Barbuda fisheries, most of the legislation is related to demersal resources (mainly reef and deep slope fishes, Caribbean spiny lobster and Queen conch). There are no species-specific regulations that relate to pelagic species, however, restrictions are placed on seine mesh size that affects both pelagic (mainly coastal) and demersal species. Section 26 of the *Fisheries Regulations (1990)* specifies that the minimum mesh size for seine nets be not less than 1 ½ inches (3.81 cm) stretched.

The *Fisheries Act, No.14 of 1983*, makes provisions for the State to take action against citizens of Antigua and Barbuda that are involved in IUU fishing outside Antigua and Barbuda waters. Section 37 of the Act states:

> *Any offence against any of the provisions of this Act or any regulations made under this Act committed within Antigua and Barbuda waters by any person, or any such offence committed outside such waters by any citizen of or person ordinarily resident in Antigua and Barbuda or by any person on board any local vessel, shall be triable in any court of Antigua and Barbuda as if such offence has been committed in Antigua and Barbuda within local limits of the jurisdiction of such court.*

The *Fisheries Act, No. 22 of 2006*, which was passed by Parliament and is currently awaiting a date of enactment, improves on the 1983 Act by:

- Incorporating provisions for sports fishing tournament, whereby permission has to be sought from the Chief Fisheries Officer and in granting the permission conditions may be set (Section 38).
- Banning large driftnet fishing in Antigua and Barbuda waters (Section 57);

Under the 2006 Act, large driftnet is defined as a gill net or other net or combination of nets which is more than one kilometre in length, the purpose of which is to enmesh, entrap or entangle fish by drifting on the surface of or in the water (this does not include a net attached to a point on land or to the seabed).

The Draft Amended Regulations that is expected to come into effect in 2010 includes a number of provisions that impact on pelagic species. These include:

- new sub categories of fishing licence such as local and foreign sports fishing licence;
- provisions on the placing, designation, marking and disposal of fish aggregating devices (FADs); and
- special permit for the use of beach seine net.

With respect to fish aggregating devices, written permission has to be sought from the Chief Fisheries Officer and permission does not confer any exclusive right to fish in the vicinity of the device. Under Section 38 of Draft Amended Regulations the Chief Fisheries Officer may designate FADs and:

- no person shall fish within a radius of 100 metres from a designated FAD without the written permission of the Chief Fisheries Officer and otherwise than in accordance with such conditions as the Chief Fisheries Officer may specify.
- the Chief Fisheries Officer may declare that only certain categories of vessels or defined groups of persons may fish within a radius of 100 metres from one or more designated FADs.

The Draft High Seas Fishing Act and Regulations is scheduled to be placed before Parliament in 2011. These pieces of legislation intend to:

- establish a system for the regulation of fishing vessels of Antigua and Barbuda operating outside areas under national jurisdiction;
- implement the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (*1993 FAO Compliance Agreement*) ; and
- implement the Agreement for the Implementation of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (*1995 United Nations Fish Stock Agreement*).

In the absence of this legislative framework and accompanying infrastructure, the Government of Antigua and Barbuda has opted not to flag foreign fishing vessels. Antigua and Barbuda does not have a home based high seas fishing fleet.

3.3 Pelagic Fish Resource Utilisation

Table 6 presents the catch profile for Antigua and Barbuda from 2001 to 2008. Values presented for the pelagic species may be conservative since current data collection programme has limited

coverage of the sports fishery. Landings of sharks and rays are mainly demersal species since most are by-catch of traps and bottom-set gill net. Hence landings of pelagic sharks are negligible. Landings of both coastal and large pelagics ranged from 61 to 183 metric tons or 2.6 to 6.1% of the total landings.

Table 6. Capture production in live weight (metric tons) for Antigua and Barbuda; "nei" = not elsewhere included (Source: Fisheries Division, Antigua-Barbuda).

Scientific Name	FAO Common Name	2001	2002	2003	2004	2005	2006	2007	2008
Scombroidei	**Tuna-like fishes nei**	**28**	**12**	**13**	**5**	**59**	**22**	**28**	**41**
Osteichthyes	Marine fishes nei	66	13	36	31	108	62	59	17
Panulirus argus	Caribbean spiny lobster	272	276	243	245	309	318	318	165
Strombus gigas	Queen conch	278	319	469	554	528	494	517	1357
Coryphaena hippurus	**Common dolphinfish**	**4**	**7**	**7**	**10**	**13**	**9**	**10**	**62**
Elasmobranchii	Sharks, rays nei	8	17	36	29	17	44	30	91
Ostraciidae	Boxfishes nei	66	38	40	66	81	101	81	76
Acanthuridae	Surgeonfishes nei	158	237	196	141	254	289	259	236
Scaridae	Parrotfishes nei	173	252	254	225	202	278	285	259
Lutjanidae	Snappers nei	284	348	341	411	296	320	420	525
Serranidae	Groupers nei	217	364	352	398	455	463	454	258
Haemulidae	Grunts nei	167	259	212	184	410	385	322	216
Holocentridae	Squirrelfishes nei	29	45	54	13	32	78	50	15
Balistidae	Triggerfishes nei	18	83	143	89	61	124	102	72
Kyphosidae	Sea chubs nei	8	4	10	6	9	3	9	20
Sparidae	Porgies nei	9	15	35	16	40	30	28	40
Sphyraena spp	**Barracudas nei**	**6**	**8**	**26**	**33**	**13**	**12**	**20**	**23**
Carangidae	**Carangids, jacks nei**	**33**	**34**	**85**	**65**	**98**	**43**	**72**	**38**
Pomacanthidae	Angelfishes nei		28	12	4	12	15	17	8
Monacanthidae	Filefishes nei		15	23	2	2	2	11	2
Total		**1824**	**2374**	**2587**	**2527**	**2999**	**3092**	**3092**	**3521**

3.4 Landing Sites Associated with Pelagic Species

In 2001, vessels that primary targeted the pelagic species accounted for 10.0% of the active fishing fleet (289). In 2008, these vessels have increased to 17.3% of the active fishing fleet (382). Vessels were mainly modern, fiberglass, cabin cruisers or launches (Figure 17) that operated from the four main sports fishing sites in Antigua (English Harbour, Falmouth Harbour, Jolly Harbour and Shell Beach). There are about 65 private sports fishing vessels operating in Antigua and Barbuda (Table 7); 10 are commercial charters while the others operate on a recreational or weekend basis. Over the past decade, increase in the number of sports fishing units coincided with increase in the GDP (nominal) per capita. While trolling for the large pelagics (tunas, billfishes, dolphinfish, etc.) has become more common in Antigua and Barbuda, the use of beach seine to target the coastal pelagics (sennets, jacks, etc.) has become rare (Table 7). In the past, beach seine was associated with rural fishing villages, whereby individuals from the village would help to haul the seine in return for a portion of the catch.

Table 7. Distribution of active fishing vessels that target primarily pelagic species in 2001 and in 2008 (Source: Fisheries Division, Antigua-Barbuda).

Landing Sites (Antigua)	**Primary Gear**					
	Troll line (2001)	Troll line (2008)	Percentage change (%)	Beach seine (2001)	Beach seine (2008)	Percentage change (%)
Beachcomber	2	1	-100%	0	0	0
Carlisle Bay	0	0	0	0	0	0
Crab Hill	0	0	0	0	0	0
Crabbs Marina	0	0	0	0	0	0
Dickenson Bay	1	0	-100%	0	0	0
Dredge Bay	0	0	0	0	0	0
English Harbour	**2**	**6**	**200%**	**0**	**0**	**0**
Fitches Creek	0	1	-	0	0	0
Falmouth Harbour	**13**	**11**	**-15%**	**0**	**0**	**0**
Five Island	0	0	0	0	0	0
Gaynors	0	0	0	0	0	0
High St. Wharf	0	0	0	0	0	0
Johnson Point	0	0	0	0	0	0
Jolly Harbour	**5**	**14**	**180%**	**0**	**0**	**0**
Keeling Point	0	0	0	0	0	0
Mamora Bay	0	5	-	0	0	0
Morris Bay	0	0	0	0	0	0
Mill Reef	0	1	-	0	0	0
Market Wharf	0	0	0	0	1	-
Parham	1	4	300%	0	0	0
Point Wharf	0	2	-	0	0	0
Royal Bay	0	1	-	0	0	0
Shell Beach	**1**	**12**	**1100%**	**0**	**0**	**0**
Seatons	1	5	400%	0	0	0
Urlings	0	2	-	0	0	0
Valley Church	0	0	0	0	0	0
Willoughby Bay	0	0	0	0	0	0
Willikies	0	0	0	0	0	0
Sub Total	**26**	**65**	**150%**	**0**	**1**	**-**
Landing Sites (Barbuda)						
Coco Point	1	0	-100%	0	0	0
Codrington Wharf	1	0	-100%	0	0	0
Pearl Harbour	0	0	0	0	0	0
River Wharf	1	0	-100%	0	0	0
Sub Total	**3**	**0**	**-300%**	**0**	**0**	**0**
Grand Total	**29**	**65**	**124%**	**0**	**1**	**-**

Figure 17. Sports fishing site in Antigua (Catamaran Marina, Falmouth Harbour).

3.5 Status of Pelagic Fish Resource

Large Pelagic Species

Tunas (*Scombridae*), dolphinfish (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), billfishes (*Istiophoridae*), swordfish (*Xiphius gladius*) and pelagic sharks (*Elasmobranchii*) migrate through Antigua and Barbuda waters and are harvested mainly by the sports fishers and to a less extent by commercial fishers. The migratory nature of these species makes regional management necessary. The International Commission for the Conservation of Atlantic Tunas (ICCAT) provides an annual review of these stocks. According to these reviews many of the larger pelagic are fully or over-exploited. These include the Atlantic bluefin tuna, albacore, bigeye tuna, blue marlin and white marlin (ICCAT, 2010).

Catches of the large pelagic species are seasonal. Conservative estimates of capture production ranged from 15 to 72 metric tons (Figure 18). The status of some species are unknown, however certain species are believed to be adequate enough to allow for an expansion of this fishery in Antigua and Barbuda. Figure 18 provides potential yield estimates for various species; estimates for individual species (in most cases) are well above what is landed for the entire group (*Scombroidei* and *Coryphaena hippurus*) on an annual basis.

In order to participate in the regional management of these resources, the current data collection programme will have to be upgraded to improve monitoring of these resources. In the long term, the Government of Antigua and Barbuda should consider membership in ICCAT, if it intends to utilise its “fair share” of the resource.

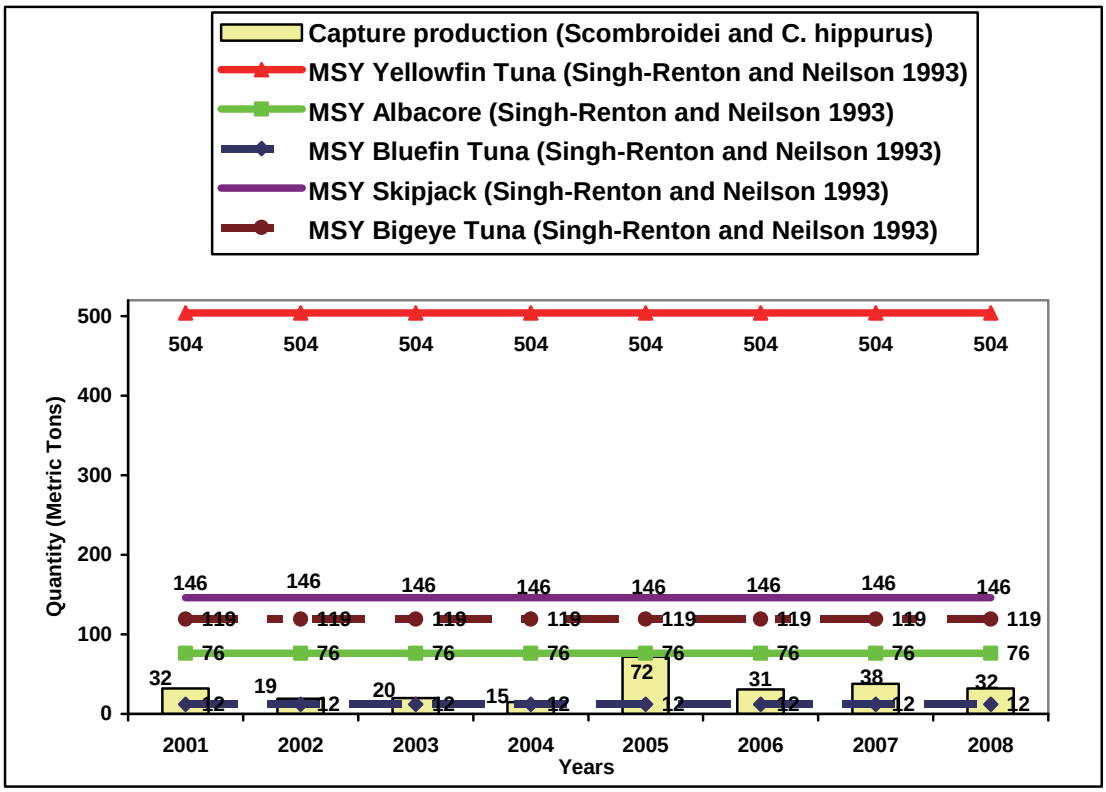


Figure 18. Capture production for large pelagic species and maximum sustainable yield (MSY) estimates for various large pelagic species within Antigua and Barbuda waters.

Coastal Pelagic Species

Coastal pelagic species include jacks (*Carangidae*), ballyhoo (*Hemiramphus* spp.), herrings (*Clupeidae*), scads (*Decapterus* spp.), sennets (*Sphyraena* spp.), bonefishes (*Albulidae*) and small tunas. In recent times fishers have not focused on this fishery. The principle gears employed to catch coastal pelagics include cast net, beach seine and ballyhoo net. Gill nets are occasionally used to target the jacks, however these fish are less marketable due to the risk of ciguatera fish poisoning. Currently there is only one beach seine in operation in Antigua and Barbuda. Coastal pelagics such as the ballyhoo and herring are mainly used as bait in the large pelagic or sports fishery.

Anecdotal evidence from fishers suggests that the coastal pelagic species are moderately exploited. Lack of data on these resources precludes the estimation of potential yields. Consequently, efforts to expand the fishery should take a precautionary approach.

3.6 Critical Issues Affecting Utilisation of Pelagic Fish Resource

Antigua and Barbuda has expressed an interest in expanding its pelagic fishery; however, it is constrained by some of the same issues that affect other OECS member states (OECS, 1999), mainly:

- there is limited knowledge of the potential resources;
- accessing financial resources is difficult; and
- human and financial resources are limited.

Relating to the issue of accessing financial resources and fundamental to the creation of a suitable investment climate, the absence of insurance or its high cost is a disincentive to private sector investment. Currently, only 9.6% of the fishing fleet is covered by vessel insurance (Horsford, 2009), despite Antigua and Barbuda's ranking among the top four countries affected by natural disasters (mainly hurricanes) from 1970 to 2002 (International Monetary Fund, 2004).

Other critical issues affecting utilisation of pelagic species include:

- Ciguatera fish poisoning in the case of certain coastal pelagics (e.g., barracudas and jacks); Antigua and Barbuda has some of the highest number of reported cases per year (192 cases in 2005).
- The "taste preference" for demersal species (e.g., snappers, groupers, grunts and parrotfishes) with respect to fresh fish; this date back to the colonial era (Lanaghan, 1844).
- The profitability of the spiny lobster and reef fish trap fishery (Horsford, 2001; Tietze, Prado, Le Ry, & Lasch, 2001; FAO, 2002; and Tietze, Thiele, Lasch, Thomsen, & Rihan, 2005) may limit targeted effort applied to harvesting pelagic species; positive rates of return on investment ranged from 29% to 41% while positive net cash flows ranged from US$4,390 to US$30,150 (Tietze, Thiele, Lasch, Thomsen, & Rihan, 2005). Fishers less likely to exit a profitable fishery for one whose economic status is unknown (i.e., the economic concept of opportunity cost).
- High investment and running costs with respect to the large pelagics; Antigua and Barbuda shelf is only narrow on the north eastern side of Barbuda and the southern side of Antigua.
- Mode of fishing operations; the mean trip length of vessels in 2008 was 1.2 days. This would affect the viability of an operation focused solely on the large pelagics due to high running cost. The reluctance of crew to fish for several days has also impacted on the profitability of the larger trap-fishing units (Horsford, 2001; Tietze, Prado, Le Ry, & Lasch, 2001; FAO, 2002; and Tietze, Thiele, Lasch, Thomsen, & Rihan, 2005).
- User-conflict with French vessels fishing illegally in Antigua and Barbuda waters; according to the Sea Around Us Project (2009), vessels from Guadeloupe landed about 1,324 metric tons of fish from Antigua and Barbuda waters in 2006 (Figure 19). A substantial proportion of the catch was pelagic species, highlighting the untapped potential of the fisheries sector.

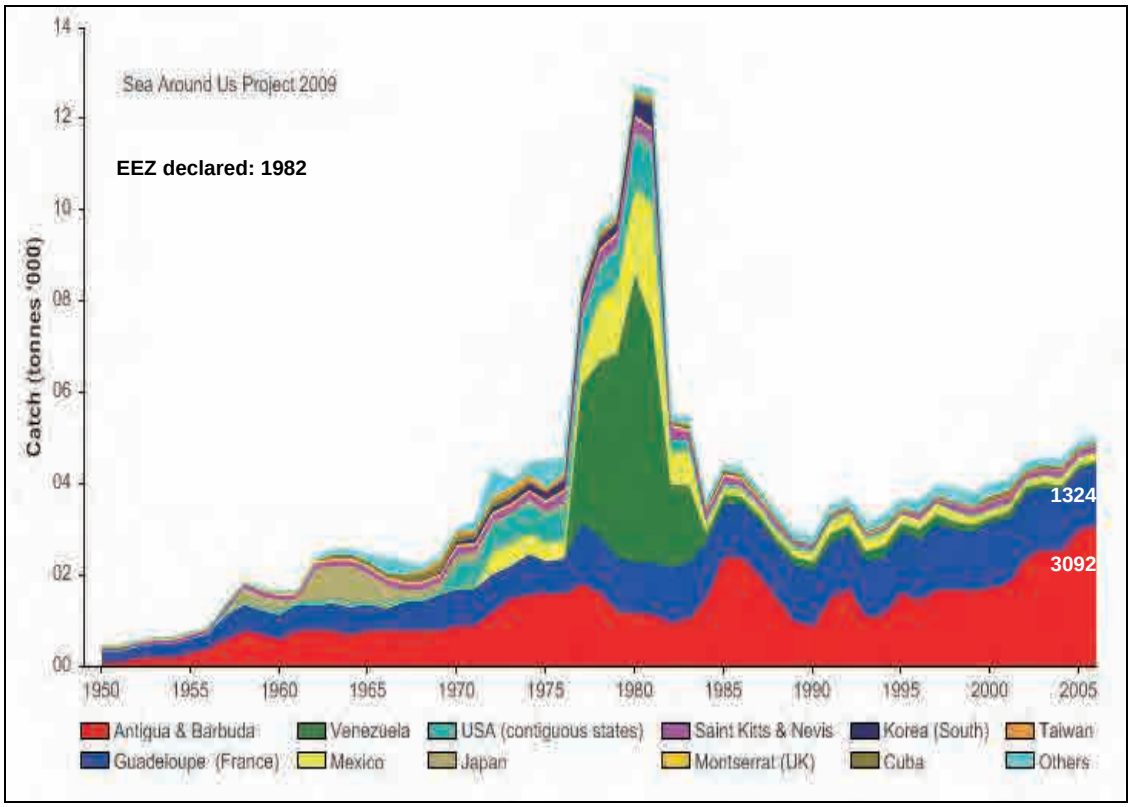


Figure 19. Landings by fishing country in Antigua and Barbuda waters (Source: Sea Around Us Project, 2009).

3.7 Actions Taken to Promote Utilisation of Pelagic Fish Resource

Actions taken by the Fisheries Division to promote utilization of pelagic resource include:

- Training of fishers in methods used to target the pelagics (e.g., surface long lining, vertical long lining using squid jigs and gill netting of flying fish). These training programmes were facilitated by the Japan International Cooperation Agency (JICA) (Figure 20).
- The inception of a monitoring programme for ciguatera as part of a cooperation programme between Antigua-Barbuda and Cuba; the aim is mitigate the risk associated with certain species.
- Increased offshore fisheries patrol to reduce the occurrence of IUU fishing by French vessels thereby mitigating user-conflict.
- The promotion of fishing FADs as a viable option to reducing the running cost associated with targeting the large pelagics.

A study of the sports fishery should be conducted to see how best Antigua and Barbuda can capitalize from recreational services. This should be done in conjunction with the Ministry of Tourism and the sports fishing association. Finally, any development in the pelagic fishery should follow the precautionary approach which emphasises that sustainable utilisation requires the application of prudent foresight to avoid changes that are irreversible.

Figure 20. Exploratory fishing operation sponsored by JICA in 2001 for the pelagic Diamondback squid (*Thysanoteuthis rhombus*) and Neon flying squid (*Ommastrephes bartrami*).

4. AQUACULTURE MANAGEMENT AND DEVELOPMENT COMPONENT

4.1 Aquaculture Policy, Management and Development

Over the years, various governments have expressed an interest in developing an aquaculture sub sector. However, the only justification to-date for the development of aquaculture lies in the *Draft White Paper on a Policy for Agriculture, 1988-1998,* which indicates the following objectives:

- Increase production of food and other products from the nation's farms, forests and fisheries;
- Displace, to the extent possible, imports;
- Raise the productivity and income of farmers, fishermen and foresters;
- Capture special export market … to earn additional income and foreign exchange; and
- Develop among young peoplealternative forms of employment and entrepreneurship.

The Ministry of Agriculture is currently drafting new policies for the development of the agriculture sector (including aquaculture). This includes the *Antigua and Barbuda Agricultural Land Use Policy*, which will be incorporated into the *Draft National Physical Development Plan*. This is seen as critical to the sustainable development of the agriculture sector given the rate of

encroachment of residential and tourism development on prime agriculture land and areas suited for aquaculture.

There are no specific aquaculture management and development plans for Antigua and Barbuda.

4.2 Legislative Framework

The *Fisheries Act, No. 22 of 2006,* which is scheduled to be enacted in 2010, provides the overall legislative framework for managing and developing of aquaculture in Antigua and Barbuda. Prior to the passage of this legislation, no legal framework existed. Provisions are made in the Act to:

- ensure that the aquaculture sector is considered in overall management and development of the fisheries sector (Section 6);
- provide for control and enforcement measure for aquaculture activities (Section 60 [1]); and
- harmonize the regulatory powers with the new aquaculture requirement (Section 76).

This legislative framework provides a sufficient basis for further development of detailed regulatory instruments relating to aquaculture.

Aquaculture is defined as the culture, propagation and ranching of aquatic plants and fish from eggs, spores, sprats or seeds and includes the aggregation, capture or keeping of fish for the purpose of public exhibition or observation or other recreational purposes.

Section 6 requires the Chief Fisheries Officer to prepare a plan for the development of aquaculture activities in Antigua and Barbuda waters and in the territory of Antigua and Barbuda. In preparation of the plan the Chief Fisheries Officer shall adopt a precautionary approach to aquaculture development.

Under Section 40 of the Act, no person may conduct aquaculture without an aquaculture licence from the Chief Fisheries Officer and, if necessary, a lease from the Governor-General for land including foreshore and sea bed (Section 42). Chief Fisheries Officer shall only issue a licence if:

- the applicant holds the necessary permits, including those relating to land development and environmental protection;
- where environmental impact assessment is required by legislation, an environmental clearance has been issued;
- aquaculture activity will not adversely impact on other economic activity;
- the granting of an authorisation will not create a significant risk of pollution; and
- the proposed site is suited for aquaculture activity (Section 41).

There are additional provisions in the Act related to: the recapturing of escape fish; fishing and passage close to aquaculture farms; cancellation or suspension of aquaculture licence; feeds, drugs and disinfectants in aquaculture; disease and infected organisms; prohibitions; and sanctions.

4.3 Status of Aquaculture Development

Antigua and Barbuda are two of the driest islands in the Eastern Caribbean and thus large scale fresh water fish culture faces a serious challenge. The earliest attempts were in the 1970s of tilapia and catfish, but these proved unsuccessful due to the constraints of low rainfall. Because of the numerous inlets and coves in Antigua and the relatively large lagoon in Barbuda, attempts have been made at mariculture, however none were commercially successful. Past projects include:

- Caribbean king crab, *Mithrax spinosissimus*, (sponsored by the Smithsonian Institute);
- sea moss, *Eucheuma isiforme*, (sponsored by the Canadian International Development Research Centre project in Barbuda);
- *Penaeus* shrimp (sponsored by the Eastern Caribbean Mariculture Ltd.); and
- grow-out of Caribbean spiny lobster (*Panulirus argus*) juveniles.

The most ambitious of these projects was the *Penaeus* shrimp by Antigua Shrimpery Ltd. Trial operation began in 1982 and obtained funds from the United States Agency for International Development (USAID), the Bank of Antigua and the Caribbean Food Cooperation. The farm was located at Nonsuch Bay and had a quarantine/nursery laboratory and six 2-hectares grow-out ponds, supported by a 10 hectares reservoir. Commercial operations started in 1995 using *Penaeus vannamei*, but also experimented with *Penaeus monodon*. The production was sold primarily in the local market. Low yields, 0.36 to 0.57 metric tons per hectare were recorded. The company also reported difficulty in obtaining disease-free juveniles. The original project was conceived as a pilot project for the Lesser Antilles, but encountered difficulties and the Eastern Caribbean Group of Companies (a St. Vincent food-processing group) purchased majority ownership and renamed the company Eastern Caribbean Mariculture Ltd. At the time of operation it was one of two existing companies in the Eastern Caribbean; the other located in St. Kitts.

In the 1990s, three persons in Antigua experimented with culturing sea moss (*Eucheuma* and *Gracilaria* sp.); by 2000, one grower had gone commercial and had the potential of producing 200 lbs dry weight per day. This level of production was not realised due to low local demand and limited access to regional markets. Sea moss is typically cultured on lines in a shallow bay, by twisting pieces of the moss between long lines of nylon rope (Figure 21). The moss is trimmed after a few weeks leaving a portion of the moss in the rope to regenerate.

In Antigua and Barbuda, sea moss has been traditionally harvested from the wild and consumed in a milky beverage laced with spices. Local folklore has it that the drink has aphrodisiacal properties. Various cultured products on the market include bottled and canned concentrates as well as dried sea moss (Figure 22). Other issues affecting sea moss culture, particularly for those who develop value-added products, include the: cost of importing beverage bottles and bottling; legal requirements for marketing and exporting food products; identification of product ingredients and correct labelling; and competition from cheaper imports. An international market exists for algal gels from sea moss (e.g., agar and carrageenin) however no feasibility assessment has been done.

Currently in Antigua and Barbuda, aquaculture production is limited to a single sea moss producer on the northeast coast of Antigua, and the reintroduction of tilapia culture, in 2003, by a retired university professor.

No attempts have been made to use aquaculture to support stock enhancement.

Figure 21. Sea moss (*Gracilaria* sp.) cultivation on the northeast coast of Antigua.

Figure 22. Various sea moss commodities produced in Antigua.

4.5 Critical Issues Affecting Aquaculture Development

The key issues affecting aquaculture management and development in Antigua and Barbuda include:

- Lack of a well defined aquaculture policy to guide management and development.
- Scarcity of fresh water supplies in the case of fresh water fish culture; Antigua receives an average monthly rainfall of 3.4 inches (86.4 mm) and is prone to periodic droughts.
- Competition with the tourism sector for prime coastal property in the case of mariculture; despite having numerous bays and coves in Antigua most are already earmarked or associated with tourism development. Because of the loss of or degradation of critical habitats (e.g., mangroves and sea grass beds) due to coastal and tourism development (de Albuquerque & McElroy, 1995; Baldwin, 2000), Fisheries Division intends to declare additional marine reserves.
- Accessing financial resources is difficult; mariculture is capital-intensive and aquaculture (in general) is seen as a high risk venture by lending institutions.
- Limited incentives to promote aquaculture development.
- Limited technical and research capability both in the public and private sector; the Fisheries Division lacks a dedicated aquaculturist, only one member of staff has been trained in this area; the private sector suffers from a similar shortage.
- Competition from cheaper imports; in general, imports of tilapia from Jamaica and Guyana, and sea moss from St. Lucia and the Dominican Republic are cheaper than their local counterparts.
- Taste preference for demersal species (e.g., snappers and groupers); this is compounded by the fact that top-valued demersal fish, retail at low value than locally farmed tilapia (US$8.15 per kg versus US$9.51 per kg).
- Lack of insurance coverage with respect to aquaculture resources and infrastructure (particularly in the case of mariculture facilities).

4.6 Actions Taken to Support Aquaculture Development

Actions taken by the Fisheries Division to promote aquaculture include:

- Legislative framework development (*Fisheries Act, No. 22 of 2006*).
- Provisions for aquaculture in fisheries management and development plans and strategies.
- Capacity building in the area of research and economic feasibility; the Division has one officer trained in aquaculture (courtesy of the Peoples Republic of China) and a postgraduate marine resource economist.

Other areas that can support aquaculture development include:

- Formalising aquaculture development policy including land use policy and specific fiscal incentives.
- Use of pilot projects to transfer technology and its evaluation.
- Formal evaluation of past projects including “lessons learned” and “best management practices”.
- Improve national administrative procedures including evaluation, approval, monitoring, control and surveillance.

5. FISHERIES INFORMATION AND STATISTICS SYSTEM COMPONENT

5.1 Policy and Legislative Framework

The current legal framework that covers the collection and management of fisheries information and statistics are enshrined in the following pieces of legislation:

- the *Fisheries Act (1983)*;
- the *Fisheries Regulations (1990)*;
- the *General Statistics Act (1975)*; and
- the *Freedom of Information Act (2004)*.

The *Fisheries Act (1983)* and the *Fisheries Regulations (1990)* provide the legal basis for the collection of information related to the licensing of fishing vessels (both local and foreign) and fishing operations (e.g., catch and effort and species-biological information). While there is no specific mandatory provision for registration of vessels, the administrative process of licensing a fishing vessel (such as inspection related to safety standards prescribed by the Chief Fisheries Officer) and other general conditions of the licence provide all the necessary information to create a vessel registry. Similarly, there is no specific mandatory provision for registration of fishers, however legal provisions related to duty free concessions (i.e., the Chief Fisheries Officer is responsible for validating whether or not an individual is a bona fide fisher), government policy relating to the issuance of disaster aid, and other administrative procedures (application for a loan, passport, visa, work permit, etc) basically coerce fishers to register.

The *Fisheries Act (2006)* and the Draft Amended Regulations, which will be enacted in 2010, address the fore mentioned issue by making the registration of vessels and fishers compulsory.

In regards to fisheries research in Antigua and Barbuda waters, permission has to be granted and conditions may be attached to the permission (Section 23 of the *Fisheries Act, 1983*). The *Fisheries Act (2006)* retains these provisions; however the Draft Amended Regulations makes it mandatory that the data collected during the research and the results of the research be made available to the Chief Fisheries Officer, within a reasonable period of time after the research has been carried out (Section 54). This is in response to the fact that a significant amount of the information related to Antigua and Barbuda's fisheries resides outside of the country.

In the absence of specific provisions governing the collection and management of fisheries information and statistics in the Act and Regulations, fisheries officers are guided by the *General Statistics Act of 1975*. Under Section 12 (security of information):

> *Information collected through inquires…may not be published in a manner which enables the identification of the cost of production, capital employed and profit arising in any particular undertaking or business or which discloses the affairs of an individual household or person.*
>
> *No report, abstract, working sheets or other documents containing particulars of statistical information so arranged as to enable identification with any person, undertaking or business, shall be published, admitted in evidence or shown to any person not employed in the execution of a duty under this Act unless the previous consent in writing thereto has been obtained from the person making such return or giving such answer.*

Under the *General Statistics Act*, the head of the Statistics Division is the Statistics Authority for Antigua and Barbuda and shall be responsible for taking, from time to time, appropriate measures to organise and develop a national statistical system capable of meeting effectively the statistical needs of social and economic planning.

Fishing is listed in the Schedule of the *General Statistics Act* hence the Fisheries Division is subject to the provisions related to social and economic planning.

The *General Statistics Act* also allows the Statistics Authority to delegate any of its functions to specified officials or organisations, once such a delegation has been made, the specified official or head of the specified organisation, have all of the enabling powers vested in the Statistics Authority by virtue of the Act.

As public authorities under the *Freedom of Information Act, No. 19 of 2004*, the Fisheries Division and the Barbuda Council, are subject to the provisions of the Act, which is intended:

- to promote maximum disclosure of information in the public interest;
- to guarantee and facilitate the right of access to information; and
- to provide for effective mechanisms to secure that right.

Under the Act, a Ministry of the Government, a department, division or unit, the Barbuda Council, are all included in the definition of public authority.

Exceptions to the general right of access that are particularly relevant to the Fisheries Division and the Barbuda Council include:

- personal information about a third party (Section 26);
- information obtained in confidence (Section 28);
- information related to law enforcement (Section 30); and
- information related to policy making and operations of public authorities (Section 33).

With respect to personal information, a public authority, such as the Fisheries Division may refuse to indicate whether or not it holds a record, or refuse to communicate information. If this were to occur, it would involve the unreasonable disclosure of personal information about a third party which is relevant to information obtained during fisher and vessel registration. The sections related to information obtained in confidence and information related to law enforcement is used by the Fisheries Division to guide officers involved in surveys, census and fisheries enforcement. The *Freedom of Information Act* complements the provisions in the *General Statistics Act* that is used to guide the collection and management of fisheries information and statistics.

5.2 Fisheries Information and Statistics System

The following programmes are used to:

- assess the status of fisheries (including fishery resources and socio-economics);
- monitor the level of compliance regarding fisheries legislation; and
- guide fisheries management (including monitoring, control, surveillance and enforcement) as well as development strategies.

The Licensing and Registration Programme captures baseline socio-economic data on fishers (age, work status, no. of dependants, etc) as well as technological features of the fishing fleet (vessel size, engine power, primary gear, etc). The registration component allows for the estimation of the potential fishing effort within the country while the licensing component provides an estimation of the actual fishing effort currently utilised. Despite the fore mentioned, the *Vessel Frame Survey 2001* (Horsford, 2004b), indicated that the number of licensed vessels is

not a "good indicator" of the actual fishing effort. This was attributed to the low level of compliance with respect to licensing of local fishing vessels (58%) and the fact that the fisheries sector acts as a "safety net" for other economic activities (mainly employment in the tourism and construction sectors). Hence level of fishing activity varies depending on upturn or downturn in the related sectors. In 2008, at least 36% of the registered fishers were either part-time or occasional fishers.

To improve monitoring of actual fishing efforts and level of compliance regarding local licence, a census of the number of active fishing vessels has been conducted annually since 2001. This has improved the accuracy of various annual fisheries statistics (capture production, contribution to GDP, level of employment, etc).

Figure 23 highlights how the Fisheries Division uses data on age of fishers from the registration process to determine prospects for future growth of fishing communities. Note that the population pyramid is constrictive indicating a "greying" of the population due to few young entrants. This in combination with the mean annual rate of growth of active fishers can be used to forecast or model future population growth.

The Catch and Effort Data Collection Programme captures data pertaining to fishing vessel's trips (total catch, species composition, fishing effort, crew size, trip expenditure, etc) while the Biological Data Collection Programme captures data on the fishery resources (size, sex, maturity, etc). Both programmes are used to monitor various trends in the fisheries such as mean catch per unit effort, mean size landed and level of compliance with conservation measures (See Figure 24).

Since 2001, the focus of the Catch and Effort and the Biological Programmes have changed, from one that is *stock assessment driven* to one that is *management objective driven*. This approach focuses on monitoring various indicators (annual mean catch per unit effort, annual mean size landed, etc) against corresponding reference points (mean historic catch per unit effort, mean size of 50% maturity, etc) and take corrective action (e.g., reduce effort) if there are any deviation from the desired state. This approach may also be described as *adaptive fisheries management* since it relies on systematic feedback learning to improve fisheries management. Mahon (1997) outlined some of the pitfalls of management that is *stock assessment driven*, such as the tendency for managers of small stocks to disproportionately allocate resources to stock assessment rather than other critical components of management (e.g., implementation). Figure 25 summarizes the action sequence with respect to both approach.

In order to properly track domestic fishery exports and to improve overall management of the export sector, a spreadsheet of the information related to each consignment is maintained by the Fisheries Division. This allows for proper management of all the necessary documentation required for export (e.g., in the case of the European Union, custom warrant, health certificate and more recently catch certificate).

Since 2001, the Fisheries Division has maintained a spreadsheet of breaches of the fisheries legislation to:

- readily identify repeat offenders;
- track changes in the types of violations;
- geo-reference "hot spots" for IUU fishing; and
- guide monitoring, control, surveillance and enforcement strategies.

Other data collection programmes run by the Fisheries Division include:

- beach monitoring, where 25 beaches in Antigua and Barbuda are profiled (in terms of area and width) on a quarterly basis as part of a climate change programme.
- sea grass monitoring, which is also done quarterly as part of the SeagrassNet programme that documents the status of sea grass globally.
- coral reef and mangrove monitoring.

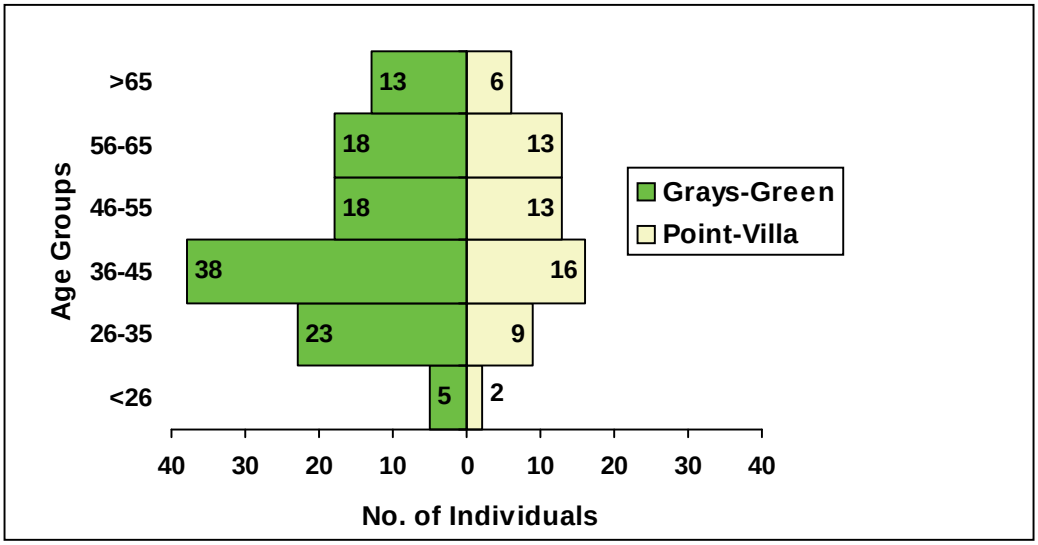


Figure 23. Age distribution of fishers residing in the communities of Grays-Green and Point-Villa (Source: Horsford, 2005).

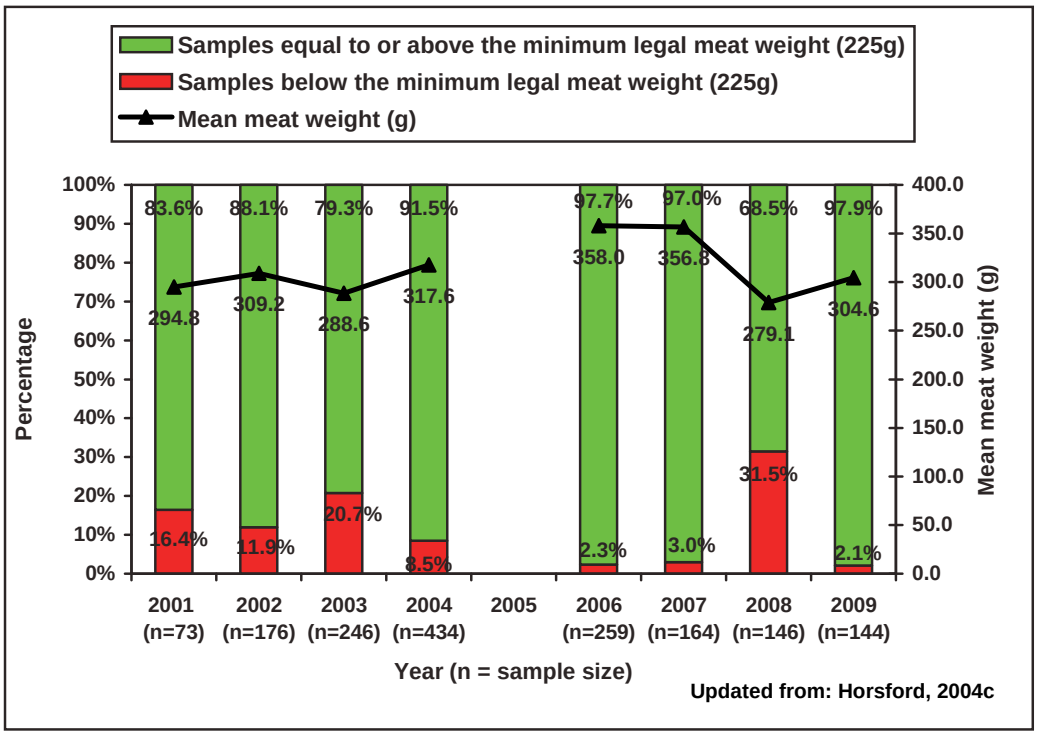


Figure 24. Trend in the mean meat weight of Queen conch *(Strombus gigas)* landed in Antigua and Barbuda as well as level of compliance regarding the minimum legal meat weight of 225 grams; meat weight is the weight of the conch after removal of shell and digestive gland.

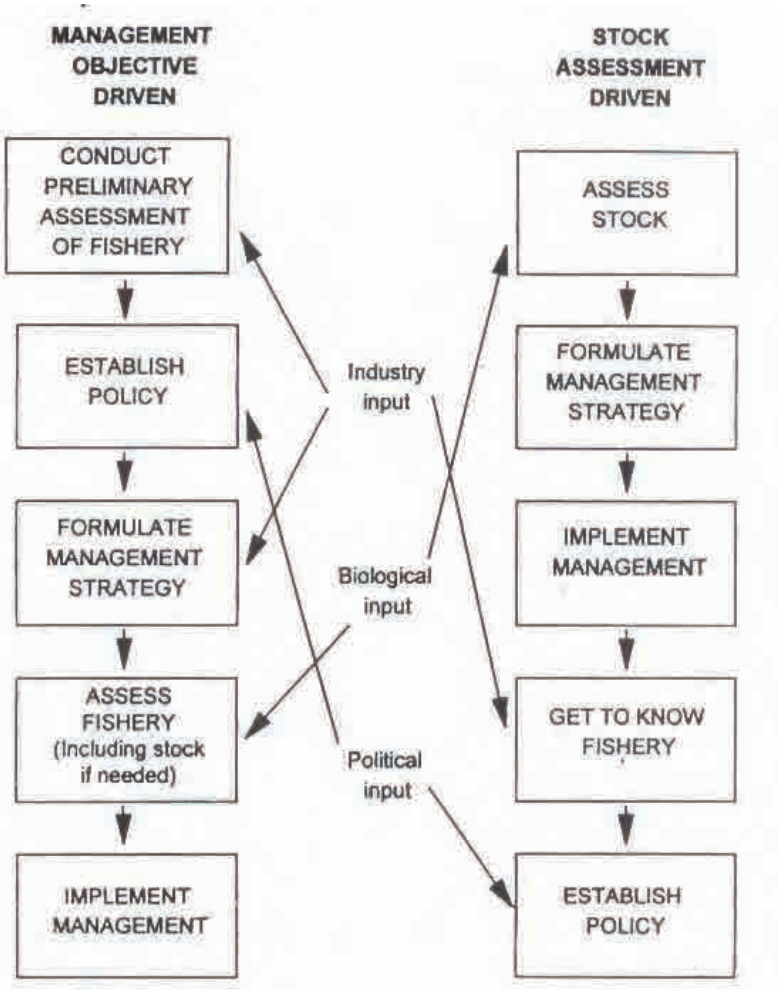


Figure 25. The action sequence that should take place when fishery management is management objective driven and that tends to take place when it is stock assessment driven (Source: Mahon, 1997).

5.3 Data Management and Storage

Data pertaining to the Licensing and Registration Programme are inputted and stored in Microsoft Access, while Microsoft Excel is used for the following:

- Catch and Effort Data Collection Programme
- Biological Data Collection Programme
- data pertaining to domestic fishery exports and breaches of the fisheries legislation.

The database and spreadsheet files are password protected with respect to opening and modifying, and password is limited only to key personnel. All files are stored on one dedicated desktop workstation at the Fisheries Division and backed up on a laptop and a portable hard drive at a separate location. All files are backed up on weekly basis.

When data analysis involves individuals that are not staff members of the Fisheries Division, data is edited prior to the analysis to ensure that personal information remains confidential. SPSS 14.0 for Windows is the primary software used for statistical analysis; GenStat is also used from time to time.

The Caribbean Fisheries Information System (CARIFIS) is currently not used due to fact that a number of the important fields that are relevant to Antigua and Barbuda are not captured in the CARIFIS database (i.e., the issue of designing to suit the end user). With respect to regional stock assessment, the issue of standardization of fishing effort is problematic due to the diverse use of the same gear. For example, traps or fish pot can be used to target different resources by changing the type of funnel, the type of bait, the depth or area set or the length of the soak time.

5.4 Fisheries Specific Information Dissemination

The Fisheries Division provides the following entities with annual reports / statistics:

- Ministry of Finance;
- Ministry of Trade, Industry and Commerce;
- Economic Policy and Planning Unit;
- Environment Division;
- Statistics Division;
- Eastern Caribbean Central Bank;
- Organization of Eastern Caribbean States;
- Caribbean Regional Fisheries Mechanism;
- Food and Agriculture Organization of the United Nations;
- Inter-American Institute for Cooperation on Agriculture;
- Barbuda Fisheries;
- Barbuda Council;
- Antigua Fisheries Ltd;
- National Development Foundation;
- Antigua and Barbuda Investment Authority;
- Antigua and Barbuda Development Bank;
- Environmental Awareness Group;
- Antigua and Barbuda Fishermen Co-operative Society Ltd; and
- Caribbean Network of Fisherfolk Organisations – Coordinating Unit

Regarding fisheries enforcement, the Fisheries Division provides the Antigua and Barbuda Defence Force Coast Guard, with a list of authorised fishing vessels on a weekly basis.

In terms of feedback to stakeholders (particularly fishers), there is an Annual Fisheries Symposium, where status reports are presented for discussion. Articles are also printed in newspapers and there are numerous reports / statistics on the Fisheries Division's website: www.fisheries.gov.ag

Critical Issues Affecting Fisheries Information and Statistics System

The main issues affecting the fisheries information and statistics system include:

- Limited human resources; in the absence of full time data collectors all technical staff (6 in total) are required to collect data. While this is an inefficient way to manage a data collection programme it allows for maximum interaction of staff with stakeholders.
- Limited financial resource; government austerity measures (e.g., budget cuts and fuel rationing) have impact on the Fisheries Division's work programme.

- The multiple roles of Fisheries Division and its personnel; the Division has obligations for marine pollution, seafood safety and quality assurance, beach and wetland monitoring, review of environmental impact assessments, multilateral environmental agreements, marine research, vessel inspection, etc.
- Conflicting roles (e.g., fisheries enforcement / inspection versus data collection).

5.5 Actions Taken to Improve Fisheries Information and Statistics System

Actions taken by the Fisheries Division to improve fisheries information and statistics system include:

- Annual formulation of specific work programmes and scheduling of field work.
- Prioritising the basic core functions when there is a shortfall in human and financial resources.
- Collaborating with stakeholders (fishers, dive operators, NGOs, etc) in terms of field survey and data collection.
- Use of log books by certain willing fishers in the case of the Catch and Effort Data Collection Programme.

In the medium to long term outlook, the Fisheries Division needs additional human and financial resources, in order to execute its functions efficiently. Until greater emphasis is placed on the importance of data collection programmes and the resources needed to properly manage such programmes, the ability to make sound management decisions or effectively plan for the sector, will be hampered.

6. RESULT OF THE BASELINE WORKSHOP

6.1. Output from Workshop with Staff of the Fishery Division

Brief Overview of the Workshop

The workshop consisted of two parts, the first of which is a Project Cycle Management (PCM) workshop, which aimed to identify issues in a participatory manner. The second part was an Institutional Development/Organizational Strengthening (ID/OS) workshop, which intended to analyze the situation of the fisheries division from both internal and external perspectives with a SWOT approach.

Both workshops were held on the 8th of September 2009 in a meeting room of the fisheries division in Antigua and featured five participants including the Chief Fisheries Officer Ms. Cheryl Jeffery-Appleton.

Problem Analysis

Since the fishery division had its own strategic plan, its scope already identified most issues. Thus few issues and problems were newly identified in the workshop. , Some issues were strongly addressed, such as the need for a study of ciguatera and its management in Barbuda.

ID/OS Analysis

External analysis revealed the most numerous negative factors related to Barbuda. According to the workshop result, there is a certain difference between the two islands in terms of the fisheries policy and quality of activities, which may be mainly attributable to the semi-autonomous local government system. Even though the head office of fisheries division established strategy, this was not necessarily followed by the Barbuda local government.

During the internal analysis, the fisheries division elaborated the characteristics in its "Strategy". Although inadequate fisheries strategy is a problem afflicting many Caribbean countries, the fisheries division in Antigua is actually strong in this area and no further weaknesses were identified. In fact, Antigua has one of the most organized fisheries management plans in the region, especially coastal resource monitoring.

6.2. Output from Interviews with Local Fishers

Brief Overview of the interviews

In Antigua and Barbuda, no workshops with local fishers have been conducted due to lack of time to organize local fishers who would be involved in several coastal fishing activities. Information of the community was collected through interview surveys conducted on the 9th and 10th of September 2009. Interviewees included fishers in Urlings (conch and coastal fish fishers) in Antigua, lobster fishers in Barbuda, a council member of the latter and the head of the fisher association in Antigua.

According to the interview survey, there is a considerable disparity in the fisheries situation between Antigua and Barbuda. Fishers in Urlings in Antigua have advanced boats with equipment such as GPS and fish finders, mainly targeting coastal fish and conch. Conversely, many Barbuda fishers use small old-style boats with outboard engines for their lobster fishing and consider resources to be in decline and fishing not as profitable lately. The outlook of the fishers toward fishing and its resources differ quite remarkably between the two islands.

Summary of the Community

Fishers in Antigua do not necessarily live near the landing sites and need to commute by car, while those in Barbuda have formed a community along the coastline.

Present Status of Local Fishery

In Antigua, many fishers use fish pots for lobsters, snappers, trigger fish, parrotfish, grant and hinds and long lines for coastal fish such as groupers and snappers. There was no clear fishing trend apparent through the interviews. Since fish are in high demand in Antigua, many fishers have fishery products requested by vendors prior to going fishing and then have no trouble selling their catch.

Many fishers in Barbuda however, rely on lobster fishing. They have had some trouble exporting lobsters to the EU, one of the biggest lobster markets due to changes in the quality standard.

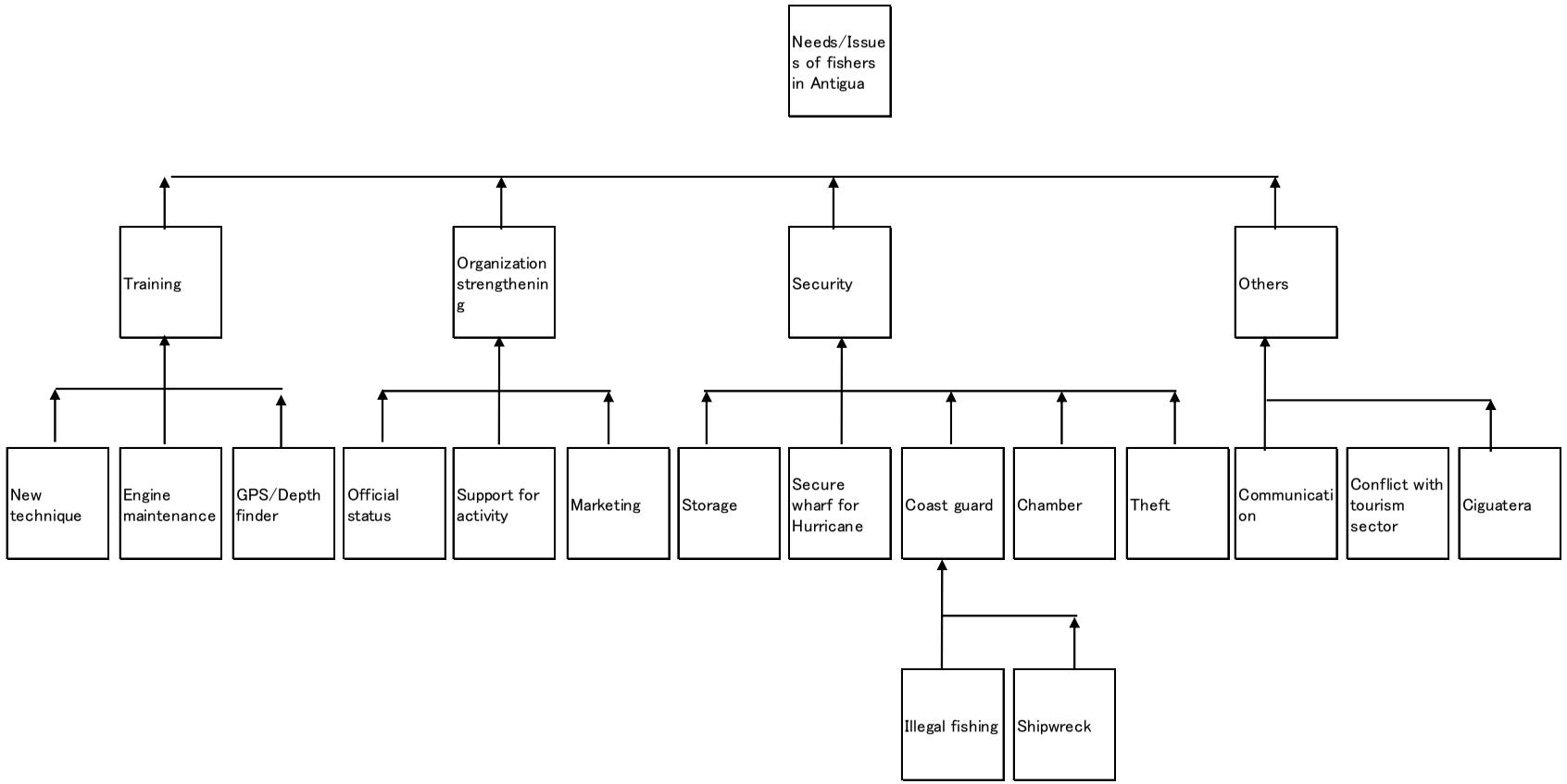
Needs of Local Fishers

According to fishers in Antigua, the need for training is frequently requested for navigation and advanced fishing techniques. Secure storage is another issue to be addressed since they have problems with theft and hurricanes. Conch fishers identified the need for a decompression chamber and further diversification of the conch market. Some fishers also commented on the importance of empowering informal fishing groups, since the fishers themselves can help improve the situation and solve issues if such groups had more power. As for Barbuda, both fishers and the council addressed the importance of improving resource management as their primary need.

6.3 Key issues identified for coastal resources management in the workshops

Based on information gathered, rebuilding the Barbuda resource management was considered the key issue. It contained 4 components: a fishery development for Barbuda; staff training; a community participatory program; and a stock enhancement program. There was also a request from the fisheries division to put a ciguatera study as a possible pilot project.

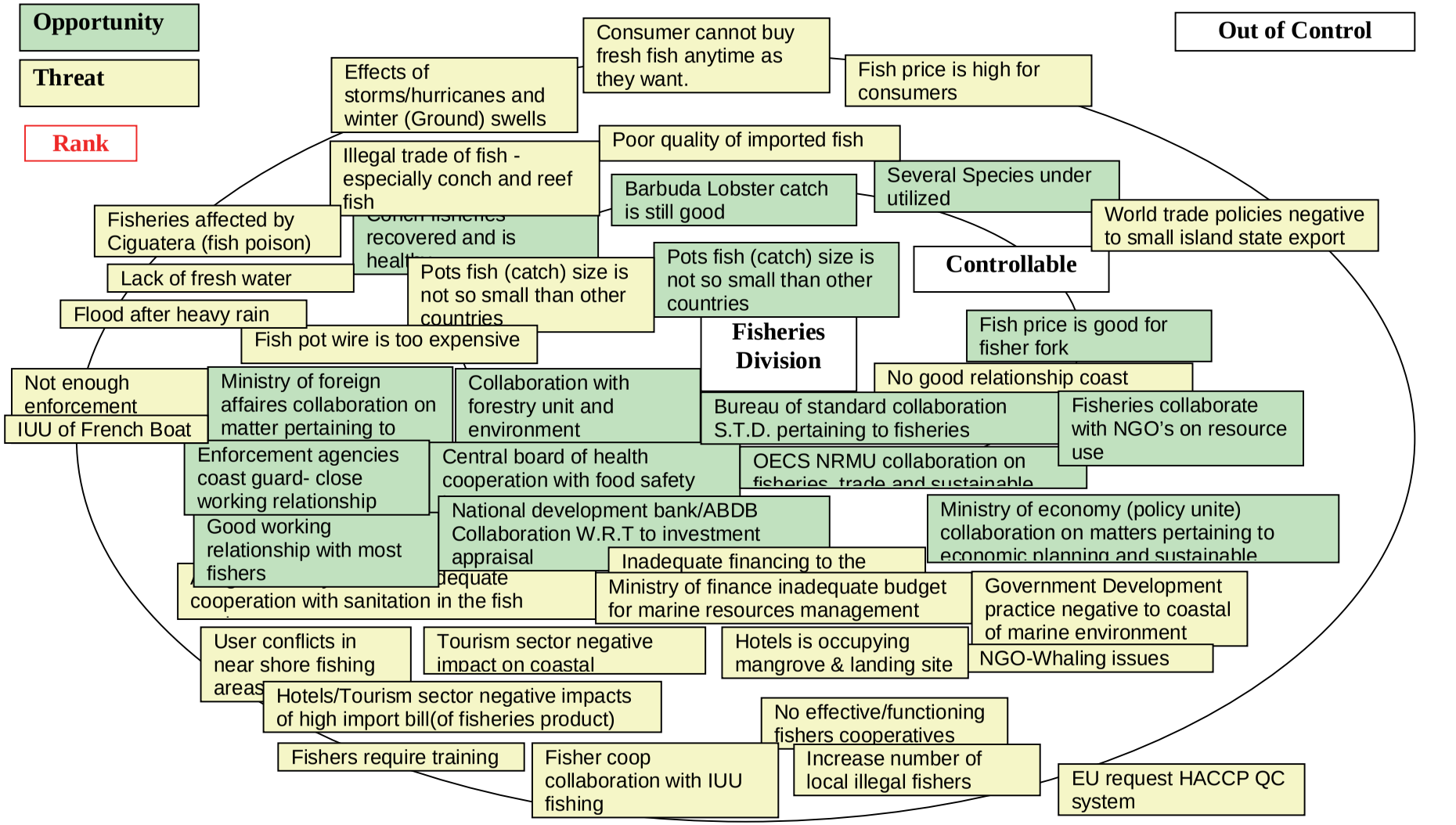
RESULT OF THE PCM WORKSHOP



RESULT OF THE ID/OS WORKSHOP (External Factor Analysis)

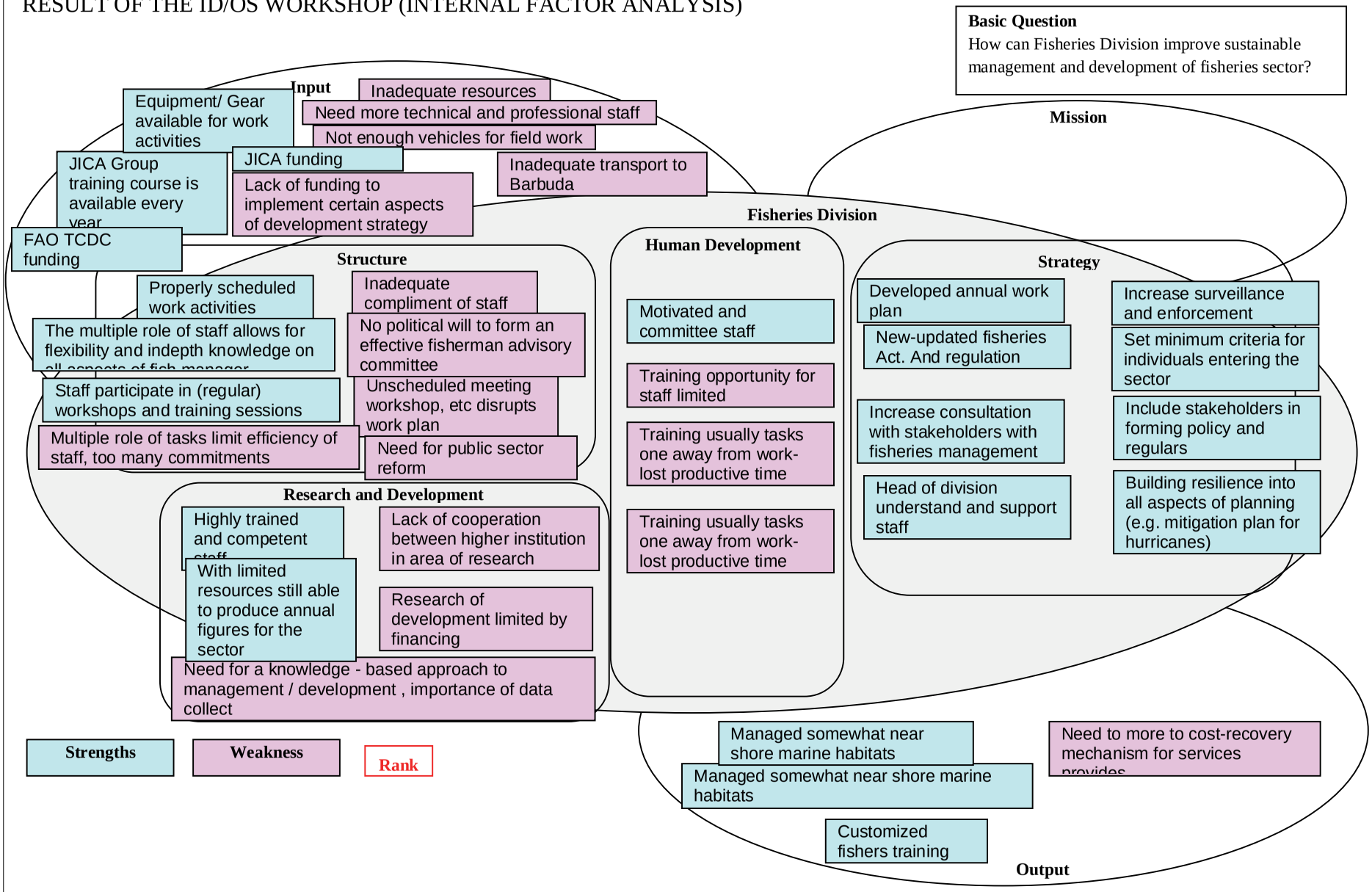
Basic Question
How can Fisheries Division improve sustainable management and

Factors (Policy / Rule / Environment / Economy / Culture)



Relations (Cooperation / Collaboration / Competition / Conflict)

RESULT OF THE ID/OS WORKSHOP (INTERNAL FACTOR ANALYSIS)



REFERENCES

Baldwin, J. (2000). Tourism development, wetland degradation and beach erosion in Antigua, West Indies. *Tourism Geographies, 2*(2), 193-218.

Danida. (2007). *Community based natural resource management – Technical note 2007*. Denmark: Danida Ministry of Foreign Affairs.

de Albuquerque, K. & McElroy, J.L. (1995). *Antigua and Barbuda: a legacy of environmental degradation, policy failure and coastal decline*. *Supplementary paper no. 5* [Electronic version]. Washington: United States Agency for International Development, the Environmental and Natural Resources Policy and Training Project, and the Midwest Universities Consortium for International Activities, Inc.

Earth Trends. (2003). *Earth Trends country profile*: *coastal and marine ecosystems – Antigua and Barbuda*. Retrieved April 30, 2010, from the Earth Trends website: http:// earthtrends.wri.org/country_profiles/fetch_profile.php?theme=1&filename=coa_cou_028.PDF

Eastern Caribbean Central Bank. (2009). *National accounts statistics 2009 for the year ending 31 December 2008*. Retrieved April 23, 2010, from the Eastern Caribbean Central Bank website: http:// www.eccb-centralbank.org/Publications/

Environment Division & Barbuda Council. (2009). *Codrington Lagoon National Park (Barbuda) management plan*: *2009 – 2019*. Antigua: Environment Division & Barbuda Council.

Fisheries Division. (1998). *Plan for operating the Fisheries Advisory Committee of Antigua and Barbuda*. Antigua: Fisheries Division.

Food and Agriculture Organization of the United Nations. (2007). *The state of world fisheries and aquaculture 2006* [Electronic version]. Rome: Food and Agriculture Organization of the United Nations.

Food and Agriculture Organization of the United Nations. (2002). *The state of world fisheries and aquaculture 2002* [Electronic version]. Rome: Food and Agriculture Organization of the United Nations.

Government of Antigua and Barbuda. (2004). *Antigua and Barbuda environmental management strategy and action Plan (2004 to 2009)* [Electronic version].

Horsford, I. (2009). *Brief on technical meeting to address the World Trade Organization fisheries subsidies roadmap*. Antigua: Fisheries Division.

Horsford, I. (2006). National draft management plan: Antigua and Barbuda. In *FAO Fisheries Report No. 832*: *Report of the regional workshop on the monitoring and management of Queen conch, Strombus gigas* (pp. 39 – 52) [Electronic version]. Rome: Food and Agriculture Organization of the United Nations.

Horsford, I. (2005). Fishing industry vital – The experiences of Point-Villa and Grays-Green. *The Sunday Scoop, the Family Newspaper of the OECS.*

Horsford, I. (2004a, August 12). The case for Barbuda's fisheries development. *The Daily Observer*.

Horsford, I. (2004b). *Vessel frame survey 2001, Antigua-Barbuda*. Retrieved January 22, 2010, from Fisheries Division website: http://www.fisheries.gov.ag/information/ publications/pdf/Vessel_Frame_Survey_2001.pdf

Horsford, I. (2004c, November 09). Queen conch an endangered species. *The Daily observer,* pp. 8-10.

Horsford, I. (2001). Economic viability of marine capture fisheries in Antigua and Barbuda – A case study. In U. Tietze (Ed.), *Report of the regional workshop on the effects of globalization and deregulation on fisheries in the Caribbean*. *Castries, St. Lucia, 4-8 December 2000*. *FAO Fisheries Report 640* (pp. 100 – 117). Rome: Food and Agriculture Organization of the United Nations.

Horsford, I. (1999). *A socio-economic survey of the fishers of Barbuda – Implications for planning and development*. Antigua: Fisheries Division.

International Commission for the Conservation of Atlantic Tunas. (2010). *Report for the biennial period, 2008-09, part II (2009), Volume 2* [Electronic version]. Madrid: International Commission for the Conservation of Atlantic Tunas

International Monetary Fund. (2005). *Eastern Caribbean Currency Union*: *Selected Issues* (IMF Country Report No. 05/305). Retrieved April 04, 2007, from the International Monetary Fund website: http://www.imf.org/external/pubs/ft/scr/2005/ cr05305.pdf

International Monetary Fund. (2004). *Antigua and Barbuda*: *2004 Article IV Consultation – staff report*; *staff statement*; *public information notice on the Executive Board discussion*; *and statement by the Authorities of Antigua and Barbuda* (IMF Country Report No. 04/367).

Jackson, I. (2007). *North East Marine Management Area (NEMMA)*: *2007 – 2010 management plan*. St. Lucia: Organization of Eastern Caribbean States – Environment and Sustainable Development Unit.

Lanaghan. (1844). *Antigua and the Antiguans: a full account of the colony and its inhabitants from the time of the Caribs to the present day, interspersed with anecdotes and legends also, an impartial view of slavery and the free labour systems, the statistics of the island, and biographical notices of the principal families*. London: Saunders & Otley.

Mahon, R. (1997). Does fisheries science serve the needs of managers of small stocks in developing countries? *Canadian Journal of Fisheries and Aquaculture Sciences, 54,* 2207-2213.

Organization of Eastern Caribbean States. (1999). *OECS fisheries management and development strategy and implementation plan*. St. Lucia: Organization of Eastern Caribbean States – Natural Resources Management Unit.

Sea Around Us Project. (2009). *Landings by fishing country in the waters of Antigua & Barbuda*. Retrieved April 23, 2010, from the Sea Around Us Project website: http://www.seaaroundus.org/eez/28/4.aspx

Tietze, U., Thiele, W., Lasch, R., Thomsen, B., & Rihan, D. (2005). *Economic performance and fishing efficiency of marine capture fisheries*. *FAO Fisheries Technical Paper 482* [Electronic version]. Rome: Food and Agriculture Organization of the United Nations.

Tietze, U., Prado, J., Le Ry, J-M., & Lasch, R. (2001). *Techno-economic performance of marine capture fisheries*. *FAO Fisheries Technical Paper 421* [Electronic version]. Rome: Food and Agriculture Organization of the United Nations.

United Nations, Department of Economic and Social Affairs, Population Division. (2009). *International migration, 2009 wallchart*. New York: United Nations, Department of Economic and Social Affairs, Population Division.

Van der Meerin, S. (1998). *The lobster fishery of Barbuda*. *A socio-economic study*. St. Lucia: Organization of Eastern Caribbean States – Natural Resources Management Unit.

FINAL COUNTRY REPORT: BARBADOS

October 2009

Barbados

Country Profile

Geographic coordinates	13^{o} 10' N, 59^{o} 32' W
Total area	430 sq km
Land area	430 sq km
Water area	0
Length of Coastline	97 km
Shelf Area	213 sq km
Territorial Sea	3,383 sq km
Claimed EEZ	183,436 sq km
Highest point (m)	336 m (Mount Hillaby)
Climate	Tropical with temperature range 24°C to 30°C; rainy season June to October; annual rainfall from 1200 mm to 1700 mm.
Natural hazards	infrequent hurricanes; periodic landslides and flooding
Population	284,589 (July 2009 est.)
Annual Population Growth Rate	0.383% (2009 est.)
Life Expectancy at birth	73.94 years
Languages	English; Barbadian dialect widely spoken.
Ethnic Mix	black 90%, white 4%, Asian and mixed 6%
Work force	175,000 (2007 est.)
Unemployment	10.7% (2003 est.)
GDP (PPP)	$5.425 billion (2008 est.)
GDP Growth rate	0.7% (2008 est.
GDP per Capita (PPP)	$19,100 (2008 est.)
Currency Unit	Barbadian dollars (BBD); US$1 = BB$2.0113
Area of Mangrove Forests	0
Percent of Mangrove Forests Protected	na
Per Capita Food Supply from Fish/Fishery Products (2000)	42 kg/person
Exports	$385 million (2006); manufactures, sugar and molasses, rum, other foods and beverages, chemicals, electrical components

Sources: CIA World Factbook – Barbados (2009); EarthTrends Country Profiles – Barbados.

Abbreviations and Acronyms

BARNUFO	Barbados National Union of Fisherfolk Organizations
BGFA	Barbados Game Fishing Association
CARICOM	Caribbean Community
CARIFIS	Caribbean Fisheries Information System
CARNUFO	Caribbean Regional Network of National Fisherfolk Organizations
CERMES	Centre for Resource Management and Environmental Studies of the UWI
CFO	Chief Fisheries Officer
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programme
CIDA	Canadian International Development Agency
CPUE	Catch per unit effort
CRFM	CARICOM Regional Fisheries Mechanism
DOF	Department of Fisheries
EU	European Union
FAO	Food & Agriculture Organization of the United Nations
FAC	Fisheries Advisory Committee
FD	Fisheries Department
FIS	Fisheries Information System
FISBARB	Fisheries Information System for Barbados
FMP	Fisheries Management Plan
GEF	Global Environmental Facility
GOB	Government of Barbados
IHHN	Hypodermal Hematopoietic Necrosis
JICA	Japan International Co-operation Agency
MCS	Monitoring, control and surveillance
MPA	Marine Protected Area
mt	Metric Ton
TIP	Trip Interview Program
TSV	Taura Syndrome Virus
UNDP	United Nations Development Program
UWI	University of the West Indies

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CHAPTER 1: INTRODUCTION

1.1 Geography

Barbados is the most easterly of the West Indian islands (Figure 1)[1]. Its Exclusive Economic Zone (EEZ) covers an area of approximately 177, 346 km^2. Barbados has delimited boundaries with the French Republic and the Republic of Trinidad and Tobago

The continental shelf is narrow; the 100 fathom line (~180 m) varying between 0.8 and 2.6 nautical miles offshore. The deeper and broader sections of

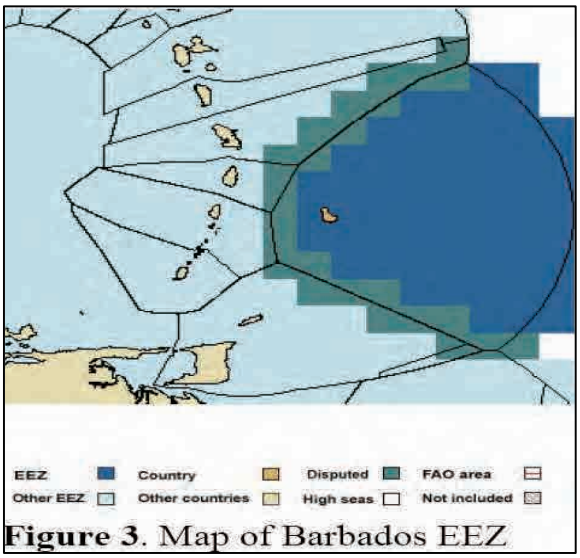


Figure 3. Map of Barbados EEZ

[1] This description is adapted from Mohammed, et al. (2003).

this narrow insular shelf occur off the northeast and northwest coasts. An isolated off-shore bank, locally known as the 'London Shallows' exists off the southeast coast.

Barbados has a relatively small island shelf of approx.426 sq km^2 with total reef area of approximate 100 km^2. The most actively growing coral reefs are located along the south and west (leeward) coasts.

1.2 Importance of the Fisheries

The Fisheries sector is a major contributor to the economy of Barbados. In 2003, it was estimated that fish production contributed 8% of the Agriculture GDP. Note that in 2003 the total contribution of the Agriculture sector represented approximately 5.8 % of the total GDP (US$2.6 billion) of the country (FAO, 2005).

The fishing industry of Barbados provides employment and income for an estimated 6,000 persons directly and indirectly. 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 Description of Fisheries

1.3.1 Fisheries Resources

The fisheries resources are grouped into *the following* nine (9) categories :

(i) the large pelagic fishery: targets dolphinfish (*Coryphaena hippurus*), tunas (Scombridae), kingfish (*Scomberomorus cavalla* and *Acanthocybium and solandri*), swordfish (*Istiophorus albicans*) with handlines, troll lines or longlines; and

(ii) the flyingfish fishery targets mainly the four-winged flyingfish (*Hirundichthys affinis*) with gillnets, handlines and dip nets.

Shallow shelf reef fisheries target parrotfish (Scaridae) and surgeonfish (Acanthuridae) using fish pots, nets and spear guns;

(iii) Deep slope fisheries target mainly snappers (Lutjanidae) and groupers (Serranidae) with fish pots and handlines.

(iv) Coastal pelagic fishery targets herrings (Clupeidae), jacks (Carangidae) and small tunas with handlines, troll lines, seine and cast nets.

(v) Sea urchins (*Tripneustes ventricosus*) This fishery harvests the roes of the sea urchin (*Tripneustes ventricosus*), The urchins known locally as "sea eggs" are collected by hand.

(vi) Queen conch (*Strombus gigas*) are hand collected.

(vii) Turtles (mainly the hawksbill *Eretmochelys imbricate.*) are caught with entangling nets.

There has been a moratorium on turtle capture since 1998. However, this is listed as a fishery because effort is still made in monitoring the impact and enforcing the management measures.

(viii) Lobsters (*Panulirus argus*) are fished with fish traps and hand spears. This is a minor fishery. [Transferred to end of (viii)]

The flyingfish and large pelagic (especially dolphin) are the main fisheries in Barbados. 90% of the fishery for large pelagics occurs between November and July.

1.3.1 Fishing Vessels

In Barbados fishing vessels are classified according to length of vessel and type of fishing done (2004-2006 FMP). There are three size classes (<6m, 6-12m and >12m) and four types ("moses", day-boats, ice boats and longliners) are commonly designated.

Moses are typically less than 6m (class 1 vessel) open dinghies constructed of wood or glass-reinforced plastic, propelled by oars or 10-40 hp outboard engines. The moses boats comprise the bulk of the Barbadian fleet, with between 335-485 vessels operating in the inshore areas. The gear varies according to the target species: traps are used to catch multi-species reef fish; hook and line (*including trolling lines*), and nets are used to capture coastal pelagics

Day-boats are wooden vessels, 6-12m long (class 2 vessels) with fitted inboard diesel engines of 10-180 hp; 250 day-boats ply Barbadian waters up to 50 km offshore for large pelagics and flying fish, but their numbers are trending downward as they are converted to or replaced by ice-boats. Although day boats have navigation, communication and safety equipment, they lack ice holds and are limited to daylong trips. Day-boats primarily deploy gillnets and hoop nets to target flying fish and hook and line to catch large pelagic, especially dolphin.

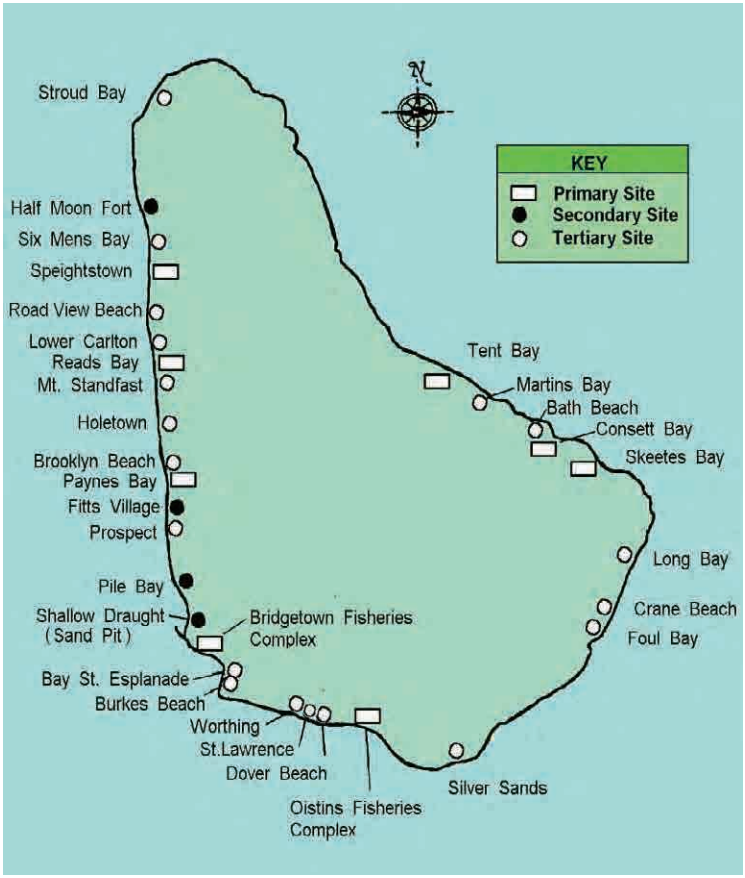
Iceboats are usually larger than 12 m (class 3). They are similar in structure to day-boats but carry iceholds for storing fish during multi-day trips. Ice-boats are powered by 180-200 hp inboard diesel engines. An estimated 190 ice-boats travel up to 200 miles (360 km) offshore.

Ice boats conduct trips of 5-10 days duration; they fish throughout the Barbadian 200 mile EEZ, with most activity along the south and the west.

FAO (2005) reported a fleet of thirty (30) longliners (class 3 vessels) between 12 and 24 m in length.. They use pelagic longline gear to target tunas and swordfish. Billfishes are also among the caught. Barbadian longliners fish mostly within the EEZ and the Atlantic waters on the southeast side of the island,

1.3.2 *Landing Sites*

There are thirty-one (31) fish landing sites in Barbados (see map). These are categorized as primary, secondary and tertiary based on the type of physical infrastructure present. Most are on the more sheltered west coast of the island, but a few are located on the east coast (the Atlantic side). (FMP 2004-2006)



Primary landing sites are characterized by market buildings and other facilities such as chill or cold storage, fish processing areas, ice, lockers, and a haul-out area. The majority of the fish catch is landed at the two largest markets: the Bridgetown Fisheries Complex (opened in 1989) and the Oistins Fisheries Complex (opened in 1983). (FMP 2004-2006).

Bridgetown has a fishing harbor and Oistins a jetty, and they host the largest number of fishing boats in Barbados. Fish tolls, catch, and effort and price statistics, are collected at the fish markets which are all managed by the Markets Division. (FMP 2004-2006)

The secondary sites are characterized by sheds in which there are water electricity and slab for filleting and cutting fish. Caretakers are employed by the Fisheries Division to clean the premises and collect catch and effort statistics. Many secondary landing sites have been converted to markets in recent years.

The tertiary landing sites are beach areas where fish are landed. These areas are characterized by not having any physical infrastructure. Data collectors visit these sites to collect data. At one site - "Sixmens" in the north of the island - a data collector is employed continuously.

1.3.3 Stakeholder

Stakeholders are categorized as primary and secondary. Primary stakeholders are those individuals or groups who are ultimately affected (either positively or negatively) by events, interventions or policies in the fishing industry. These include fishermen, vendors, boat owners, processors and Fisheries Division.

The secondary stakeholders, on the other hand, are individuals or groups that are indirectly affected by or may influence events, interventions or policies in the fishing industry. These include customers, suppliers, and various government and private sector with interests in the fishery and NGOs

In 1997 the GOB supported by the Commonwealth Secretariat, initiated a two year project to resuscitate and develop fisherfolk organizations in Barbados. This project lead to the formation of fourteen (14) fisherfolk organizations including an umbrella body called Barbados National Union of Fisherfolk Organizations (BARNUFO). (*Source personal communication with the Barbados Chief Fisheries Officer*)

Currently there are fourteen (15) locally registered fisherfolk organizations, of which only six (6) are presently active. Efforts are being made by BARNUFO and the Fisheries Division to resuscitate the following dormant associations.

It is accepted by GOB that 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". (2004-2006 Barbados FMP).

It is anticipated that the embracement of stakeholder participation in the management and development fisheries, in addition to having them involved in decision-making will lead to: (*personal communication Chief Fisheries Officer*)

- more realistic and effective policies and legislation
- stakeholders concerns being considered in decision-making
- support for and commitment to policy and legislative proposals
- improved compliance by stakeholders
- effective planning, implementing and evaluating of fisheries activities'
- transparency of the decision-making processes
- reduced conflict and contribution to conflict resolution
- more sustainable economic and social benefits to stakeholders
- more effective monitoring, control and surveillance of fisheries activities

1.4 The Administration of Fisheries in Barbados

The Fisheries Division is a department in the Ministry of Agriculture with a mandate for the "*management and development of fisheries to ensure the optimum utilization of the fisheries resources in the waters of Barbados for the benefit of the people of Barbados"*

The Fisheries Division is headed by the Chief Fisheries assisted by a Deputy Chief Fisheries and a staff of twenty nine (29) persons. According to the work breakdown structure the Fisheries Division is divided into the following there sections.

1. Administration and Services: administer the Fisheries Division and the services offered by Government to the fishing industry.
2. Infrastructure and Development: advise on infrastructure development and maintain the Fisheries Division's property
3. Fishery Resource Management; conduct research and collect information for the planning and decision-making.

The following Figure 1 shows the work breakdown structure of the Barbados Fisheries Division.

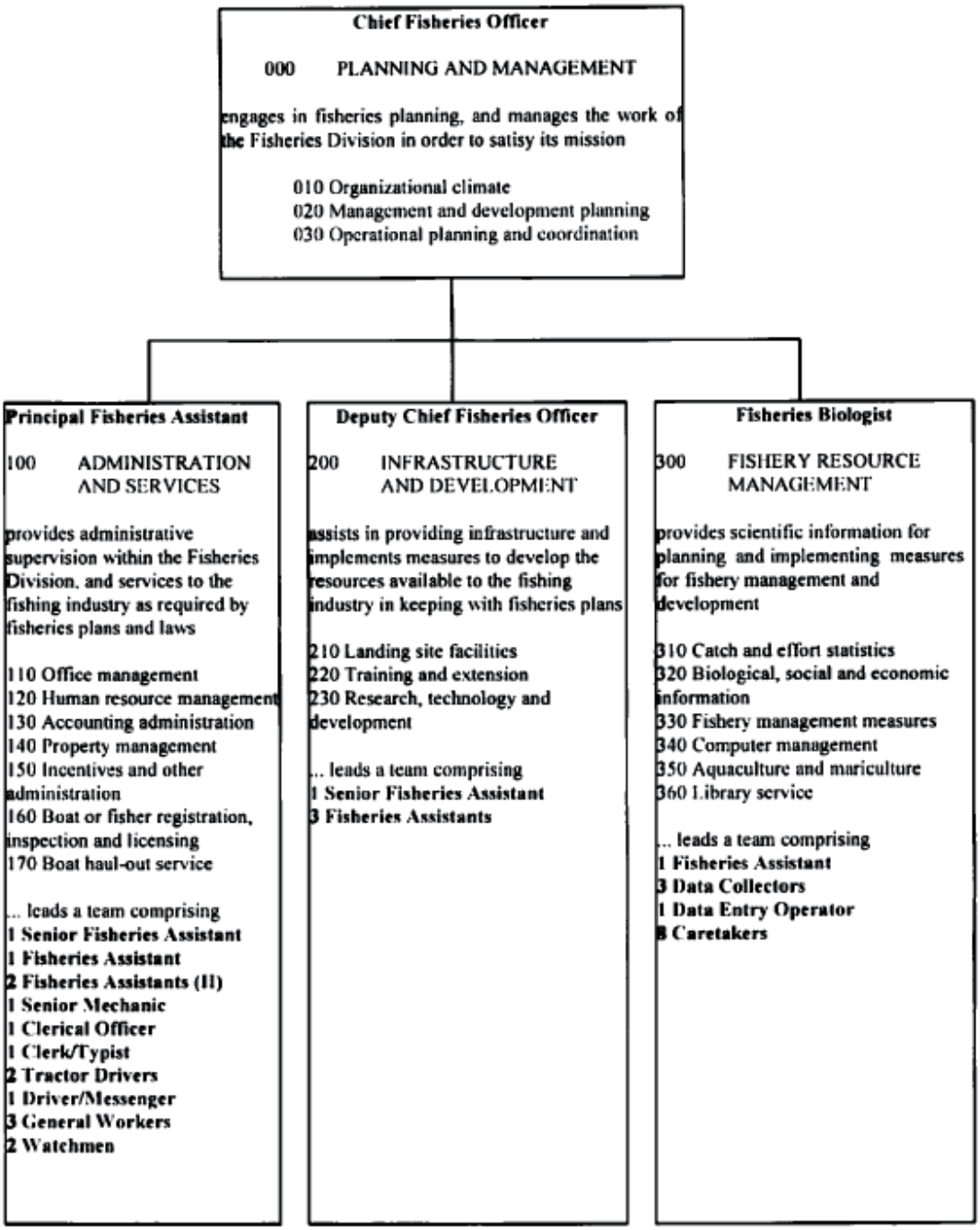


Figure 1. Work Breakdown Structure of the Barbados Fisheries Division

1.5 Fisheries Policy

The Barbados does not have a specific document called a "Fisheries Policy". However, Government policy for the fisheries can be found in: i) the National Strategic Plan of Barbados (2005-2025) and, ii) the Fisheries Management Plan (2004-2008), where strategies for fisheries are outlined.

1.5.1 The National Strategic Plan

The National Strategic Plan speaks specifically to following strategies for fisheries. Although plans refer to strategies indeed they reflect GOB policies on fisheries.

a) Sustainable fisheries Development.

b) Manage fisheries resources for long term sustainability

c) Improvements landing sites and markets Infrastructural to ensure Sanitary and Phyto-Sanitary (SPS) compliance and adherence to HACCP principles

In addition to the above specifics strategies, the Plan also contains several general agricultural strategies that applicable to fisheries, since fisheries are considered as part of agriculture. These include:

a) Establish and strengthen inter-sectoral linkages.

b) Develop both domestic and export marketing.

c) enhance productivity product quality and value-added

d) Improvement of skills critical to the development of the sector.

e) legislative and policy reforms and institutional strengthening

f) Define and institute good fisheries practices. and good agricultural practices across the sector.

g) Develop and implement a national food security programme.

h) protect sensitive products and to minimize the cost of critical inputs into production of these goods.

1.5.1 Fisheries Management Plans (FMP)

Barbados has being preparing Fisheries Management Plans (FMP) since 1997 to guide the management and development of local fisheries. At the time of writing the FPM for 2010-2012 is awaiting Government's approval.

GOB' policy on fisheries is also evident in the guiding principles for fisheries management and development in Barbados as set out in the Fisheries Management Plans (FMP). These guiding principles were included in the FMPs since 1997 and are also part of the 2010-2013 FMP. The guiding principles are based on Article 6 of the FAO Code of Conduct for Responsible Fisheries. The principles which guide the management and development of fisheries in Barbados are:

- 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;
- Promote awareness of responsible fishing through education and training;
- Ensure safe, healthy and fair working and living conditions for fishery workers;
- Recognize the contribution of small-scale fisheries to employment, income and food security;
- Integrate fisheries into coastal area management to ensure that the needs of coastal communities are met without harming fragile coastal ecosystems.

- 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 an encourage aquaculture as a means for diversification of income and diet.

1.6 Legislation

1.6.1 The Fisheries Act

The Fisheries Act (Cap. 391, 1993) is an Act for the management and development of fisheries in Barbados. The Act provides *inter alia* for:

a. the appoint of a Chief fisheries Officer
b. the establishment of a Fisheries Advisory Committee
c. preparation and implementation of schemes for the management and development of fisheries
d. fisheries access agreements
e. registration of fishing vessels
f. licensing of local, foreign and sport fishing vessels
g. notification of construction and alteration of fishing vessels
h. approval of fisheries research
i. prohibiting the use of any explosive, poison or other noxious substance
j. supply information
k. regulations for the management of fisheries
l. Penalties for non-compliance

1.6.2 Fisheries (Management) Regulations

Fisheries (Management) Regulations (1998) *inter alia*

- sets minimum size mesh restrictions for seine nets and fish traps
- establishes 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
- prohibits the capture, possession or sale of marine turtles, turtle eggs and turtle parts;
- bans the use of SCUBA for harvesting sea eggs;

- provides the Minister responsible for fisheries with authority to regulates the sea egg fishery through the designation of closed seasons and closed areas
- prohibits landing tunas of less than 3.2 kg live weight
- stipulates that corals may not be damaged destroyed or fished without the written permission
- provide maximum penalties for $50,000 and/or two years imprisonment for non-compliance with these regulations.

1.7 Visions

The visions for the fisheries in Barbados, according to the CFO are:

A) Biological Sustainability. Fish being taken, on a continual basis, without reducing the stock biomass to unsustainable levels.
B) Increased contribution to food security. Locally caught fish making a significant contribution to national food security.
C) Economic Viability. Enhanced livelihoods and well-being for fishers and other stakeholders through the sustainable utilization of fish resources.
D) Preservation. Protection of associated biodiversity and habitats.
E) Co-management. Government agencies and other stakeholders collaborating, sharing of information and working closely with each other, to manage and develop the fisheries sector.
F) Infrastructural Improvement. Improved infrastructure at landing sites for the sale of fish and repair and construction of fishing vessels.
G) Effective monitoring (data collection), control (regulatory measures) and surveillance (checking compliance) system
H) Compliance with Legislation. Stakeholders complying with fisheries legislation including fish quality assurance, harvest regulations, combating IUU fishing and fishing vessel safety.

CHAPTER 2: COMMUNITY-BASED FISHERIES MANAGEMENT COMPONENT

2.1 Introduction

This chapter looks at "community-based Fisheries Management" in Barbados. Firstly, it looks at the characteristics of the coastal community. Secondly, it examines what supporting policy, legislation, institutional arrangements and national programs, exist to support community-based Fisheries Management in Barbados. This chapter also looks at the socio-cultural and attitudinal issues related to participatory approaches to fisheries management.

2.2 Coastal Community Characteristics

Barbados is 34 km long and 23 km wide; nowhere is more than 12 km from the coast. It may be said that all of the Barbadian population lives along the coast. The coastal area is dominated by human settlements. Interspersed with the settlements are significant investments in various types of economic and social activities. Tourism infrastructure and related activities are prevalent along south and west coastlines. All Barbadian and visitors have free access to all beaches.

Some 32 fish landing sites along the coast, (see "landing sites in Chapter 1). The major fish landing facilities are found in the south of the island at Oistins and in the southwest at Bridgetown. In most cases the fishers operating at the landing sites do not live in the community surrounding the landing site. Consequently, a Barbados a coastal fishing communities can be defined as coastal area where fishers meet to interact and participate in fisheries activities.

The Barbados bus system is islandwide, connecting all the communities [and settlements] to the capital and with each other. Under Barbadian law, there is no such thing as a private beach in Barbados; all citizens have free access to every beach and coastal area, including where fish is landed.

2.3 Policy, Legislation, and Supporting Institutional Arrangements supporting community-based fisheries management

2.3.1 POLICY

The GOB is committed stakeholder community-based fisheries management, involvement of stakeholders in fisheries management and development (personal communication with Chief Fisheries Officer). This commitment is reflected in:

a) The Barbados' National Strategic Plan. The strategy is to "*Develop an efficient and effective support and regulatory framework, which is capable of meeting the needs of the various stakeholders in agriculture (fisheries).* This is a commitment to consider the needs of fisheries stakeholders and put systems in place to meet these needs.

b) The FMP (2004-2006) states that "*Active fisherfolk organizations 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"*.

In the FMP (2004-2006) there are several other references to the involvement of stakeholders. Among these are mandates to:

- ensure that fisheries decision-making processes are transparent and that all stakeholders have the opportunity to participate;
- establish and maintain means for fisherfolk and other coastal zone users to meaningfully participate in planning and management

c) The Fisheries Act provides for participation of stakeholders in decision-making. The Act provides for a Fisheries Advisory Committee (FAC), comprising fishing industry stakeholders, to be appointed by the Minister responsible for fisheries. The purpose of the FAC is to advise the Minister on fisheries matters. Provision is made for four persons engaged in the fishing industry and a representative from the umbrella fisherfolk organization, to be members of the FAC.

2.4 Planning Process

According to the Chief Fisheries Officer the planning process provides several opportunities for stakeholders in the fishing industry to review and give inputs to the draft FMP, which would lead to a new formulation should their concerns be taken on board. The planning process proposed in the draft new FMP involves the following steps.[repositioned below]

- Formulation/Revision: in consultation with key stakeholders
- Appraisal and discussion: by the Fisheries Advisory Committee
- Review: by stakeholders/public
- Approval: by Minister with responsibility for fisheries/Cabinet
- Implementation: joint (Government and stakeholders) monitoring, control and surveillance
- Evaluation: by Government and stakeholders

The stakeholders participate through their delegates who sit as members of the Fisheries Advisory Committee or all may participate directly in the public stakeholder review process. The fact that stakeholders are involved in the actual formulation and re-formulation of the draft FMP certainly qualifies as participation in fisheries management, in a proactive way.

2. 5. Legislation

The Fisheries Act (Cap. 391, 1993) provides for:

a) the appointment of a Chief Fisheries Officer, who "*shall develop and keep under review schemes for the management and development of fisheries in the waters of Barbados*". It goes on to say that "*In preparing and reviewing a fisheries scheme the Chief*

Fisheries Officer may consult with local fishermen, any fishing cooperative or association, or any other persons affected by the fishery scheme and with the Fisheries Advisory Committee appointed under section 5 ". Note that it says that he "*may*" consult, not that he "*shall*" consult; but the persons and groups with whom he may consult is wide.

b) The appointment of Fisheries Advisory Committee by *the Minister*. The Committee is appointed *by instrument in writing to advise* the Minister *on:*

- *the development and management of fisheries*
- *joint venture investment in fisheries, access agreements or other agreements in respect of fisheries*
- *matters concerning or facilitating the harmonization of fisheries*
- *legislation including the licensing requirements for foreign fishing vessels*
- *the co-ordination of the policies with regard to fisheries with other departments of Government*
- *any other matter specified in the Act or any regulations made under the Act*

The composition of Fisheries Advisory Committee as follows: consists of

- the Chief Fisheries Officer or his nominee *ex officio*
- a biologist who specializes in fisheries
- a representative of the Ministry of the Environment
- four other persons engaged in the fishing industry who are recommended by the Chief Fisheries Officer
- a representative of the Markets Division; and
- a representative of the registered fishing associations

The Minister appoints the Chairman and Vice-Chairman.

The wording is ambiguous, but it would seem that all the registered fishing associations of Barbados have one representative on the FAC between them, although it could mean that each registered fishing association has one representative.

If the CFO chooses to recommend to the FAC four persons engaged in the fishing industry who are not artisanal fishers, and the former interpretation of (f) is used, then artisanal fishers might only have the one representative on the FAC.

The Act requires not only boats to be registered and licensed but also fishermen to be Licensed.

The 2004-2006 Barbados FMP is much further advanced in its provisions for the involvement of fishers, fisher organizations, fishing communities and other stakeholders in the management of fishery resources than is the 1993 Barbados Fisheries Act.

Other Fisheries Acts in the Caribbean take it further and allow a local fishers' organization ***to actually manage*** a local fisheries management area, and state that this local fishers' organization ***shall make by-laws*** regulating the conduct of fishing operations in the designated area. This

gives local fishers' organizations real power, and not just the right to be consulted. These provisions are not included in the 1993 Barbados Fisheries Act.

2.6 Supporting Institutional Arrangements for Community-Based Fisheries Management

The concept of "stakeholder participation in fisheries management and development" has been fully embraced by the Barbados Fisheries Division and is infused into the 2004-2006 Barbados FMP and the draft 2009-2011 Barbados FMP as is evident in the provisions of the Barbados' National Strategic Plan, FMP and legislation cited above. Yet there is no Fisheries Division's staff member whose sole responsibility is to work with fisherfolk organizations. The officer whose has responsibility for fisherfolk organizations also has numerous other fisheries related duties.

2.7 National Programmes to promote the Involvement of Fishers, Fisher Organizations, Fishing Communities and other Stakeholders in the Management of Fishery Resources

The GOB encourages and supports the formation of strong and vibrant fisherfolk organizations. by providing (personal communication - Chief Fisheries Officer).

a. fisherfolk organizations with small grants for small development projects.
b. fisherfolk organizations with training
c. BARNUFO with an annual subvention rent free office space. In addition the GOB pays the utilities
d. Provides a venue for fisherfolk meeting

The Fisheries Advisory Committee provided for under the Fisheries is also evidence of the supporting institution arrangement community-based management, since it involves representatives from several stakeholders.

One possibility for a pilot project under this JICA-CRFM project is the preparation of a plan to involve fishers, fisher organizations, fishing communities and other stakeholders in the management of fishery resources, including providing the training the stakeholders will need to fulfill the obligations which would be imposed upon them.

2.8 Effectiveness of National and Community-Level Participatory Approaches to Fisheries Management

GOB recognizing the need for strong vibrant fisherfolk organizations in fisheries management and development initiated, with the assistance of the Commonwealth Secretariat, a two year project in 1997 to resuscitation of fisherfolk organizations. This project resulted in the formation

of thirteen primary level organizations and a national umbrella organisation - Barbados National Union of Fisherfolk Organizations (BARNUFO) [ref. Fisheries Report of Fisherfolk Organizations].

In the following years many of these organizations failed. In an unpublished report on the "Challenges Facing Fisherfolk Organisation in Barbados" the Chief Fisheries Offices Stephen Willoughby gave the following reasons inter alia for the failure of the organisations:

- Inadequate financial resources
- Small membership
- Infrequent meeting of members
- frustration and conflict among members
- Self-centred, myopic and highly opinionated attitudes among members
- limited member participation and support for the organization's activities

The CFO revealed that in event of a perceived crisis the majority of stakeholders in the fishing industry join organizations, accepting that there is strength in numbers, and believing that they have a better chance of having the crisis addressed. Once the crisis is resolved, interest in the organization fades and individuality returns.

Many of the organizations face several challenges. Some fishers may abandon their fisherfolk organization if they felt their issues were not being properly ventilated and addressed by the organization's leadership or if they felt that they were being ignored by other members. Quite often the most vocal members dominated the meetings. These vocal members usually get their issues addressed, leaving the others members frustrated.

The executives also have their share of challenges. Some executive committees are accused of not having enough meeting to inform the members on the issues. Some executive members abandon their organization, before serving a full term. This results in the burden of administering the organization falling fells on the few remaining members. Animosity, conflict and accusations often resulted, in these situations. Some fishers feel that the government and BARNUFO could do more the organizations more assistance (personal communication with CFO S. Willoughby).

Currently boat owners, fishers and vendors are members of the same organizations, yet they have different and possibly conflicting interests. The CFO suggested that they form separate organizations (e.g. Boat-Owners Organizations, Vendor Organizations) to better discuss and articulate their concerns, and then defend them at the meeting of the national umbrella fisherfolk body (BARNUFO) ("Challenges Facing Fisherfolk Organisation in Barbados" unpublished document - personal communication with CFO Willoughby).

There is scope for initiatives to be undertaken under the Master Plan currently being developed to encourage fishers, fisher organizations, fishing communities and other stakeholders to join, develop and manage their organizations.

Incentives to join fishers organizations could be provided, for example, a reduction in the fees charged for certain government services for members of fisherfolk organizations (like boat inspections and licensing and registration).

There also needs to be a campaign by the FD to build trust between the Government and fishers, and to promote the importance of fisherfolk organizations among the fisherfolk; the latter need to be convinced that they do have a say in fisheries management.

The Fisheries Division has embarked on the following initiatives to build capacity among the memberships of fisherfolk organizations to enable effective participate with Government in co-management and decision-making. This programme involves training of members of the organizations.

Training for the executive members of fisherfolk organizations in:

- How to prepare for meetings
- How to conduct meetings
- How to take notes of meetings
- How to keep financial records
- Communication skills
- How to publicize their achievements
- How to encourage open and frank discussions without demoralizing each other

- Training for the ordinary members of fisherfolk organizations in:
  - How to meaningfully participate in meetings
  - How to listen and hear effectively
  - How to build good interpersonal relationships
- Training for the all members of fisherfolk organizations in:
  - Visioning for the future
  - How to identify projects
  - How to do fundraising
  - How to implement projects
  - Conflict resolution
  - Co-management of natural resources
  - Fisheries management strategies
  - Leadership skills

2.9. Socio-Cultural and Attitudinal Issues related to Participatory Approaches to Fisheries Management and Introduction of Alternative Livelihoods

Baseline workshops were held with government staff and the community. The results are presented in the Chapter 6 of this report.

CHAPTER 3: PELAGIC FISH RESOURCE MANAGEMENT AND DEVELOPMENT COMPONENT

3.1. Policy, Supporting Legislation, and Fishery Development and Management Plans

As outlined in chapter 1 the pelagic fish resources of Barbados are grouped as follows (a) Coastal pelagics - multi-species including jacks, bonito, fray and herrings and (b) The offshore pelagics – mainly flying fish, dolphin, wahoo, tunas, billfishes and swordfish. and oceanic pelagics are trans-boundary species and therefore require regional and international cooperation in their management.

This chapter looks at the "Pelagic fish resources management and development" in Barbados in terms of:

- policy, *supporting legislation, and fishery development and management plans.*
- Fishery Development Status regarding stated Policy Goals and Development and Management Objectives
- Fishery and Market Characteristics
- Catch and Effort in the Pelagic Fishery

*3.1. **1. Policy***

There is no specific policy for pelagic fish resources. However, the general strategies (apply to all local fisheries) for fisheries management and development are outlined National Strategic Plan and the guiding principles listed in the Fisheries Managements Plans are an indications of the policy for the fisheries, see chapter 2 policy. These apply to all local fisheries (including the pelagic fish resources).

> According to the CFO, during the next planning period the approach to pelagic fisheries management and development is to apply the guiding principles outline in chapter 2 and the principle of good governance - develop an enabling environment of fairness, openness, accountability, transparency, trust and fisher participation.

It was recognized that were several barriers to implementing the strategies, attaining good governance realizing the vision set out in chapter 2. Among these barriers are:

- limited participation of fishers in fisheries management and development
- ineffective sharing of information and communications
- insufficient resources – *human, financial and equipment*
- inadequate legislation
- poor compliance

- weak monitoring, control, surveillance and enforcement systems.

The Strategies put forward to overcome this barrier include:

- work with stakeholders to strengthen fisherfolk organizations
- build trust between fishers and Government by working closely with fishers on major fisheries issues
- involve fishers in monitoring control, surveillance and enforcement programmes;
- continue to collaborate with regional and international pelagic fisheries bodies
- seeking funding for management and development projects
- network with other agencies to develop and implement policy

Supporting Legislation

The "*Fisheries Act* and the Fisheries Management Regulations address the development and management of the pelagic fisheries in Barbados. Since the Act applies to all fisheries in Barbados (including the pelagic fisheries) it may be concluded that the goal of management of the pelagic resources is to:

> "*Ensure the optimum utilization of the pelagic fisheries resources in the waters of Barbados for the benefit of the people of Barbados.*"

In applying the Act to pelagic fisheries:

- formulate and review pelagic management plans
- all commercial pelagic fishermen are required to have a "commercial fisherman's licence"
- all commercial pelagic fishing vessels must be inspected annually, in addition to having a "local fishing vessel licence"
- all new vessels have to pass an inspection prior to being registered
- all pelagic sport fishing vessels are required to have a "sport fishing licence"
- formulating and reviewing fisheries management and development schemes (plans)

In the Fisheries Management Regulation there are specific references to pelagic fisheries it the prohibition of the:

- use of pelagic drift nets greater than 2.5 km in length
- landing of yellow fin or big-eye tunas weighing less than 3.2 kg
- use of trammel nets and any other entangling nets

Enforcement of Regulations

The agencies involved in enforcing fisheries legislation are the:

(1) Fisheries Division
(2) Coast Guard
(3) Marine Division of the Police Force of Barbados

Level of enforcement

The level of enforcement of fisheries management measures needs to be improved. Improvement will need the commitment of more recourses (*financial, human and equipment*), education of both stakeholders and enforcement officers, and sensitization of the public.

Level of compliance

The level of compliance with fisheries legislation is not adequate because of the challenges identified in the above paragraph.

3.2 Fishery Development Status regarding stated Policy Goals and Development and Management Objectives

The Baseline survey was done but the financial challenges encountered in mailing the completed questionnaires resulted in them not being mailed. Consequently, evaluation of stated policy goals and development and management objectives could not be done. Thus it is difficult to make a quantitative assessment of the overall realization of these goals and objectives.

Fishery and Market Characteristics

FISHERY CHARACTERISTICS

Exploited Species

In Barbados. Flying fish and Dolphin fish are the most important commercial fisheries, and these species are predominant in the landings, processing and marketing of fish products in Barbados.

Wahoo is known as kingfish in Barbados, a group that also includes king mackerel and cero mackerel. Likewise, these species are often reported in the catch and sold on the market as kingfish. Similarly, blackfin tuna are reported in the catch as bonito, a group that includes several small tuna species. Thus, it is generally difficult to disaggregate the catch data and to assess the exploitation level on each species.

Stock Status

The available data are insufficient to evaluate the stock status of coastal pelagic species in Barbadian waters. However, catch of these species in the Atlantic are commonly monitored by the International Commission for the Conservation of Atlantic Tunas (ICCAT 2008). Also, in 2004 the CRFM conducted an evaluation of the wahoo stock in the eastern Caribbean, which concluded that wahoo catches in the region were sustainable (CRFM, 2004).

MARKET CHARACTERISTICS

The section needs to address more than the value of fish. It should to give a brief description of the marketing arrangements in Barbados include marketing facilities, local fish distribution, export markets, and value added products.

Refer the chapter 1 – landing facilities,

Table 1 presents the market value of fish production as estimated by Mahon et al. (2007) for different types of fish. Note that the kingfish type comprises mainly wahoo, but may include species like king mackerel and Spanish mackerel. Similarly, the bonito type may contain blackfin tuna and all small tunas in general.

In term of market value, the flyingfish constitute by far the most important commercial fish in Barbados, with an annual transaction value of BDS$30,237,174.00. The dolphinfish fishery is the second most valuable fishery in Barbados, with a total amount of market transaction of BDS$11,002,730.00.

Table 1:
Total Value (in BDS $) of the Production of Pelagic Fish in Barbados.

Fish type	Ex-vessel value*	Value added *	Total value*
Kingfish	266,918	184,283.00	451,201.00
Dolphinfish	5,000,384.00	6,002,346.00	11,002,730.00
Flyingfih	3,588,498.00	26,648,676.00	30,237,174.00
Jacks	59,252	33,796.00	93,048.00
Bonito (including blackfin)	9,771.00	9,369.00	19,140.00
Lobsters*	7,867.00	7,775.00	15,642.00

Source: *Data extracted from Mahon et al. (2007).

Fish Distribution

Four types of buyers absorb most of the landings (Table 2)*:*

(1) **Fish vendors/hawkers**: buy fresh fish from fishermen and resell to direct consumers and "fish fryers" (i.e., sellers of fried fish meat).
(2) **Processors**: buy fish from fishermen and process their meat to sell direct to consumers, restaurants, supermarkets and fish fryers. They use processing facilities located at the fish markets or owned by the private sector.
(3) **Fish fryers**: buy fresh fish from fishermen and sell fried fish meat to consumers;
(4) **Consumers**: buy fish from fishermen for direct consumption.

Products form

Fish are available to consumers in the following forms.

1. **Venders:** fresh whole, fillets or steaks; fresh fillet in packages;
2. **Processors:** frozen whole, fillets or steak in packages; fish burgers, fingers, nuggets; salted fish.
3. **Restaurants and Hotels**: mainly fried and grilled; occasionally boiled; variety of other recipes.

4. **Supermarket and shop**: frozen whole, fillets or steaks
5. **Fish-fryers**: fried; grilled; boiled; fish cakes

Table 2 shows that approximately half of the landing of kingfish, dolphinfish, and flyingfish was bought by processors. This is an indicator that these fish products have high value in term of attracting visitors to Barbados (Mahon 2007).

Table 2:
Market Price and Distribution of Landings among Buyers in 2007

Fish type	Buyer *	Proportion (%) *	Landings*	Price (BDS $ per kg)*	Total value
Kingfish	Vendor/Hawkers	21.00	5,874.00	9.49	55,744.26
	Processors	48.00	13,426.00	9.15	122,847.90
	Fish Fry	22.00	6,153.00	9.90	60,914.70
	Consumer	9.00	2,517.00	10.89	27,410.13
	Total landing (kg)		27,970.00	**Landed value**	266,916.99
Dolphinfish	Vendor/Hawkers	29.00	146,967.00	10.17	1,494,654.39
	Processors	56.00	283,798.00	9.15	2,596,751.70
	Fish Fry	8.00	40,543.00	11.65	472,325.95
	Consumer	7.00	35,475.00	12.45	441,663.75
	Total landing (kg)		506,783.00	**Landed value**	5,005,395.79
Flyingfish	Vendor/Hawkers	25.00	378,669.00	2.53	958,032.57
	Processors	45.00	670,870.00	2.02	1,355,157.40
	Fish Fry	9.00	134,174.00	2.89	387,762.86
	Consumer	21.00	307,109.00	2.89	887,545.01
	Total landing (kg)			**Landed value**	3,588,497.84
Bonito	Vendor/Hawkers	37.00	630.00	5.08	3,200.40
	Fish Fry	33.00	562.00	6.10	3,428.20
	Consumer	30.00	511.00	6.16	3,147.76
	Total landing (kg)			**Landed value**	9,776.36
Lobsters	Vendor/Hawkers	45.00	182.00	19.00	3,458.00
	Processors	35.00	142.00	18.50	2,627.00
	Consumer	20.00	81.00	22.00	1,782.00
	Total landing (kg)			**Landed value**	7,867.00

Source: *Data extracted from Mahon et al. (2007)

N.B. Kingfish type comprises mainly wahoo, but may also include king mackerel and Spanish mackerel.
Bonito type may comprise blackfin and all small tunas in general.
Hawkers: retailers of whole, package fillets or steak products away from landing sites.

3.3 Catch and Effort in the Pelagic Fishery

Catch Data

Table 3 shows catch data for wahoo, dolphin and flying fish as published by FAO for 2001-2007. These landing data show that fishing production for those three (3) species have varied little over this seven (7) year period.

Table3:
Total Landings of Wahoo, Dolphinfish and Flyingfish, Barbados 2001-2007

	Landing* (mt)						
Species	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Wahoo (*Acanthocybium solandri*)	26	44	34	45	26	41	25
Dolphin fish (*Coryphaena hippurus*)	574	553	458	455	357	476	428
Flying fish (*Hirundicthys spp.*)	1673	1590	1912	1186	1112	922	1288

Source: the Fisheries Division of Barbados

Technology Improvement & Extension Programs

Flyingfish fishery

Note that trials on the use of vertical and bottom set longlines were successfully conducted in the past. However, fishermen are not yet willing to move into using these types of gears.

Dayboat operation:

There is the need to reduce the cost of operating these boats and to increase the quality of fish products.

- More efficient engines are needed to improve fuel consumption;
- Conversion of Dayboat into Iceboat may improve the preservation and the quality of fishing products.

Dayboat and IceBoat operation:

There is need to reduce the cost of operating these boats.

- Development of more fuel-efficient engines is much warranted;
- May need better fish finding devices to reduce searching time.

Technical and Research Capabilities

The FD has a wet and a dry laboratory to conduct biological and fisheries research. However, these facilities are currently underused.

Technology needs: An image analysis system (i.e. compound microscope, digital camera, etc.) would allow an improvement in the quality of basic biological research such as age and growth analysis from fish otoliths, and reproductive biology of the different pelagic fish species.

Needs in funding

There is need of technical assistance and funding towards:

- Training the staff of the Fisheries Division;
- Improving the collection of biological and fishery data on coastal pelagic species;
- Establishing a solid outreach program for stakeholder, enforcement offices and the public.

CHAPTER 4: AQUACULTURE DEVELOPMENT COMPONENT

4.1 Policy, Supporting Legislation, Development Plans

Policy

There is no **Aquaculture Policy**. The 2004-2006 Fisheries Management Plan for Barbados has been prepared, which repeats the following from the FAO Code of Conduct for Responsible Fisheries as the only reference to aquaculture:

- Promote aquaculture as a means of diversification of income and diet
- Encourage aquaculture as a means of diversification of income and diet

There is no strategy named to implement this goal.

Legislation

The Fisheries Act (1993, amended 2000) makes no reference to aquaculture.

Institutional Support for Aquaculture in Barbados

The Barbados Aquaculture Association was formed in 1991 under the umbrella of the Barbados Agricultural Society aimed at being a focal point for public and private sector interests in aquaculture sector development. However, its main role was never defined and the association has not been active in aquaculture related activities.

4.2 Aquaculture Development Status regarding Stated Policy Goals and Development Objectives

Since there are no stated policy goals and development objectives in the **2004-2006 Fisheries Management Plan** for Barbados, there is little further to say on this matter.

The scope or potential for freshwater aquaculture in Barbados is very limited due to lack of natural resources and the attendant high costs of production. This notwithstanding, there is a renewed effort to develop small scale tilapia farming in Barbados as a backyard operation.

4.3 Aquaculture and Market Characteristics

With a population of over 280,000 and with significant numbers of tourist arrivals there are possible niche markets for fresh aquaculture produce that preferably is eco-labeled.

4.4 Current Levels of Aquaculture Production by Species

Inland aquaculture

Prawns

- Several private sector proposals to raise fresh water prawns and shrimps have been drawn up, but none have gone beyond the project formulation stages.

Coastal Culture (Mariculture)

Consett Bay is one of the few areas in Barbados where there is a protected bay suitable for marine farming.

Seamoss

An interesting fact concerning the mariculture of *Gracilaria* species at both of the sites mentioned was that thousands of juvenile lobsters were often found settled in the growing moss. This suggests that there is a potential for lobster mariculture enterprises in conjunction with seamoss culture.

No coastal or inland aquaculture activities of note are currently being undertaken in Barbados.

4.5 Knowledge on Aquaculture Issues by Category

Major constraint to aquaculture in Barbados

i limited supply of both freshwater and suitable soil types

ii The permeable nature of coral rock allows water to percolate into the soil thus reducing surface run-off

iii Consumer preferences for marine fish

The general topography, resource use conflicts, and the high concentration of human habitation within the costal zone, act as deterrents for aquaculture in Barbados.

- The limited supply of both freshwater and suitable soil types is a major constraint to the development of fish farming in Barbados at a significant scale. The permeable nature of coral rock which forms 86% of the island, allows water to percolate into the soil thus reducing surface run-off, especially during the dry season, and significantly reduces the formation of freshwater bodies.
- Consumer preferences for marine fish dictate that attempts to introduce aquaculture products must be accompanied by aggressive marketing efforts.
- There is a high degree of urbanization in the southern part of the coast. Cliffs with a few small bays characterize the eastern coastline in both the southern and northern quadrants. The west and south coasts, despite being the most protected areas and potentially the most suitable for mariculture, are highly urbanized and cater mainly for the important tourism industry.

Taking into account the physical factors which greatly determine the possibility of commercial aquaculture development in Barbados, the limited potential exists for the following types of culture:

- bivalve culture along the south and west coast;
- rearing of juvenile queen conch (*Strombus gigas)* for reseeding of shallow water areas;
- seamoss (*Gracilaria* spp.) cultivation using long-lines;
- culture of indigenous ornamental fish species;
- culture of the Asian freshwater prawn in land-based concrete tanks;
- culture of tilapia in land-based concrete tanks; and

- red drum (*Sciaenops ocellatus*) and dolphin fish culture in sea cages.

4.6 Technical Aspects of Small-Scale Aquaculture Operations and Stock Enhancement

A possible direction would be to investigate the role of renewable energy systems to support recirculating aquaculture systems. Presently, a great number of private wells exist on the island for agricultural irrigation, and the possibility for integrated farming systems coupled with renewable energy systems could also be explored. Such activities could offer a more rational use of the pumped water. Land costs and the nature of infrastructure installation requirements make the simplest investment very capital intensive.

4.7 Technical and Research Capabilities of Fisheries

An aquaculture research centre was opened at the University of the West Indies (UWI), Cave Hill in 1987. One doctoral (PhD) student worked on tilapia larval production and rearing activities. The building is no longer used for aquaculture purposes and no one is currently actively involved in aquaculture research anywhere in the island.

The aquaculture project established at the Greenland Agricultural Station in 1983 lasted until 1989. The 0.63 acres of ponds and a hatchery are no longer used for applied aquaculture research. The Fisheries Division is not presently in a position to carry out any applied aquaculture research due to lack of facilities and trained personnel.

The Fisheries Division's technical assistance and extension activities are confined to providing available information to persons interested in aquaculture and monitoring the activities of aquaculture operations. UWI no longer provides technical support, but the former Ph.D. student continues to offer advice on an *ad hoc* basis to interested persons. The Analytical Services Laboratory can assist with the analysis of soil and water samples.

Barbados is interested in developing small-scale aquaculture; a feasibility study to determine the potential for such development could be undertaken.

CHAPTER 5: REGIONAL FISHERIES DATABASE DEVELOPMENT COMPONENT

5.1 Policy and Data Management Documents

In the 2004-2006 Barbados FMP, attention is given to the importance of fisheries statistics as a useful tool in management of the fisheries.

5.2 Data Collection – Current Situation

There is currently no formal Data Management Policy document, however, the Fisheries Division has been collecting catch and effort data since the 1950. The current practices are understood by officers conducting data collection; however, the absence of a formal document leaves room for subjectivity and inconsistency as new officers takeover the collection of data. The consistency in the type of data collected is vulnerable by this situation and the probability of inconsistently in data becomes greater.

A data Collection and Management Policy is necessary to guide and standardize data collection procedures to ensure that quality data are collected both now and in the future despite who is collecting the data.

The Fisheries Division (FD) is responsible for collating catch and effort data for local fisheries. However, the Markets Division (MD) is the primary agency in charge of weighing and recording the catch information at the primary fish landing sites (markets) around the island while the FD collects catch and effort data at the secondary and tertiary landing sites.

At the market, the catch is recorded by broad taxonomic groups (e.g. tunas, billfishes etc). Each group of fish is weighed to compute the fish tolls. Tolls are based on the quantity and taxonomic type of fish. In the case of flying fish, the number of fish is estimated and the weight calculated by the formula 3 flying fish=1lb. The receipts containing the catch by species group, vessel registrations number and date of the landings is passed on to the FD for collation and analysis of the data.

At the secondary and tertiary sites the data collectors record fish weight by species group and boat. The FD collates and analyses the data.

No information is collected on mariculture/aquaculture as not much is done in Barbados. Biological data, social data, economic data and recreational data are only collected during ad-hoc activities.

Catch and effort data (catch by boat by species group by trip) are collect daily at the primary and secondary landing sites. At the tertiary site catch and effort data are collected during random visits by the data collector. It was noted by an officer in the Fisheries Division that all the landings are not recorded because some of the catch bypasses the data collectors at the landing sites. The Fisheries Division is developing a system to prevent this leak in data.

Barbados uses CARIFIS (a regional programme) to collate and analyze catch and FISBARB a vessel and fisher registration database (developed by the FD) to record and analyze vessel information. By linking the two databases through unique hull numbers assigned to the vessels, it is possible to link current vessel information with catch records

Data are entered by the Data Input Clerk into the system within two (2) weeks of receipt of the toll-books from the Markets Division.

Vessel information (registration number, type, length, engine power etc.) is first recorded by fishing boat inspectors in the field. The information is then transferred to a card filing system and added to vessel database. Prior to 2005, the LRS was used for this purpose. In 2005, the Barbados FD started to use a new computerized catch recording programme – CARIFIS. In addition to this, a complementary custom-designed vessel and fisher registration database programme (Fisheries Information System for Barbados-FISBARB) developed in-house by the FD was also put into use. By linking the two databases through unique hull numbers assigned to the vessels, it is possible to accurately link current vessel information with catch records. Very significantly, the system allows for archiving of the licensing and registration information and thus accurately linking the historic catch and vessel information recorded in the TIP database.

5.3 Data Management – Current Situation

The Fisheries Division, Ministry of Agriculture is solely responsible for the management of the fisheries data.

Data are entered by the Data Input Clerk into the system within two (2) weeks of receipt of the toll-books from the Markets Division.

Vessel information (registration number, type, length, engine power etc.) is first recorded by fishing boat inspectors in the field. There are two (2) officers in charge of the vessel database and one (1) data entry operator in charge of the catch database. An off-site back-up system is needed.

Each year since 2004, the CRFM has held a Scientific Meeting where all participating countries take data collected and have analyses such as stock assessments performed. This collaboration is important and has shown real progress over the years. It is also a useful way to share resources in a coordinated manner to allow member states with limited in-country capacity to analyze data. Barbados has participated in these meetings.

Apart from Summary Statistics, no other treatments are conducted on the data in-house. Most of the assimilation of the data is done at the CRFM Regional Meeting and the FAO ad-hoc Working Group on Flying Fish.

5.4 Information Dissemination

Contemporaneous monthly summaries of un-raised recorded catch data are sent to the Agricultural Planning Unit (APU). Raised island total catch (landed weights) and fleet statistics are reported on a half-yearly and annual basis to the Ministry of Economic Affairs through the APU for inclusion in national social and economic reports. Annual total island catch (round weight) and fleet statistics are sent to FAO and ICCAT. Only previously published data may be given to the public. Distribution of raw data to persons or agencies outside of the Ministry must first be approved by the Chief Fisheries Officer.

Currently, the link between the fisheries data and management decisions is very weak. The data is not presently used in a dynamic manner to guide regulations, quotas or any other fisheries guidelines. There is some stakeholder involvement, but a great deal more needs to happen. One initiative is the formation of the Sea Egg Management Council, which uses data to guide the fisheries in a dynamic manner.

5.5 Gaps in Capacity to Manage Fisheries Information Systems

1. Human Resources

The number of staff members in the Barbados Fisheries Department is reasonable to effectively collect and manage the national fisheries data. The table below summaries the current situation, and recommends the optimal staff complement.

Position	Current Staff Complement	Recommended Staff Complement	Gap	Training Required**
Data Manager-Administrator	0	1	1	Yes
Data Collectors*	2	4	2	Yes
Data Input Clerks	1	~~1~~ 2	~~0~~ 1	Yes
Fisheries Statistician	1	1	0	Yes
Total	**4**	**~~6~~ 7**	**~~2~~ 3**	

** some of these data collectors can be based at selected field locations based on logistics and level of fishing at the sites to ensure efficiency.*
***Training is required also in CARIFIS and it is necessary for this training to be conducted in-house with real data after gaps in the computer infrastructure are dealt with (as outlined below).*

2. Equipment

There is a lack of equipment to effectively input, store and manage the fisheries data. Though some equipment is available for use, these are not dedicated to the Fisheries Information System, and will have implications for safety of data as well as access to the data. The system requires at a minimum:

- Two (2) Desktop Workstations for data input
- One (1) Desktop Workstation for validation of data, summary statistics, and data assimilation
- One (1) field-hardy laptop
- One (1) UPS dedicated for the FIS
- One (1) external hard drive (desktop)
  One (1) external hard drive (portable) that can be kept off-site

Chapter 6. RESULT OF THE BASELINE WORKSHOP

6.1. Output from Workshop in the Fisheries Division

Brief Overview of the Workshop

A participatory workshop was conducted in the Fisheries Division on the 20th and the 21st of October 2009. Nine Fisheries Division officers participated in the discussion of issues and the potential for sustainable fisheries development in Barbados (Table 4).

Table 4: The workshop activities

Date	Place	Content	Participants
20 October 2009	Fisheries Division	- External factor analysis - Internal factor analysis	- Fisheries officers: 9 persons - CRFM: 1 person - Study team: 2 persons
21 October 2009	Fisheries Division	- Strategic orientation - Problem analysis	

Problem Analysis

A Problem analysis using the PCM method was applied to identify major issues involved in sustainable fisheries development in the aspect of fishing operations of local fishers. The problem analysis concluded the following major issues for fisheries development in Barbados:

Difficulty of enforcing fishing regulations
Difficulty of fishing operations
Low fish prices
Poor fish handling practices onshore and at market, and
Lack of ice between fishing trips.

ID/OS Analysis

The ID/OS method was applied in the workshop for the Fisheries Division. The workshop analyzed external and internal factors (problems, conditions, potential and so on) of the Fisheries Division, and found proper strategic options in terms of sustainable fisheries development in Barbados. According to the basic question of sustainable fisheries management and development namely "how the Fisheries Division can improve the sustainable management and development of the fisheries sector", analysis of both external and internal factors concluded the following. External analysis revealed that the major opportunities were "Some fishers have an environmental awareness and understanding of interaction"; "Framework of fisheries registration in place"; and "Fishers are willing to cooperate with the fisheries division." The major threats were "Climate change; "Unaware of fisheries law and regulation"; "Limited finances"; and "Weak monitoring control and surveillance system". Within the internal analysis, the fisheries division's strengths were "Good record system for vessels and fisheries workers"; "Some staff are well trained for their jobs"; "The strengths of staff need to be identified and fully utilized and appreciated"; "Administrative procedures exist"; and "Good inspection and registration system". The weaknesses were "Poor communication among staff"; "A lack of clear direction or vision"; "Ineffective organizational structure"; "Internal cross fertilization of staff ideas is necessary"; and "Very few publications for general knowledge".

The strategic orientation discusses practical impact of important strengths and weaknesses of the target organization to enhance opportunities and overcome threats, and also evaluates the feasibility of selected strategic options in accordance with the basic question. The result of this strategic orientation in the workshop suggests the Fisheries Division needs to be responsive to the threats “Lack of awareness of

fisheries laws and regulations" and "Weak monitoring control and surveillance system" with effective strategic options for sustainable fisheries development.

2-2.2.5. Output from Workshops with Local Fishers

Overview of the Workshop

Mini-workshops with local fishers were conducted at 3 landing sites, namely Sixmen's Bay (west coast), Onitins (south coast), and Conset Bay (east coast), on the 21st and 22nd of October 2009. Five to ten fishers attended each of these workshops to discuss their current fishing activities and identify major issues within their fishing operations as shown in Table 5.

Table 5: The workshop activities

Date	Place	Contents	Participants
21 October 2009 15:00 - 16:30	Sixmen's Bay (West coast)	Fishing ground (mapping) Fishing activities Income and expenditure of fishing operation Fishing season (calendar) Problems / issues of fishing activity and operation	- Local fishers: 17 persons - Fisheries Division: 2 persons - CRFM: 1 person - Study team: 2 persons
22 October 2009 10:30 - 12:00	Oistins (South coast)		- Local fishers: 6 persons - Fisheries officers: 2 persons - CRFM: 1 person - Study team: 2 persons
22 October 2009 13:30 - 15:00	Conset Bay (East coast)		- Local fishers: 8 persons - Fisheries Division: 2 persons - CRFM: 1 person - Study team: 2 persons

Summary of Community

The basic features of 3 fish landing sites were identified as shown in Table 6.

Table 6: Basic features of 3 fish landing sites

Site	Perish	Number of fishers	Number of fishing boats	Existence of fish landing / market facility
Sixmen's Bay	St. Peter	80 - 100	40 – 50	No
Oinstins	Christ Church	-	Big boat 32, Small boat 33	Yes (Oinstins Fish Market)
Conset Bay	St. John	-	-	Yes (Conset Bay Fish Market)

6.2. Present Status of Local Fisheries

Big fishing boats (30 to 60 feet long with an inboard engine) are operated by two or three crew members to catch offshore pelagic fish mainly flying fish, dolphin fish and tuna, with gill nets or hocks and lines. Most big boats carry ice to preserve caught fish during trips ranging from 3 to 10 days. Some big boats (32 feet long with an inboard engine) only conduct one-day fishing operations in the coastal areas of the island.

Small fishing boats (20 feet long with an outboard engine) are operated by one or two crew members to catch coastal pelagic fish such as jack and robin with beach seine nets or demersal fish, mainly snappers, with fish pots or spear guns. Small boats usually start fishing in the early morning and land them in the late afternoon or evening. Due to the length their one-day fishing operation, they do not carry ice.

The main fishing season for offshore pelagic fish is from November to June for species such as flying fish, dolphin fish, and kingfish.. Most big boats stop their fishing operations during the hurricane season from August to October. During this off-season the big boats are repaired and maintained on land. However, activities including beach seines, pot fishing, and dive fishing with a spear gun are largely conducted in coastal areas.

6.3. Needs of Local Fishers

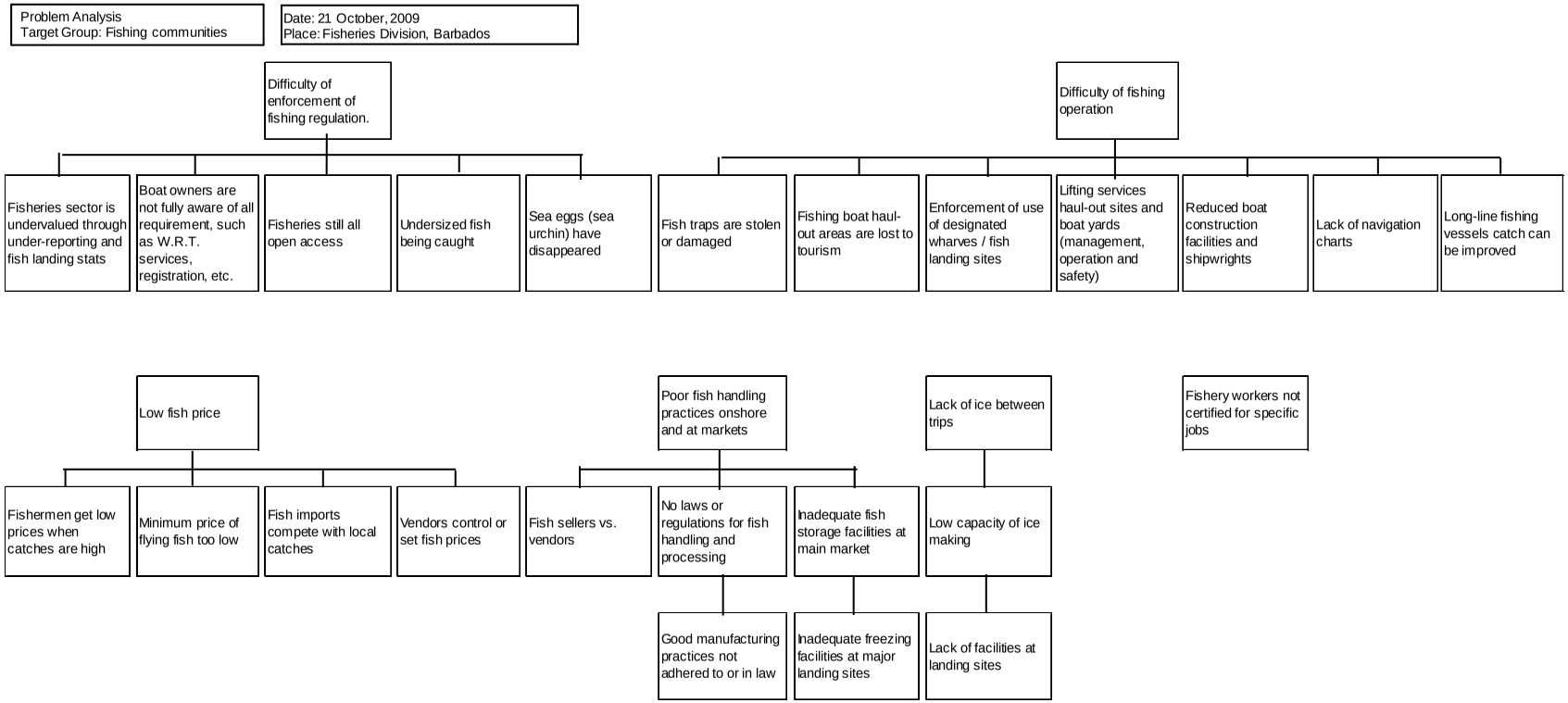
The following major issues within local fishing activities were identified in the workshops with local fishers:

Ice Supply and Cost
The ice production capacity in the market is insufficient for all fishing boats
High cost of ice
Fish Sales in Local Markets
Fish prices fluctuate and have dropped too low
Difficulty in selling fish during times of surplus
Fishing Equipment Supply and Maintenance
Restriction on buying used engines: no duty and VAT exemption
Fishing gear is only sold in one or two shops
Support for Fishers' Activities
Banks do not allocate loan schemes due to high risk of the fishing business
There is no fisher cooperative in support of fishers' lives.

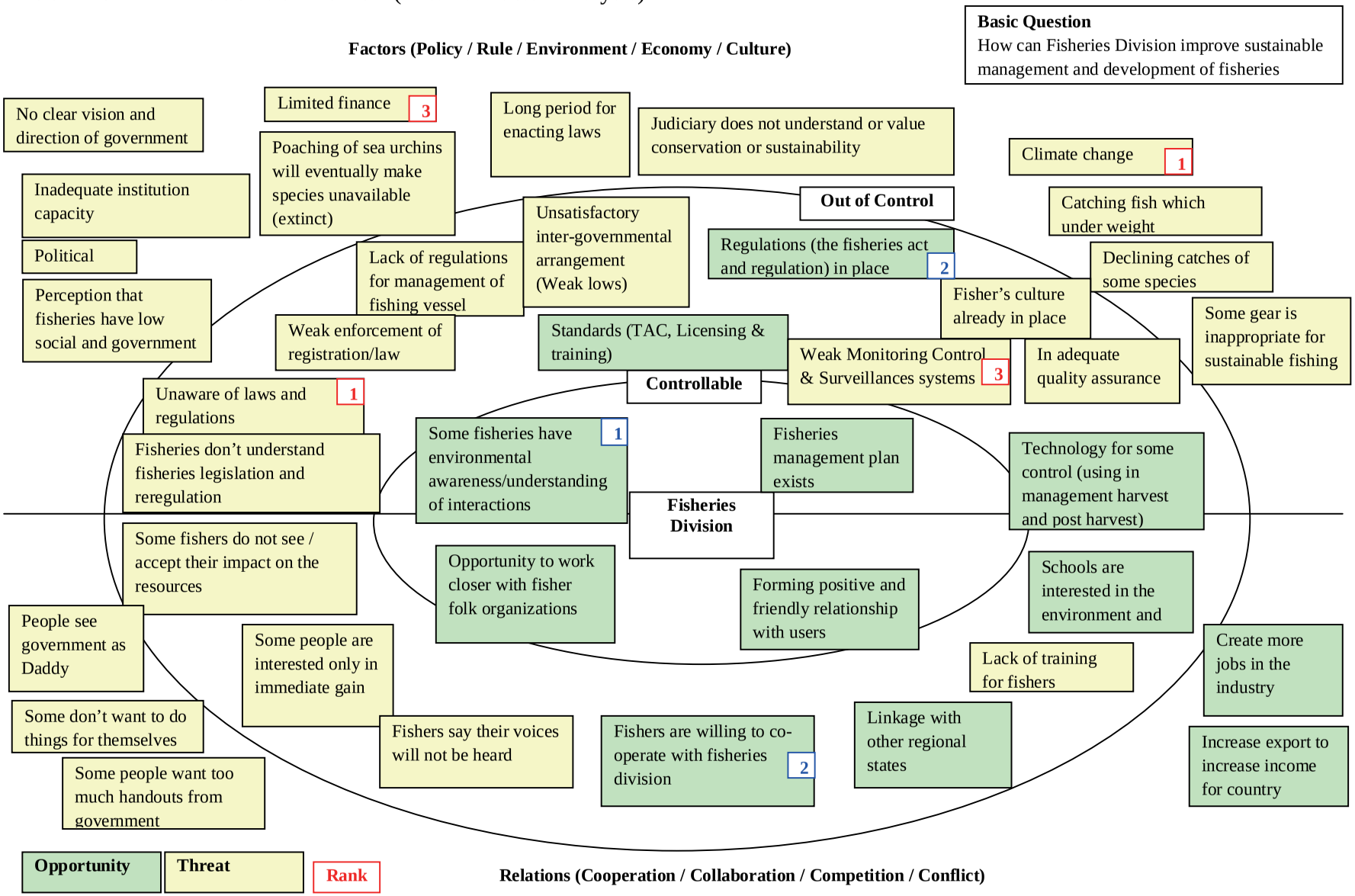
6.4. Key issues identified in coastal resources management during the Workshop

According to results of the workshops with both the Fisheries Division and local fishers, key issues were identified for the sustainable use of coastal resources, namely "Utilization of Offshore Pelagic Fish by the FADs' Deployment"; "Introduction of New Fishing Methods and Resource Management for Demersal Fish",and "Resource Enhancement of Reef Fish and Lobster in Coastal Areas".

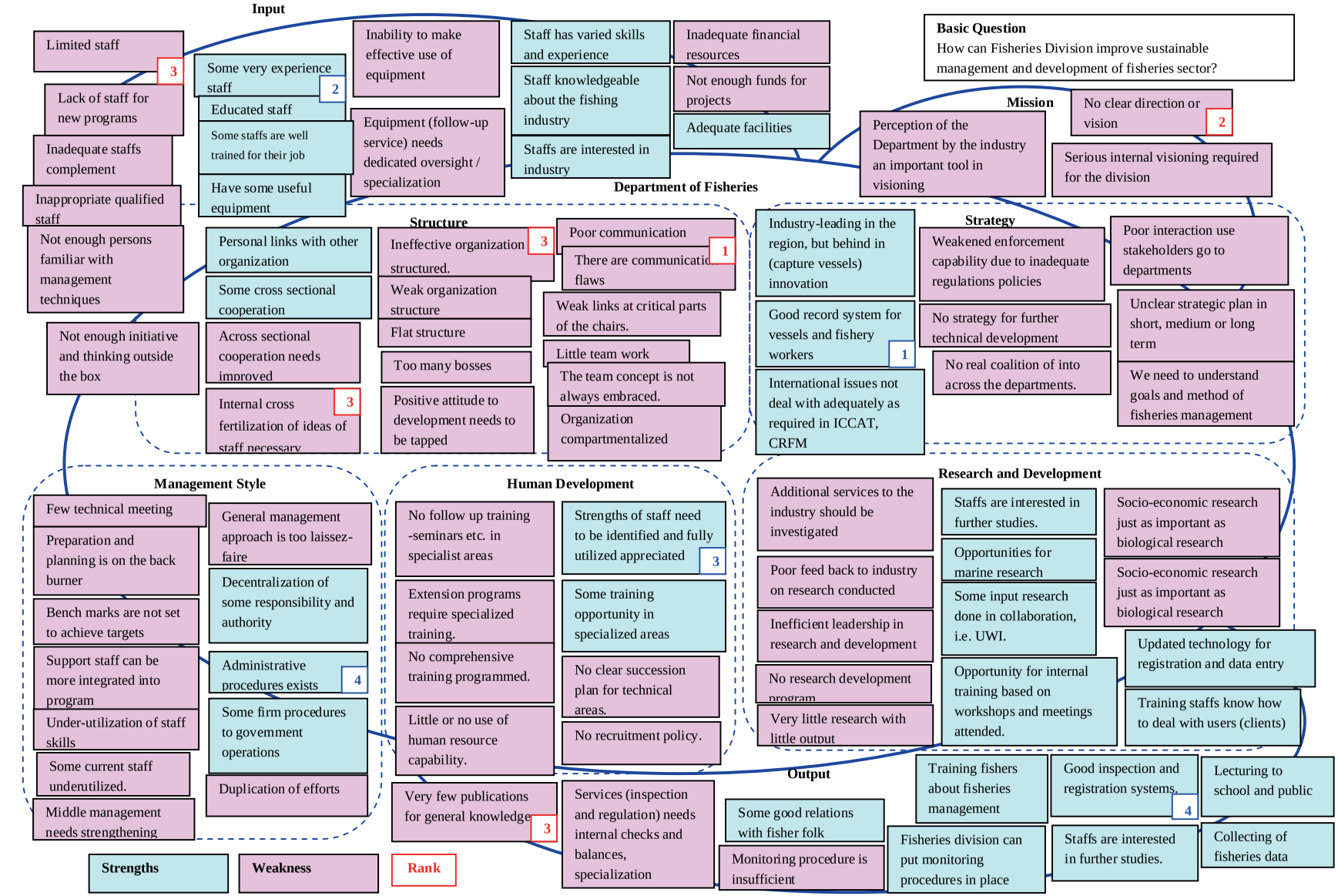
RESULT OF THE PCM WORKSHOP



RESULT OF THE ID/OS WORKSHOP (External Factor Analysis)



RESULT OF THE ID/OS WORKSHOP (Internal Factor Analysis)



REFERENCES

ATAPATTU, Anton. *Technical Report: Explanatory Notes on the Comments of the Technical Officer*. February 1998.

BARBADOS. *Barbados Fisheries Management Plan 2004-2006: Schemes for the Management of Fisheries in the Waters of Barbados.* The Fisheries Division, Ministry of Agriculture and Rural Development. 2004.

BARBADOS. *Fisheries Act 1993.*

BARBADOS. *Fisheries (Amendment) Act 2000.*

BARBADOS. *Fisheries Management Plan 2009-2012 (Draft).* The Fisheries Division, Ministry of Agriculture and Rural Development. 2009.

CECIL, Robert Gerald. *Half a Century of Fisheries in Barbados: a Quest for Socio-Economic Interpretations in the Systematic Literature and the Popular Press.* Fisheries Division Report No. 1. Fisheries Division, Ministry of Agriculture and Rural Development, March 1999.

CRFM. *Report of the first annual CRFM scientific meeting*. 22-30 June 2004. Published by the Caribbean Regional Fisheries Mechanism Secretariat, Belize City, Belize. CRFM Fishery Report No. 11. 318p. 2005.

CRFM. *Report of the fourth annual CRFM scientific meeting*. Kingstown, St Vincent and the Grenadines. 10-20 June 2008. Caribbean Regional Fisheries Mechanism Secretariat, Belize City, Belize. CRFM Fishery Report 2008, 75p. 2008.

ESPEUT, Peter. *A Socioeconomic Baseline Survey of Thirty Fishing Communities in Twelve CARICOM Countries*. Report of a survey conducted for the Caribbean Natural Resources Institute, (CANARI), Vieux Fort, St. Lucia, W.I., for the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP), Belize City, Belize, C.A., 1994.

FAO. *Fishery country profile, Barbados*. 2005. www.fao.org/fi/oldsite/FCP/en/BRB/profile.htm

ICCAT, 2008. *Report of the standing committee of research and statistics*. Madrid Spain, September 29-October 3, 2008. International Commission for the Conservation of Atlantic Tunas. 2008 SCRS Report, 241p.

MAHON, R., C. PARKER, T. SINCKLER, S. WILLOUGHBY, and J. JOHNSON. *The Value of Barbados' Fisheries: A Preliminary Assessment*. **Proceedings of the Gulf and Caribbean Fisheries Institute.** 58:88-192. 2007.

MOHAMMED, Elizabeth, Christopher PARKER and Stephen WILLOUGHBY. Barbados: *Reconstructed Fisheries Catches and Fishing Effort, 1940-2000*. **Fisheries Centre Research Reports**. Vol. 11 (6). 2003.

FINAL COUNTRY REPORT: BELIZE

October 2009

Belize

Country Profile

Geographic coordinates	17° 15' N, 88° 45' W
Total area	22,966 sq km
Land area	22,806 sq km
Water area	160 sq km
Length of Coastline	1,996 km
Shelf Area	8,727 sq km
Territorial Sea	18,508 sq km
Claimed EEZ	12,839 sq km
Highest point (m)	1,124 (Doyle's Delight)
Climate	tropical; very hot and humid; rainy season (May to November); dry season (February to May)
Natural hazards	frequent, devastating hurricanes (June to November) and coastal flooding (especially in south)
Population	307,899 (July 2009 est.)
Annual Population Growth Rate	2.154% (2009 est.)
Life Expectancy	total population: 68.2 years
Languages	Spanish 46%, Creole 32.9%, Mayan dialects 8.9%, English 3.9% (official), Garifuna 3.4% (Carib), German 3.3%, other 1.4%, unknown 0.2% (2000 census
Ethnic Mix	Mestizo 48.7%, Creole 24.9%, Maya 10.6%, Garifuna 6.1%, Other 9.7% (2000 census)
Work force	122,300; agriculture: 10.2% industry: 18.1% services: 71.7% (2007)
Unemployment	8.1% (2007)
GDP	$2.536 billion (2008 est.)
GDP Growth rate	3% (2008 est.)
GDP per Capita	$8,400 (2008 est.)
Currency Unit	2 Belizean dollars (BZD) = 1 US dollar
Area of Mangrove Forests	301 sq km
Percent of Mangrove Forests Protected	10%
Per Capita Food Supply from Fish/Fishery Products (2000)	15 kg/person
Exports	$458 million (2008 est.) sugar, bananas, citrus, clothing, fish products, molasses, wood, crude oil

Sources: CIA World Factbook – Belize (2009); EarthTrends Country Profiles – Belize.

Abbreviations and Acronyms

AQUIF	Aquaculture & Inland Fisheries
BAHA	Belize Agricultural Health Authority
BELRIV	Belize River Valley
BELTRAIDE	Belize Trade & Investment Development
BMDC	Belize Marketing Development Corporation
CARICOM	Caribbean Community
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programme
CRFM	CARICOM Regional Fisheries Mechanism
CZMA/I	Coastal Zone Management Authority and Institute
DOE	Department of the Environment
EPZ	Export Processing Zone
EU	European Union
FAO	Food & Agriculture Organization of the United Nations
FCBL	Fresh Catch Belize Limited
FD	Fisheries Department
GEF	Global Environmental Facility
GOB	Government of Belize
IHHN	Hypodermal Hematopoietic Necrosis
JICA	Japan International Co-operation Agency
MAFC	Ministry of Agriculture, Fisheries & Co-operatives
MPW	Ministry of Public Works
MRD	Ministry of Rural Development
mt	Metric Ton
TSV	Taura Syndrome Virus
UNDP	United Nations Development Program

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CHAPTER 1: INTRODUCTION

Fig. 1: Map of Wider Caribbean

Belize (formerly the colony of British Honduras), is a country in Central America bordered by Mexico to the north, Guatemala to the south and west, and the Caribbean Sea to the east (See Fig.1). The second-longest barrier reef in the world flanks much of the 386 km (240 mi) of predominantly marshy coastline. The area of the country totals 22,966 sq km (8,860 sq mi); the abundance of lagoons along the coasts and in the northern interior reduces the actual land area to 21,400 sq km (8,300 sq mi). It is the second smallest country on the American continent. With 308,000 people (2009 est.), the population density is the lowest in Central American and one of the lowest in the world. However, the country's population growth rate, 2.15% (2009 est.), is the highest in the region and one of the highest in the western hemisphere.

Belize has a diverse society, composed of many cultures and languages. Culturally, Belize considers itself to be Central American but keeps close ties with the English Speaking Caribbean. It is a member of the Caribbean Community (CARICOM) and the British Commonwealth of Nations.

The Fishing industry in Belize is mainly an artisanal industry and the majority of the fishing effort is concentrated within the shallow protected waters of the main Barrier Reef (barrier platform and barrier lagoon) including the shallow areas in front of Belize City, such as Gallows Point, Long Caye and Caye Caulker as well at the three outer atolls (Turneffe, Lighthouse and Glovers Reef.

The Fishing Industry is a major contributor to the Belizean economy, primarily in foreign exchange earnings and employment. Fishing activities in Belize have traditionally revolved around the lobster and conch fisheries. Over the last few years shrimp and finfish, both demersal and inshore pelagics, have gained recognition as fisheries of significant economic potential.

The marine fishery is a significant contributor to the total economy of Belize and ranks as the third largest foreign exchange earner in the country. Its contribution to the Gross Domestic Product (GDP) is significant but variable (See Table 1); it increased over the last decade to a high of 7.84% in 2005, and declined to a low of 2.56% in 2008.

The most significant contributor of fisheries biomass and revenues is aquaculture, with shrimp farming being the important income earner. Lobster and conch are the most significant elements of the wild caught or capture fishery industry. As much as ninety percent (90%) of the lobster, conch and shrimp produced in Belize are exported, with the United States being the most important market destination.

Table 1:
Contribution of the Fisheries Sector to GDP (Constant Prices), Belize 2000-2008

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008
% of GDP	4.27%	4.31%	3.83%	7.36%	7.39%	7.84%	6.36%	2.74%	2.56%
B$ million	62.2	64.9	60.3	126.8	133.8	147.2	124.4	53.5	52.0

Source: Belize Department of Statistics 2009

The fishery industry of Belize is supported by very lucrative foreign markets. In 2006 the entire fishery sector exported 25.6 million pounds of seafood, earning US$53.4 million in foreign exchange[1]. Belize has an open access fishery with the requirement for fisher folk and boat licenses.

1.1 Description of the Marine Fisheries

The Belize fishery may be divided into the following categories[2]:

Lobster and conch fishery: Both these species are taken along the reef and within the atolls. Lobsters are taken by both free diving and traps, while conch is taken almost exclusively by free diving. Both fisheries are described as 'Mature Fisheries' with harvest volumes being just at about Maximum Sustainable Yields.

Inshore fin-fishery and other select macro-invertebrates: This includes reef fish, coastal pelagic and estuarine stocks as well as a few species of crabs:

(i) Reef fish are primarily snappers (Lutjanidae), groupers (Serranidae), grunts (Haemulidae), porgies (Sparidae) and hog fishes (Gerreidae). They are taken largely by hand lines or drop fishing, spear guns and Hawaiian Slings, gill nets, traps and weirs;

[1] Environmental Defense Fund 2008. Of this total, 95% of the production and 80% of the revenue was from farmed seafood. Data is available only for exported produce because there is no tracking of seafood distributed to local markets or consumed for subsistence.

[2] Adapted from Gillet (2003).

(ii) The seasonal, small scale estuarine fin-fish stocks consists of mullets (Mugilidae), jacks (Carangidae), snooks (Centropominidae) , and mojarras (Gerreidae): These species are caught using mainly stop nets , although trolling and spin casting also factors into the harvests;

(iii) Two species of crabs are exploited, these are the Stone Crab (*Menippe mercenaria*), and the Blue Crab (*Callinectes sapidus*): Both of these species are caught in specially baited traps – they are currently consumed mainly on the local market;

Deep slope and bank fishery: These fisheries are composed mainly of the larger snappers (Lutjanidae) and groupers (Serranidae) species. They were the traditional base of the finfish export industry which existed up to a decade or so in the past. These species are usually caught using 'drop lines' or 'hand lines', primarily during spawning aggregation events. Overexploitation is an acknowledged threat;

Inshore pelagic and shark fishery: Scombrids (mackerel, tunas and wahoos) Carangidae (jacks), ,Sphyraenidae (barracudas) and sharks are targeted. In the case of the latter the fishery is in large measure seasonal and for the Mexican, Honduran, and Guatemalan markets market;

Inshore commercial trawl fishery: This is exclusively related to the wild caught shrimp fishery. The fishery was established in 1984, peaked in 1988 with a fleet of 11 standard Mexican/Gulf trawlers. The main challenge to the industry currently is high fuel costs and modest market prices.

Marine aquarium fishery: This fishery targets the fish hobbyist in the U.S. and Europe. Earnings from this Sub-Sector are small: Production or the volume of harvest has also been relatively small and sporadic with significant variations over the last decade.

The fishing industry provided direct employment to over 2,200 full-time fishers in 2008. Direct employment was also provided for over 500 processing and market workers during this time-frame. Unlike the large commercial fleets exploiting deep-sea pelagic and demersal stocks on the high seas, Belizean fishermen are directly dependent on national stocks, and they cannot easily find alternate sources of livelihood either within the Fishing Industry or otherwise.

Table 2: Number of Fisherman's Licenses & Boat Licenses, Belize, 1999-2008		
Year	**Fishermen**	**Boats**
1999	2137	728
2000	1872	750
2001	1707	608
2002	1947	708
2003	2009	689
2004	1731	621
2005	2026	652
2006	2131	653
2007	2110	593
2008	2267	643

Source: J. Villanueva, Belize Fisheries Dept (2009)

The fishing fleet includes 643 artisanal boats (out-board skiffs, sail sloops, and canoes) in 2008 (See Table 2), as well as a couple industrial shrimp trawlers.

The annual fishers license fee is Bz$25 (US$12.50). The boat license fee is Bz$15-$50 (US$7.50-$25) depending on the size of the boat. About 25% of the boats are skiffs with fiberglass hull (16-25 ft) that are fitted with outboard engines (40-75 HP). The rest are wooden sail boats functioning as "mother boats" with about 5 – 10 small canoes on board. The strategy entails anchoring the mother boat at some central location on the fishing grounds where it is then serviced by the canoes which fan out to cover a relatively large area.

There is no subsidy for fishers in terms of fuel or gear.

1.2 Role of Fisherfolk/Stakeholder Organizations

Commercial fishing was recognized in Belize in the late 1940's and early 1950's, however the industry made its first great leap forward in terms of both fishery production and revenues in the early 1960's with the organization of fishers into cooperatives. The advent of the Fishing Cooperatives brought with it the holistic control of all facets of the industry in Belizean hands: This ranged from harvest or landing of the product, to processing and marketing of the produce. The Fishing Cooperatives are built on the principle of ownership by the members of the organization, who are the fishers themselves. This arrangement in effect resulted in significantly greater earnings for fishers. Prior to the formation of the Fishing Cooperatives the industry was controlled by a number of foreign boat owners who came to Belize to purchase produce from the fishers at sea.

The Fishing Cooperatives have become a powerful political lobby for the industry, where these institutions engage the Government of Belize (GOB) on the full range of issues relating to the development of the industry and indeed the welfare of its membership.

More than 50% of all licensed fishermen in Belize are members of one of the five cooperatives currently in existence (See Table 3). In addition to the Fishing Cooperatives, a number of

Fishing Associations have been formed to look after the interest of fishermen. These organizations have emerged over the last five (5) years. Their focus is more location-specific in regards to the communities) that they serve and involves broader community development in orientation as opposed to being confined to fisheries-specific interest. The associations are growing in prominence as partners of the wider NGO Community. . There are some overlapping interests and possible redundancies between the Fishing Cooperatives and the Fishing Associations.

Table 3:
Co-operative Locations and Memberships in 2008

Co-operative	Location	Producers	Non-Producers
Northern	Belize City	474	393
National	Belize City	331	179
Caribeña	San Pedro	15	121
Placencia	Placencia village	34	32
Rio Grande	Punta Gorda	30	30
Total	**5**	**884**	**755**

The exportation of wild caught fishery product is almost exclusive to the two (2) larger Fishing Cooperatives National Fishermen Producers Cooperative Society Limited and Northern Fishermen Cooperative Limited. Although the smaller cooperatives such as Placencia Fishermen Producers Cooperative and Caribeña Fishermen Cooperative also qualify to export fishery products from Belize, the limited volumes of production and the infrastructural requirement to process and store this product makes marketing and exportation an unviable prospect for these cooperatives. The smaller Fishing Cooperatives sell their produce to either Northern or National Fishing Cooperative.

The Fishing Cooperatives in general handle lobster, conch, shrimps, stone crabs and a number of finfish species including snapper, grouper, hog fish and jacks.

The Belize Fisherman's Cooperative Association (BFCA) is an umbrella organization representing the interest of Cooperatives. The Northern Fishermen Cooperative although not a member of this organization has indicated that it will join the BFCA soon.

Fishermen have a legal obligation to sell their catch to their own cooperative. The sale of products to other cooperatives directly or via another member, poses a major threat to the viability of the Fishing Cooperative movement in Belize. The sale of fishery product such as fin-fishes and stone crabs to other destinations such restaurants, supermarkets, hotels and consumers at large, is not viewed as a major threat to the cooperatives given the historical focus of the Cooperatives on the high value species such as lobster and conch..

Today, all of the Fishing Cooperatives report declining active membership and reduced influence in the fisheries sector. This is a major source of concern to the government which views the cooperatives as important entities for managing the fisheries coherently. The three smaller coops reported in interviews with the Environmental Defense Fund (EDF) that they are concerned about their relevance and ongoing existence. In addition, the coops have problems related to loan abuse. In interviews with the EDF, a cooperative board member estimated that 70% of its members were heavily indebted to the organization with the prospects for the recovery of those loans being extremely challenging.

Fishing Cooperatives in general provide a range of incentives that enable their members to continue to realize reasonable returns from fishing in these challenging times of high input costs and declining catches. The incentives provided by the Cooperatives to its membership include direct subsidies for fishing supplies such as ice, fuel and low-interest loans. The economic incentives have become crucial to the continued success and existence of the cooperatives.

In terms of economies of scale, National Fishermen Cooperative has reported that in order to operate successfully they need a minimum of 200,000 pounds of lobster and 200,000 pounds of conch per annum to survive.

1.3 The Administration of Fisheries in Belize

The Belize Fisheries Department, a unit of the Ministry of Agriculture, Fisheries and Cooperatives (MAFC), is charged with the regulatory leadership of Fisheries Sector. The Department has four sections:

- Personnel and financial administration
- Ecosystems management (including environmental monitoring and MPA management);
- Capture Fisheries (including marine and inland fisheries); and
- Aquaculture and Resource Mobilization

The structure of the Belize Fisheries Department may be summarized in Fig. 2 below:

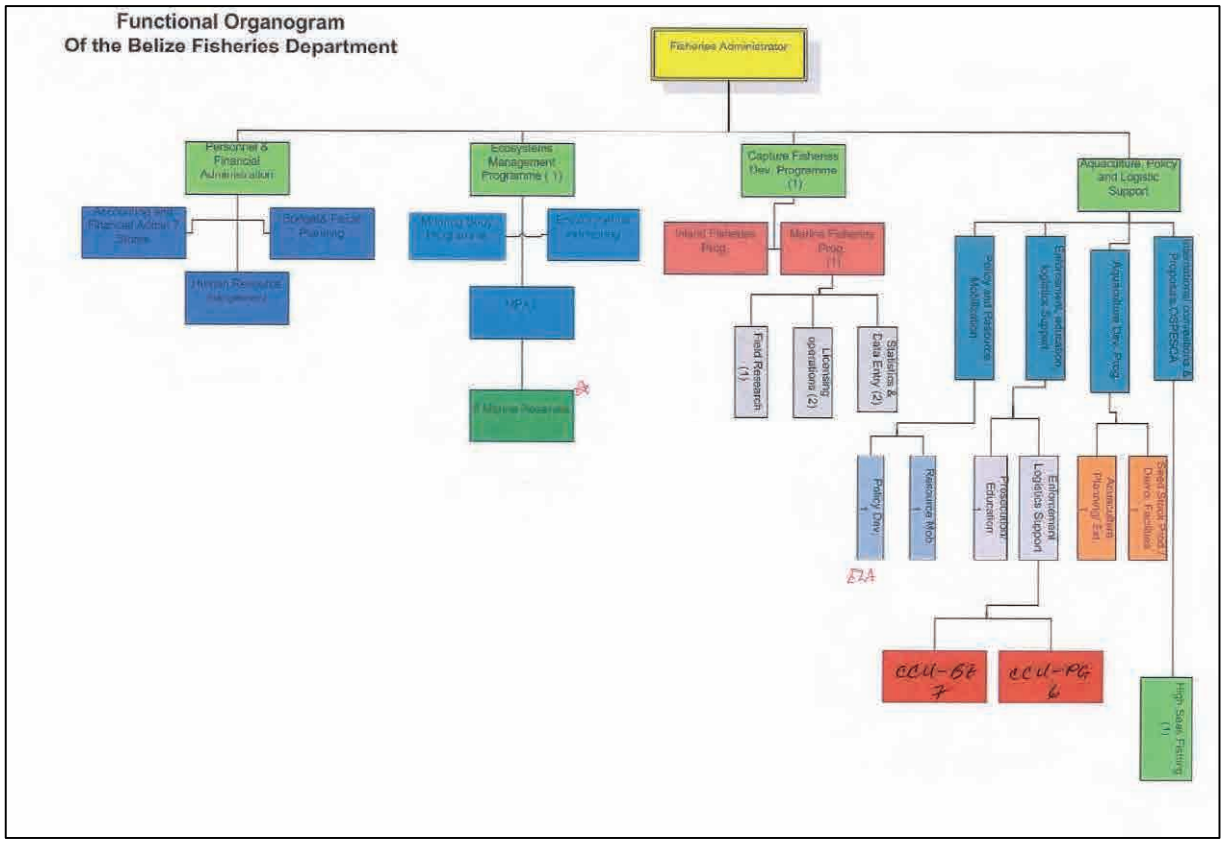
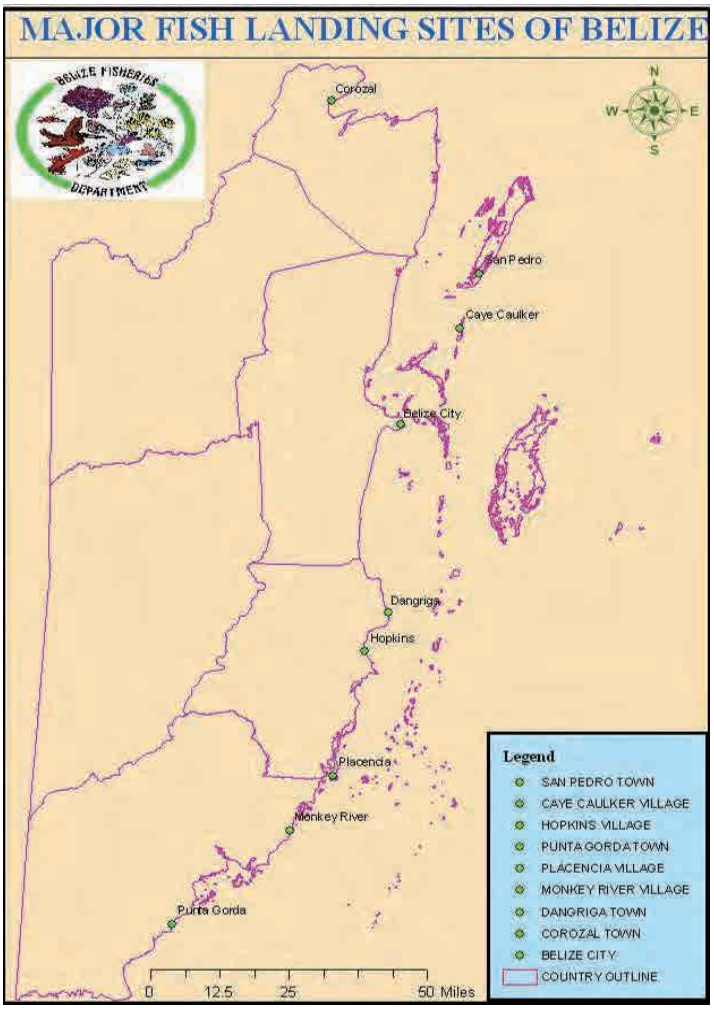


FIG.2: FISHERIES ORGANOGRAM

CHAPTER 2: COMMUNITY-BASED FISHERIES MANAGEMENT COMPONENT

2.1 Coastal Community Characteristics



It is estimated that about 45% of the population of Belize live on the coast. The major coastal settlements (going from north to south) are:

- Sarteneja - 2,800 population
- Corozal - 9,000 population
- Belize City - 70,800 population
- Dangriga - 12,000 population
- Hopkins - 1,000 population
- Placencia - 500 population
- Monkey River - 200 population
- Punta Gorda - 6,400 population

The archipelagic component of the state of Belize consists of over 1,000 cayes or islands: These cayes vary in size from tiny mud and sand shoals to islands the size of Barbados. Some of the major inhabited cayes include:

- San Pedro - 8,500 population
- Caye Caulker - 1,300 population
- St. George Caye – 450 population

A number of locations along both the mainland coast and the cayes offer opportunities for nature-oriented tourism; these range from snorkeling and scuba diving to bird watching and sports fishing.

The benefits that have been derived from tourism have significantly changed the local economies of these communities.

More than 50% of fishers are between 15 and 35 years of age. Most are from impoverished rural coastal communities. Many young fishers and plant workers have only an elementary-level education. Often the fishers are the sole income earners for their households. Lack of access to capital is a major issue for fishers, both on an individual and collective level. Individually, fishers do not have the funds available to make necessary repairs and upgrades to equipment. Fuel is not subsidized by the government, and is their highest cost.

2.2 Policy, Legislation, and Supporting Institutional Arrangements

POLICY

In April 2003 the Government of Belize through the Ministry of Agriculture and Fisheries published "**The National Food and Agriculture Policy 2002-2020**" under the slogan "**NO FARMER = NO FOOD**". Sect. 7 titled **Fisheries Policies** spells out eight (8) policy objectives and nine (9) strategies to achieve them. In the General Election in early 2008 the former opposition United Democratic Party (UDP) was elected to govern the affairs of the Government of Belize (GOB). To date the new administration has not put forward any new policy in regards to the Fisheries sector. However there is one in process at the level of the Fisheries Administration. This has nine (9) strategic objectives;

1) Reduction of effort in traditional areas.
2) Maximization of returns through improved efficiency.
3) Strengthening of capacity within the Fisheries Department.
4) Identification and development of markets. Local and external.
5) Increased emphasis on research through collaborating technical assistance and joint ventures.
6) Development of capacity within the resource users through increased extension work.
7) Increased production through the development of non-traditional and deep seas potential.
8) Increased community participation through improved public awareness.
9) Strengthen regional collaboration in the management of marine resources.

Numbers 6-8 are directly relevant to this component of the JICA-CRFM project:

- Strategic Objective 6 speaks to **capacity-building** within coastal communities;
- Strategic Objective 7 speaks to **alternative livelihoods** within the fisheries sector; and
- Strategic Objective 8 speaks to **community-based fisheries management**.

"*The key to the development of the fisheries sector is the fishers themselves since sustainable development must be 'people centered', and be focused on the involvement of the stakeholders themselves*".

The document identifies eight (8) "**Fisheries Challenges**" and two (2) which are directly relevant:

1. *Resource Depletion In Regards To The Traditional Fishing Industry:* A virtual explosion in the number of licensed fishers in combination with the increasing scale of operation of these fishers are putting unsustainable fishing pressures on the fishery resources in traditional waters, including: lobsters, conch, and larger predatory aggregating finfish species such as snapper and grouper species. Another factor contributing to the depletion of fishery resources is the general lack of enforcement capacity, which is in turn a function of limitations in funding, manpower and equipment.

5. *Insufficient Stakeholder Participation:* The global paradigm of the involvement of stakeholders in the decision-making process affecting the resources and the institutions impacting on the stewardship of those resources needs to be enforced. The participation of fishers on the Fisheries Advisory Board (FAB) needs to be strengthened. There is a need to expand the participation of fishers to include fishers that are not members of the fishing cooperatives, as well as to bring statutory powers to the Board. The involvement of stakeholders in the decision-making process also needs to be extended to the shrimp farming and aquaculture communities;

By identifying the "explosion" in the number of fishers as a "challenge" this points to the reduction in the number of fishers as a possible solution, which again raises the issue of alternative livelihoods. Increasing stakeholder participation is the main subject of this component.

The second and third policy objectives for the capture fishery are:

(b) Including the resources users in the management process: Recent studies have shown that the most effective way to sustainably manage a common resource is to involve the stakeholders. To break the pattern of "the tragedy of the commons" it is important that the resource users be involved in the management process and be allowed to feel a sense of ownership. Involvement of stakeholders will require the following:

i. An extension and public education/awareness programmes that targets the resource users in particular and the Belizean public in general.
ii. Establishment of close working relationships with the fishermen's organizations to discuss matters that is of importance to the sector.
iii. Involvement of fishermen and other resource users in the public consultation process.
iv. Enhancement of the Fisheries Advisory Board model to ensure its continuity and continued effectiveness through some form of legislative process.

(c) Improving the efficiency and profitability of the sector through the identification of new methods and markets.

Most of the higher priced commercially exploited marine species are at or beyond their Maximum Sustainable Yield (MSY). This is shown in the landings for Lobster, Conch and Shrimp where increased effort (through an increase in the number of fishers) has resulted in very small increases in landings, if any at all. If these species are to continue at present production levels, then a reduction in the fishing pressure is needed. This will means a reduction in the current fishing effort on these species. As indicated above, this reduction in effort can take the form of limiting entry, licensing by species, quotas and closed season/ areas, all resulting in a reduction of the number of fishers per species per unit time. However, this will mean that some fishers will be displaced and in general the earnings of the industry will be affected. To offset this potential situation a combination of strategies will be necessary. These include but are not limited to:

i. Identification of alternative commercially exploitable species such as shellfish (oysters, clams etc), blue crabs, pelagic fish species (tunas, mackerels, jacks) and squids.
ii. Training of fishermen in the harvesting and handling of target species.
iii. Improvements in methods of handling for all species caught to reduce post harvest losses and increase value through increased quality. Close cooperation with agencies such as the Belize Agricultural Health Authority (BAHA) will be a must.
iv. Identification and assistance in the identification and development of new markets both locally and regionally for new target species.
v. Training and assistance with development of processing and packaging methods to add value to the harvested products, whether traditional or new. Such things as seasoned ground conch or seasoned lobster head meat packaged in one or two pound packets, or crab meat in the back, or salting and smoking or dry salting and packaging will be some of the options explored.

As part of the fifth policy objective (entitled: **Develop and foster linkages between the various regional and local organizations and institutions involved in natural resources management**) there is the following recommendation:

i. Development of co-management arrangements with local Community-Based Organizations (CBOs) and Non-governmental Organizations (NGOs) for the management of selected fisheries or areas.

In summary, the 2003 Belize Fisheries Policy does give priority to the involvement of fishers, fisher organizations, fishing communities and other stakeholders in the management of fishery resources, and it is to be expected that this policy will be continued into the future.

LEGISLATION

Although the political party which was in power from 2003-2008 was the same one which espoused the above Belize Fisheries Policy, they did not take it to the next stage by changing the legal framework to give effect to the new recommendations.

Monkey River, Toledo District, Belize

The **Belize Fisheries Act** (Chapter 210) 1948 (last revised in 2000) contains nothing about fishers' organizations, a Fisheries Advisory Council, or any mechanism for stakeholders to participate in fisheries management.

The first reference to stakeholder participation in subsidiary legislation is contained in the **Hol Chan Marine Reserve Regulations** (1988, revised 2003) where provision is made for a **Board of Trustees** to manage the reserve (See box below). The membership is evenly balanced between government and NGO. The Board collects entry and license fees which do not go to the Consolidated Fund, and is accountable for spending same; but licenses and permits are granted by the Fisheries Administrator, which places management power squarely with the FD. These are more **trustees** in charge of managing a **fund**, rather than stakeholders managing a reserve.

THIRD SCHEDULE

[Regulation 13]

1. The Board shall comprise of nine[3] members as follows:

(a) the Manager of the Hol Chan Marine Reserve;
(b) a representative from a local NGO;
(c) the Chairman of the Fisheries Advisory Board;
(d) the Fisheries Administrator;
(e) the Financial Secretary or his representative from the Ministry of Finance;
(f) the Director, CZMA Institute;
(g) the Chairman of the Caribeña Fishermen Cooperative;
(h) a representative from a local Tourism Industry Association or BTB;
(i) a local representative from the private sector; and
(j) the Mayor of San Pedro.

Later when other reserves are created, no provision is made for a Board of Trustees or Advisory Committee [See the **Glovers Reef Marine Reserve Regulations** (1996, revised 2003); the **Port Honduras Marine Reserve Regulations** (2000, revised 2003); the **Bacalar Chico Marine Reserve Regulations** (2001, revised 2003)].

However in 2003 when the **Gladden Spit and Silk Cayes Marine Reserve Regulations** (2003) were promulgated (after the publication of the 2003 **Belize Fisheries Policy** mentioned above), Part II states that "*The Fisheries Administrator **shall** establish an Advisory Committee for the purpose of assisting in the management of the Reserve*" (emphasis mine). The regulation is reproduced in the box below. The granting of licenses to operate in the reserve is still the sole prerogative of the Fisheries Administrator.

[3] Note that even though the regulation says the Board contains nine members, ten positions are actually named.

PART II

ESTABLISHMENT OF AN ADVISORY COMMITTEE

3. (1) The Fisheries Administrator shall establish an Advisory Committee for the purpose of assisting in the management of the Reserve.

(2) The committee members shall be appointed by the post they hold in their organization.

(3) The committee members shall consist of representatives from the following organizations:

(a) Fisheries Department;
(b) Forest Department;
(c) Coastal Zone Management Authority and Institute;
(d) Placencia BTIA;
(e) Placencia Village Council;
(f) Friends of Nature (now known as Southern Environmental Association or SEA);
(g) Belize Fishermen Cooperative Association;
(h) Northern Fishermen Cooperative;
(i) Monkey River Fishermen; and
(j) Placencia Tour Guide Association.

No reference in the Fisheries legislation can be found to the establishment of a **Belize National Fisheries Advisory Board (FAB)**. In reference to the FAB its existence and operation has been described by one Fisheries Department staffer as an "administrative tradition". This means that it has no legal status, and its terms of reference need to be established every time a new Board is appointed

In 2009 a new twelve-member Fisheries Advisory Board was appointed by the Minister of Agriculture, Fisheries & Co-operatives for the period 2009-2011, and its functions, terms of reference, duties and responsibilities were outlined. The document of appointment is attached to this report as Annex 1.

SUPPORTING INSTITUTIONAL ARRANGEMENTS

The words of Vincent Gillett, former Chief Fisheries Officer of Belize, must be recalled: "*while the concept of participation has been embraced by legislation, its practice lags far behind*" (See Annex I). Although half of the licensed fishers are not members of a co-operative, there is no mechanism for them to participate in fisheries management. Although in recent years a number of fishers' organizations have emerged to represent the interests of fisher folk, they have not been incorporated into the fisheries advisory mechanism.

There is room for improvement in the provision of institutional support for fishers, fisher organizations, fishing communities and other stakeholders to participate in the management of fishery resources.

2.3 National Programmes to promote the Involvement of Fishers, Fisher Organizations, Fishing Communities and other Stakeholders in the Management of Fishery Resources

As mentioned above, there is an "administrative tradition" for the appointment of a Belize Fisheries Advisory Board to advise the Minister responsible for fisheries (See Annex II). The Fishing Cooperatives are adequately represented; however there is no definitive mechanism to assure or encourage the representation of 'Independent Fishers' on the FAB. In terms of the Marine Reserves, the situation is different; there are provisions for the participation of fishers and other stakeholders in the management of these reserves. In general there are three (3) Marine Reserves that have definitive co-management arrangements with the NGO Community. There are five (5) Marine Reserves that are directly managed by Fisheries Department; however even in this case there are Marine Reserve Specific Legislation to assure the participation of fishers and other stakeholders on the Management Committee of these institutions. In principle the Fisheries Department model of co-management for Marine Protected Areas (MPAs) makes provision for broad stakeholder participation, including the general the public in the management of the Marine Reserves.

2.4 Effectiveness of National- and Community-Level Participatory Approaches to Fisheries Management

Although much has been put in place to effect community participation in the management of the natural resources on which their livelihood depends, given the dynamic nature of the changes taking place with governance at various levels and the changing status of the resources themselves there remains the scope for the strengthening of community participation and in effect the de-centralization of management. There is thus the scope for deeper initiatives to be undertaken under the Management Plan being developed.

Baseline workshops were held with government staff and the community. The results are presented in the Chapter 6 of this report.

CHAPTER 3: PELAGIC FISH RESOURCE MANAGEMENT AND DEVELOPMENT COMPONENT

3.1 Policy, Supporting Legislation, and Fishery Development and Management Plans

There is no current **National Fisheries Policy** for Belize although one is reportedly being developed. The existing Fisheries Laws are the most pertinent reflection of Fisheries Policy.

On a related note, there are also no **Fishery Development Plans** or **Fishery Management Plans** for the pelagic fisheries of Belize. Possibly through this project, Belize could develop these important management tools.

The **Fisheries Act** (Chapter 210, Laws of Belize) last revised in 2000 is the major piece of legislation that addresses the operation and management of fisheries and related fishing activities in Belize. The main goal of this revision was to set a framework for regulating the exploitation of fisheries resources, and to generally provide provisions for:

(1) Creating and enforcing fishing regulations;
(2) Licensing fishing activities;
(3) Regulating the processing of fishing products;
(4) Regulating the exportation of fishing products;
(5) Regulation scientific/research operations;
(6) Delineating marine protected reserves within fishing limits of Belize.

The 2000 revision gave the "Minister of Agriculture and Fisheries" authority to appoint public officers for the purpose of carrying into effect the provisions of the Act or any regulations.

In 2003 the Minister of Agriculture and Fisheries passed several "Orders" that concerned mostly the appointment of fisheries officers, the regulation of fisheries and exportation of shellfish products (particularly spiny lobsters known as crawfish), and the regulation of marines reserves in Belizean coastal waters.

Fisheries Policy

Although there is a definitive fishery for coastal pelagics as inferred above, Belize does not have any stated policy that would speak to the management of this resource. Although there are management tools related to the protection of pelagics such as mesh size regulations for set nets and the prohibition of certain areas where nets cannot be set, the Fisheries Regulations are not specific enough to segregate these stocks that would need special interventions. Thus the regulations stop well short of much of the measures that would need to be put in place to protect and conserve the pelagic stocks. The situation is similar for the demersal finfish stocks.

The Fisheries Regulations are much more detailed and elaborate when it comes to conch and lobster stocks. These are the mainstay of the Belizean Fishing Industry. The Table below summarizes the management interventions that are in place to regulate the lobster and conch fishery.

Species	Policy strategy	Enforcement
Caribbean Spiny Lobster	Size limit	Tail weight > 4 Oz
		Cape length > 3 "
	No Take	Shoft shelled, Berried
	Closure	15 Feb - 14 June
Conch	Size limit	Weight > 3 Oz
		Shell length > 7 "
	No take	
	Closure	Jul 1 - Sep 30
All	Prohibition of scuba diving	Yes

3.2 Fishery Development Status regarding stated Policy Goals and Development and Management Objectives

There is the need to develop a planned approach to the management of the Fisheries Sector. This would entail the definition of a strategy for the industry that includes articulation of goals and objectives, and enabling activities including projects and recurrent programmes. This could be a candidate for a pilot project under this JICA/CRFM project.

3.3 Fishery and Market Characteristics

FISHERIES CHARACTERISTICS

Exploited Species

Table 4 summarizes the exploitation and the management status of coastal pelagic fisheries in Belize. Belizean fishing activity is mostly directed towards the exploitation of demersal reef species, especially lobster (*Panulirus spp.*) and conch (*Strombus gigas*). These species are predominant in the landings, processing and marketing of marine commercial products in Belize.

In regard to pelagic species such as wahoo, king mackerel, blackfin tunas, and Jacks, opportunities are created in both the recreational and commercial fishery. There is no reliable information on the status of these stocks in Belizean waters. Table 4 gives a brief synopsis of the relevance of these species in to both the recreational and commercial fishery.

Table 4: Status of the Coastal Pelagic Fisheries of Belize						
	Stock Status		Fishery Status			
Species	Type of exploitation	Over-exploitated	Developed	Sustainable	Monitored	Managed
Wahoo (*Acanthocybium solandri*)	Recreational	No		Yes	Yes	
Dolphin fish (*Coryphaena hippurus*)	N	?				
Black fin tuna (*Thunnus atlanticus*)	Recreational	?			Yes	
King mackerel (*Scomberomus cavalla*)	Recreational	No			Yes	
Jack Mackerel (*Trachurus spp.*)	N	?				
Flying fish (*Hirundicthys spp.*)	N	?				
Sardines (*Sadinella aurita*)	N	?				
Scaled Herring (*Harengula Jaguana*)	N	?				
Atlantic thread herring (*Opisthonema oglinum*)	N	?				
Jack (*Selar spp.*)	Recreational	?			Yes	
Robin (*Decapterus spp.*)	N	?				
Diamond back squid (*Thysanoteuthis rhombus*)*	N	?				
Conch (*Eustrombus gigas*)*	Artisanal/commercial	Near	Fully	Endangered		Yes
Caribbean spiny lobster (*Panulirus argus)**	Artisanal/commercial	Near	Fully	Uncertain		Yes
Spotted spiny lobster (*Panulirus guttatus*)*	N					

Notes:

**: These species are pelagic species but information is required on their status*

?: No data are available to evaluate the level of exploitation of these species in this fishery

N: Species are not exploited in the fishery or no catch records are available

It is noteworthy to mention that the catch of these species beyond national jurisdictional seas are monitored by the International Commission for the Conservation of Atlantic Tunas (ICCAT).

There is also a general lack of information on the status of the demersal stocks such as snappers and groupers within the jurisdictional seas of Belize.

MARKET CHARACTERISTICS

Spiny lobsters

Spiny lobsters constitute the most important commercial fishery in Belize. Much of the harvests destined for export are undertaken by the five (5) Fishing Cooperatives currently in existence. These cooperatives are National, Northern, Placencia, Rio Grande, and Caribeña Fishing Cooperatives. The bulk of the lobster production is processed by the two (2) larger cooperative, National and Northern Fishermen Cooperative. Exported lobster tails are destined almost exclusively to the United States market.

In 2008 the lobster fishery yielded 470,485 pounds of lobster tails, which represented an increase of 1.8% relative to the 2007 lobster season. In spite of the increase in production in 2008 the Cooperatives experienced a substantial loss in revenues (See Table 5). This was mainly attributable the decline in the selling price of lobster tails on the export market which decreased from $18.00 per pound in 2007 to $13.00 per pound in 2008. (Cooperative Department Annual Report 2009).

Conch

The Queen Conch fishery is the second most important in Belize. Total clean meat production of conch increased from 563,621 lbs in 2007 to 614,029 lbs in 2008. The demand for conch meats remains high in the international market, resulting in an overall increase in earnings of

$1,322,535 for producers. The annual production figures for conch have showed a steady increase from 2007-2009.

A 2008 stock assessment estimated an average density of 88.3 conch/ha in fishing areas. This density level is statistically similar to the minimum density (88 conch/ha) required by the Convention International for Endangered Species (CITES).

3.4 Current Levels of Catch and Effort by Species

Effort Data

The number of fishers and boats in a fishery may be used as an indicator of fishing effort. Table 2 above presents the number of fishers' licenses and boat licenses granted in Belize from 1999 to 2008. These data are aggregated, thus represent total annual effort in the fishery for all gear and all shellfish and finfish species (pelagic and demersal).

Catch Data

However, data on cooperative production of lobsters and conchs were provided, with time series starting in 1977 for conch and in 1990 for lobster. Over the last decade, production of lobster tail has decreased by about 22.8%, moving from 609,523 lbs to 470,485 lbs (Table 5). In contrast conch production has consistently increased over the last decade, yielding 613,867 lbs in 2008, which nearly doubles the 1999 landings.

Table 5:
Total Production of Lobster and Conch, Belize Cooperatives, 1999-2008

Year	Lobster tail (Lbs)	Lobster head meat(Lbs)	Conch meat (Lbs)*	Conch filet (Lbs)*
1999	609,523.00	47,968.00	309,376.70	
2000	555,254.00	50,637.00	513,469.00	
2001	432,884.00	45,150.00	579,561.00	
2002	587871.5	46,553.50	412,542.00	
2003	547,180.00	50,462.50	487,416.50	33,719.50
2004	561,148.00	51,289.00	604,178.50	14,213.00
2005	491,615.50	45,184.50	602,491.00	26,980.00
2006	419,863.00	37,835.00	559,501.50	117,170.50
2007	462,152.30	41,294.00	480,153.50	83,468.00
2008	470,485.00	40,903.50	613,867.00	162.00

Conch meat and Fillet ***Source: Villanueva (2009)***

The Contribution of Fisheries to the Belize Economy

The fisheries sector makes a significant annual contribution to the economy of Belize (See Table 1 above). Furthermore, compared to other Caribbean countries Belize is well positioned in the regional and international marketplace by enjoying for example:

- Duty free access for all exports to the United States, as a member of the Caribbean Basin Initiative (CBI).
- Duty free access for all exports to Canada, as a member of the CARIBCAN initiative.

Whereas the value of conch exports generally increased over the last decade, the opposite may be said for the value of lobster exports (See Table 6).

Table 6. Exports (Belize dollars) of Lobster & Conch Products 1999-2008		
Year	**Lobster ($)**	**Conch ($)**
1999	16,251,379.45	2,354,824.93
2000	18,764,630.00	4,858,240.00
2001	12,973,160.00	4,646,579.73
2002	13,574,326.95	2,846,539.87
2003	13,593,211.29	4,137,651.93
2004	15,142,367.00	5,199,912.00
2005	13,937,350.00	7,751,085.00
2006	14,741,890.00	6,734,875.00
2007	17,232,000.00	5,171,100.00
2008	13,994,015.00	6,493,635.00

Gear and fishing equipment

The lobster and conch fisheries are fully exploited, thus there is no need to improve gear and fishing equipment. However, there is need to develop new fishing methods and technology for the potential exploitation of non-traditional fisheries resources in Belize.

The 2003 Fisheries Policy defined several relevant strategic management objectives,

- Reduce effort on traditional fisheries resources, such as conch and lobsters;
- Increase fish production through development of non-traditional fisheries resources;
- Maximize return through improved efficiency of fishing methods;
- Identification of local and internal markets for alternative fisheries resources;
- Increase emphasis on research by seeking more technical assistance, developing joint ventures and collaborative scientific work with other countries;
- Strengthen regional collaboration in the management of regional resources.

Technical Assistance and Funding

The following recommendations for pilot projects are hereby made:

1. ***Fish Aggregating Devices:***
   Need: to implement a pilot project in Belize on fish aggregating devices (FADs) toward the development of a small scale coastal pelagic fishery.
   Rationale: the exploitation of lobster, conch and other reef fishes are near saturation levels in term of effort and biomass produced.
2. ***Developing a Research Program:***
   Objective: To enhance knowledge on non-traditional fisheries resources (NTFR), such as offshore pelagic and deep sea demersal stocks.
   Problem: There is a shortage of information on possible target species.
3. ***Developing an Extension Program:***
   Objective: Educate fishers on the importance of developing NTFR;
   Problem: There is general reluctance of fishermen to venture into the exploitation of new fishing areas and fisheries products.
4. ***Creating Credit programs:***
   Objective: provide support to fishers toward exploiting NTFR.

Problem: In general there is a lack of credit for the harvest of NTFR in Belize.

CHAPTER 4: AQUACULTURE DEVELOPMENT COMPONENT

Introduction

Aquaculture began in Belize in the early 1980s with modest commercial experimentation in shrimp mariculture. The industry has developed rapidly since that time and has become a significant contributor to the Belizean economy in terms of foreign exchange earnings, income generation, employment, nutrition, and food security. The industry, which is still almost exclusively based on large-scale industrial-oriented shrimp farming, has, to date, developed largely on a *laissez faire* basis, with limited regulatory interventions by the Government of Belize (GOB).

4.1 Policy, Supporting Legislation, Development Plans

Policy and Supporting Legislation

There is no formal policy specific to the development of aquaculture in Belize. There have been various initiatives over the past decade undertaken by the Fisheries Department (FD) that was structured to guide the sustainable development of the industry.

The policy responses have dealt with: disease management, aquatic pollution, the movement of exotic species, education and training, diversification of the shrimp farming industry, and the integration of small- and medium-scale producers in shrimp farming, tilapia farming and other aspects of aquaculture.

Below is an attempt to chronicle the policy, development and legislative process over the past 9 years. It is evident that sector self-interest and rapidly changing dynamics in the global arena have hindered the process thus far.

1. In 2000, the **Aquaculture and Inland Fisheries Unit** (AQUIF) of the FD drafted a 'policy paper' focused mainly on the strengthening of the shrimp farming industry. This initiative emerged as a result of the various constraints on the sector which ranged from pathogenic diseases, decrease in global market prices and other husbandry related issues. This effort however, did not go beyond the administrative reach of the FD.
2. In 2002, the FD in coordination with the Coastal Zone Management Authority contracted Tunich Nah Consultants to develop a **National Aquaculture Policy**. After consultation with key stakeholders the final draft was submitted in 2003. This document was further submitted to the Central Administration of the Ministry of Agriculture, Fisheries & Cooperatives (MAFC) for Cabinet support. However, this document was not endorsed by Cabinet due to uncertain reasons.
3. In 2003, the **Shrimp Growers' Association** submitted a draft **Shrimp Farming Bill** (SFB) to Cabinet for its consideration. In response, the FD advised the GOB that the draft Bill was not consistent with its development policies; it had proposed self-regulation and tax-exemption for the shrimp farming sector. The drafting of the SFB in 2003 was done without any stakeholder consultation other than the Shrimp Grower's Association.
4. In early 2004, under a directive from the Minister of Agriculture, Fisheries & Cooperatives the FD developed a more comprehensive bill – the draft **'Aquaculture Act**

and Regulations'. This effort was assisted by a technical team comprising representatives from the Belize Agricultural Health Authority (BAHA), the Department of Agriculture and the Department of the Environment. Both the Policy document and the draft 'Aquaculture Act & Regulations' were submitted to the Administrative Head of the MAFC on various occasions for political endorsement and onward transmission to the Solicitor General's Office.

5. In 2006, the Draft **Shrimp Farming Bill** proposed by the Shrimp Growers' Association was once again submitted by the Shrimp Growers to the Ministry of Foreign Trade for Cabinet approval, this time it was titled '**Aquaculture Development Act**'. This 'Aquaculture Development Act' was gazetted on June 5, 2007 as No. 4 of 2007. However, the Act has not been implemented as the commencement order was not enacted. Subsequently there has been a change of government.
6. In 2006-2007 the FD engaged in developing a '**National Aquaculture Export Strategy**' which was complemented by a **National Aquaculture Strategy Implementation Plan**. This was part of a series of national sector strategies spearheaded by the Belize Trade & Investment Development agency (BELTRAIDE). The export strategy which identifies priority sectors is still awaiting endorsement by Cabinet. BELTRAIDE is currently engaged in making the necessary follow-ups with the relevant Ministries.
7. The MAFC '**National Food & Agriculture Policy 2002-2020**' outlined the three main areas: Agriculture, Fisheries and the Cooperative sub-sectors. Most recently, the MAFC has contracted a consultant to develop a '**Medium Term Plan 2009-2014**' for key sectors. 'Tilapia Production' is one of the six priority areas identified in the draft report. The report is complemented by sector work plans and indicative resources required. Although tilapia farming is just one of the viable species suitable for freshwater aquaculture in Belize, the work plan is specific to tilapia development. The development plan for the entire aquaculture sector would require the intervention by the FD in assisting this process.
8. In 2008 the FD made a submission requesting assistance from the Food and Agriculture Organization (FAO) to hire a consultant to prepare a technical report on the '**Evaluation of the Current Status, Constraints & Potentials of Development of Freshwater Aquaculture in Belize as well as the Assessment of the Potential Local and Export Markets for Farmed Tilapia**'. One of the outputs from this report should be the development of a '**Short-, medium- and long-term National Strategy & Action Plan for the development of freshwater aquaculture in Belize**'. The MAFC and the FD are currently awaiting the submission of the first draft report by the consultant.

Institutional Support for Aquaculture in Belize

Institutions Involved In Aquaculture Development

The commitment of the Government of Belize (GOB) to sustainable aquaculture is witnessed by the level of institutional support and accompanying regulatory framework that exists (See Annex III). These institutions are as follows:

- Fisheries Department (FD)
- The Coastal Zone Management Authority and Institute (CZMA/I)
- The Department of the Environment (DOE)
- The Belize Agricultural Health Authority (BAHA)
- The Lands and Survey Department of the Ministry of Natural Resources.
- The Office of Petroleum and Geology

- The Ministry of Economic Development

There are concerns about the overlap of responsibility and bureaucracy associated with these agencies as it affects the permitting process. A "one-stop shop" is suggested.

4.2 Aquaculture Development Status regarding Stated Policy Goals and Development Objectives

Despite various policy initiatives the shrimp sector is in steady decline.

Considerable interest has been given to the development of small-scale tilapia aquaculture in Belize by the new United Democratic Party (UDP) Administration. This initiative was reflected in the **UDP 2008-2013** Manifesto which highlighted the need to promote investments in aquaculture in order to increase production and exports of seafood as well as to promote the expansion of land-based and caged fish farming.

4.3 Aquaculture and Market Characteristics

Farmed shrimp production in Belize, like most other fisheries commodity produced in the country, is geared for the export market. Ninety five percent (95%) of this commodity by weight is exported; the balance is sold locally.

The three (3) main global markets for marine or sea shrimp are the **U.S. market**, the **Japanese market**, and the **E.U. market**. The United States is currently the sole export market for Belizean farmed shrimp.

Shrimps are exported as tails "peeled & deveined" (PD), "peeled & undeveined" (PUD), "butterfly shrimp", "individually quick frozen" (IQF), "head-on" and "shell-on". Some exports of whole farmed shrimp have also been sent to Mexico in the form of "fresh chilled".

The portfolio of products from **Fresh Catch Belize** includes both "whole eviscerated fresh fish", as well as "fresh frozen fillets". The fillets are destined for the US market, while the eviscerated fish is exported to Mexico and Guatemala. Fresh Catch Belize Ltd is part of the 'Mountain Stream Tilapia Alliance', which is a conglomerate of fish farming companies from Costa Rica, Honduras and Belize exporting under one name brand.

Exports of farm reared cobia were initiated to the US market through a marketing company by the name of AQUA GOLD. The products exported are 'bullet' cuts whereby the head is removed and the fish is gutted. The market for cobia is relatively young; however the quality of the product is highly rated and at present fetches a price of US$11/ Kg.

4.4 Current Levels of Aquaculture Production by Species

Commercial Marine Aquaculture

Shrimp

The species being cultured is the white shrimp (*Penaeus vanamaie)*

- Semi-intensive farming systems with stocking densities of 100 000 Pl's per acre (250 thousand PL's per ha), and realizing yields of 1 800 lbs/Acre/Crop (2 000 Kg/ha/Crop) of shrimp tails. These systems were based on a single extended crop per year lasting up to nine (9) months, with a single initial stocking of seed-stock, followed a series of three (3) or four (4) intermittent harvests punctuated by a final harvest of relatively large shrimps (20-25g);
- Semi-intensive farming systems with lower stocking densities of 49 000 Pl's per Acre (120 thousand PL's per ha), realizing yields of 1 100 lbs/Acre/Crop (1 200 Kg/ha/Crop) of shrimp tails. These systems were based on two (2) crops per year with each cycle lasting four (4) to five (5) months with a single harvest per cycle, with the size range of harvested shrimps being medium to large (15-18g);
- Intensive farming systems with one stocking and one harvest per cycle after four to five months - stocking densities were 240 000 Pl's per Acre (590 thousand PL's per ha) with yields of 4 500 lbs/Acre/Crop (5 000 Kg/ha/Crop) of shrimp tails, and harvested shrimps being in the medium to large size classes (15-18g): The system is also dependent on supplemental or artificial aeration and is structured around 2 crop cycles per year;
- Super-intensive farming systems with one stocking and one harvest per cycle after four to five months - Stocking densities were 500 000 Pl's per acre (1 235 million PL's per ha) with yields of 9 700 lbs/Acre/Crop (10 890 Kg/ha/Crop) of shrimp tails and harvested shrimp being in the medium to large size classes (15-18g), the system is based on re-circulation technology with a diminished demand for water, and little or no immediate effluents: the system also relies heavily on artificial aeration.
- What is evident is that the rapid expansion of the shrimp sector has seen significant/rapid decline in production volumes and area under production. Area under production has fell from approximately 6,788 Acres in 2002 to 2,788 acres in 2008. Hence a corresponding fall off in earnings from approximately US$ 60 million to current figure of US$19.5 million.

Fish

Marine Farms Belize Limited is the only commercial Cobia farming operation established in Belize. The operation is based on marine cage farming using Norwegian Technology. The operations near Robinson Point Cays comprise cage infrastructure ranging from 5 meter circumference nursery cages as well as 40, 60 and 100 meter grow-out cages. The production capacity during the phase I & II of the operations is projected at 2,000 MT per annum. In 2008, cobia whole fish production was 384.4 MT.

Marine Farms has recently established a hatchery operation near Dangriga close to the Melinda Road located at the defunct Tao San shrimp farming operation. The brood-stock in the hatchery has been sourced locally and the first spawns were realized in July 2009. The production capacity of the hatchery is estimated at 1 million fingerlings per annum.

Marine Farms currently employs approximately 35 people full time.

Inland Aquaculture

Apart from shrimp aquaculture, other species have been farmed in the past. These include:

- the Nile Tilapia (*Oreochromis niloticus*),
- the Australian Red Claw Lobster (*Cherax quadricarinatus*),
- the Red Fish (*Sciaenops ocellatus*),

- African ornamental Cichlids.

Except for tilapia the farming of these species has met with some commercial failure.

Commercial

Tilapia is under commercial scale culture at the **Fresh Catch Belize** facility which currently has 300 acres of production ponds in operation with total yield of 1,865 MT in 2008. The operation is vertically integrated with a hatchery and processing plant to complement the pond production systems. Fresh Catch Belize Limited was established in 2002, with the first exports to the US market in mid-2004. This operation is currently being expanded by an additional 100 acres of production ponds. With the expansion, the total production capacity of Fresh Catch Belize Ltd will be 4,000 MT per annum.

A semi-intensive farming system with one nursery and two different grow-out stages are employed and are as follows:

- Nursery Phase: Stocking density of 40 pcs/m^2 with crop cycle of 120 days and harvest weight of 100-120 grams.
- Grow out Phase I: Stocking density of 13 pcs/m^2 with crop cycle of 120 days and harvest weight of 350 grams.
- Grow out Phase II: Stocking density of 4 pcs/m^2 with crop cycle of 120 days and harvest weight of 850 grams.

A 2009 survey on Small Scale Aquaculture indicated a total of 55 farmers engaged in small-scale tilapia farming with a total area of 13.3 acres of production units ranging from 0.01 acres to 0.25 Acres. There are a total of 185,677 tilapia fish stocked in production units. The estimated production for 2009 is 111,000 pounds of whole fish in addition to 75,000 pounds scheduled by mid-2010 from the 2009 crop.

4.5 Knowledge on Aquaculture Issues by Category

Marine Shrimp

Although shrimp aquaculture expanded rapidly, shrimp farming operations experienced significant economic losses in the mid-1990's and early 2000s as a result of pathogenic diseases

In addition to the economic losses as a direct result of pathogenic diseases, there was a decline in the global market prices for farmed shrimp commodities in 2000 for the major market destinations of the USA, Japan and the EU. Since then, prices have not been favorable for producing countries such as Belize. The decline in shrimp prices is directly associated with the larger volumes of farmed shrimp exported by the Asian countries at very low prices.

Given the various challenges in the shrimp farming sector, more than fifty percent of the production area has been taken out of production. In 2005, there were 14 shrimp farming operations with over 6,888 acres in production ponds. Over the last 3 to 4 years, ten (10) shrimp farms have ceased operations. In 2009, there are seven (7) operating farms with a cumulative

production pond area of 2,788 acres. **Export Status of Aquaculture in Belize** reports volumes of farmed shrimp at 2,280 MT valued at BZ$18.51 million in 2009.

This decline in the shrimp farming sector, coupled with other environmental and social issues, has generated greater interest in the sector employing a **systems approach** to ensure sustainability. Some of the important issues to be addressed are as follows:

- Environment
  - Ecological impacts relate to nutrient enrichment, increased BOD and sediment.
  - Product eco - labeling
- Disease problems
- Local feed supply
- Promoting Value added products
- Promoting the development of aquaculture by- products derived from primary processing activities
- Social concerns.
  - These include a lack of participation of small- and medium-scale operators in the production process, as well as a lack of the equitable distribution of land.
  - Other concerns relates to the continued employment of foreign parties in the face of an increasing pool of Belizeans that have been trained to the Baccalaureate and Masters Degree levels, in the various sub-disciplines of aquaculture.
- Economic
  - Maintain EPZ plus create innovative approaches to financing given the low commodities pricing for shrimp on world market

A priority issue here is to address this rapid decline in the sector.

- Possible restructuring /repositioning of the sector focusing on eco-labeling of product could possible result in resurgence in growth.
- Utilization of unused infrastructure by
  - adopting extensive culture
  - alternative species/ poly culture.

Marine Fish

This technology is relatively new and the project is currently at the pilot stage. Models with lower technological requirements which seek to support satellite farming should be explored.

Tilapia

Given the abundance of natural resources and proximity to markets, production models which favor low cost production should be developed.

4.6 Technical Aspects of Small-Scale Aquaculture Operations and Stock Enhancement

Farm visits and stakeholder meetings indicated that the fundamentals of the small scale aquaculture sector were absent, and that the existent efforts were not properly coordinated. As a consequence there were more failures/ problems than successes.

To avoid further *ad hoc* development it was concluded that prior to any further development of small-scale tilapia projects, the following issues need to be addressed:

- Identification of market outlets both locally and in the region;
- Provision of tax incentives for small farmers;
- Improving the Extension Services
- Site selection and Pond construction
- Availability/affordability of feed
- Seed stock supplies at affordable rates
- Low-interest financing for small farmers
- Engage BAHA in the food safety aspects and farm inspections.
- Develop criteria for approving the establishment of new farms.
- Establish formal discussions between the GOB and Fresh Catch Belize Limited on possible assistance for farmers.
- Engage the Biscayne Seed Stock Production Facilities in further research to develop other aquaculture species.
- Identify existing projects with commercial aquaculture potentials and ensure that these projects are sustainable on the long-term.

A detailed small scale aquaculture sector situational analysis and problem tree is attached in ANNEX #2 at the end of this paper.

4.7 Technical and Research Capabilities of Fisheries

Current staffing at the Fisheries Department is presented in Fig. 2 above and indicates that a properly structured and dedicated Aquaculture Unit exists.

The focus of the Unit entails policy, planning, extension and advisory support.

Human resources and physical facilities to support industry Research and Development are lacking and weak. It needs to be borne in mind that some industry trials take place under commercial farming situations. Current sector development plans call for the incorporation of aquaculture training within the curricula of Technical, Vocational and Tertiary institutions.

Despite previously high levels of investment in shrimp farming, there is the scope for the development of human capital within the industry, particularly at the mid, and upper management aspects of the industry.

If the aquaculture industry is to be developed along a successful sustainable path, a clear policy, and legislative and institutional framework needs to be developed.

CHAPTER 5: REGIONAL FISHERIES DATA BASE DEVELOPMENT COMPONENT

5.1 Policy and Data Management Documents

There is no current Fisheries Policy document guiding the operations of the Belize Fisheries Department (FD). The **Fisheries Development, Policy and Management in Belize** issued in 2003 recognize the importance of accurate fisheries data to support fisheries management:

> *"On a functional level, the issue of policy development and implementation are segregated into a number of specific areas that are as follows: …*
>
> *15) Collection of data and the management of information to support planning and decision-making for producers;"*

Under the heading "***Managing the fisheries resources in a sustainable manner***", the 2003 policy also outlines various information-related strategies to support the management of fisheries in Belize. These are:

> *"i. Development of a data collection programme to collect data relevant to the management of the resources.*
>
> *ii. Constant evaluation of the status of fisheries resources in Belize through frequent analysis of the data collected.*
>
> *ii. Management recommendations to the Minister based on the information collected and analyzed, including such things as closure of sensitive areas, quotas, limited entry fishing for selected species such as lobster, licenses for recreational fishing, bag limits for recreational fishing and size limits.*
>
> *iv. Development of a list of priority areas for research to provide additional information on the status of the fisheries resources and the means by which the research can be done.*
>
> *v. Identification of the resources required to undertake all the various activities associated with management of the sector, and the mobilization of those resources through various means."*

Among the challenges facing the capture fisheries sector, the 2003 policy cites the following: *"There is no consistent data collection and stock assessment that is being done to accurately determine population levels and possible future yields."*

With respect to management of marine protected areas (MPAs), the 2003 policy also makes reference to the importance of quality data to guide decisions and activities of MPA staff, fishers and other agencies in the capture fishery. However, it concedes that the Data Collection Unit should be restructured to meet the required interfaces and satisfy the needs of all the players in the management of the MPAs.

The 2003 fisheries policy document covers the basic elements of fisheries data management; however, there are many important gaps, such as the types of fisheries data to be collected. What is required is a complementary **Policy on Fisheries Data Management in Belize**, with clearly articulated guidelines and procedures, with designs of the data collection sheets which will be archived. The formulation of this complementary Policy would address the linkages between the goals and objectives of the Fisheries Policy of Belize, and ensure that the data collection and management mechanism is aligned to measure and guide the performance of the Fisheries Management Plan.

An adequate starting point for this complementary Data Management Policy is a 2008 document produced by the Data Collection Unit of the Capture Fisheries Department entitled "*Improving the Data Collection and Management of Marine Fisheries Data of Belize*" written by Ramon Carcamo Jr., Marsha Vargas and Kenneth Esquivel. It outlines the desired mechanism and guidelines for data collection, types of data to be collected, data management, data validation and data storage. There is also a draft budget for the effective implementation of the Data Management Programme and appended field collection data sheets. This document, however does not address data from recreational fishing, a useful aspect of fisheries data, especially in supplementing data for pelagic fisheries stock assessments.

The mechanism entailed in the document for Data Management (Carcamo et al. 2008) is adequate, and it is important to note that the driver of the process is the Administrator, who also ensures Quality Assurance by validating the data.

5.2 Data Collection – Current Situation

The outputs of the Fisheries Department Data Collection Programme are significantly lower than the expected level outlined in the projected Data Management Programme for the Department (See Table 7). Of the nine (9) major fish landing areas in Belize, data is only routinely collected for Belize City and Punta Gorda. Of the three (3) landing sites in Belize City, data is primarily collected from one (1) – the Fishing Cooperatives. The other two sites are not sampled because of security concerns (Yarborough and Vernon Street Landing Sites) and insufficient landing activity (Barrack Road). In Punta Gorda, the catch and effort data is collected by the Fisheries Extension Office and sent to the Data Manager in Belize City for data entry. Staff attrition in the 1990s also contributed to gaps in the collection of data.

The major reason cited for irregular and incomplete data collection is "lack of human resources" as well as "insufficient financial resources" to conduct trips to the landing sites. Transportation is the most significant limiting factor. There is currently one dedicated data collector in the Capture Fisheries Unit, while the other three (3) officers assist as part of their work effort. It was stated that diversion of efforts to other projects has impacted the data collection programme and reduced their effectiveness to collect all the data that is required.

The date range of the available data is summarized in Table 7 below **Table 7: Range of Datasets currently available**

Data	Date Range
Catch per Unit Effort (CPUE)	2002-present
Production Figures	1977-present
Export data	1948-present
Lobster biological data - Field data *in situ* - 200 datasets for Area 5/month - Other reserves *in situ, 200* datasets/month/reserve (8 reserves)	2004-present
Conch biological data	2004-present
Fish Landing Data	2006-present
Fish Biological Data	1996-current
Mutton Snapper Data	1998-2008
Restaurant Data	2006-current
Shark Data	2008-current

The catch and effort data that is collected focuses on artisanal fishing and some semi-industrial (mainly shrimp) harvesting. Data from recreational fisheries is not adequately captured as there is no programme in place.

With respect to data on the fishers, data is collected from approximately 80% of the fishers, while the other 20% are independent fishers. Social data from the fishers does not receive adequate treatment, and this was attributed to the length of time to collect this data during the licensing process.

There is no separation of the catch and effort data with respect to gear types. It is assumed that the main gear type was used to catch the total fish product.

5.3 Data Management – Current Situation

CARIFIS was adopted by Belize in 2004 and was intended to replace the Trip Interview Programme (TIP) database. However, data is currently for the most part, stored in spreadsheets created in Microsoft Excel®. Only information from the fishers taken during the registration and licensing process is entered and stored in CARIFIS. The data officers cited problems with the software as the main limiting factor for the full implementation of CARIFIS.

The data is stored on two (2) desktop computers in the Capture Fisheries Unit, and it was reported that the data is duplicated in the server at the department. There are also some hard data sheets stored within the unit as well. However, there is no off-site back-up system, and therefore there are no data safeguards in the event of damage to the offices or computer systems.

Each year, since 2004, the CRFM has held a Scientific Meeting where all participating countries take data collected and have analyses such as stock assessments done. This collaboration is important and has shown real progress over the years. It is also a useful way to share resources in a coordinated manner to allow member states with limited in-country capacity to analyze data. Belize has participated in these meetings. Currently, the officer who conducts the stock assessments is off on study leave, and this now creates in a gap in the Data Management Unit, especially with respect to analyses of the data collected.

Other treatments conducted on the data include recruitment estimates, population dynamics, quota calculations and CPUE relationships.

5.4 Information Dissemination

Since 2000, an Annual Fisheries Statistical Report has been published, which provides information about annual trends in production and export of commercial species (Carcamo et al. 2008).

Information is also disseminated in the form of a quarterly newsletter "*Catch of the Quarter*", but this is more about updates on Fisheries in Belize, rather than empirical information based on fisheries data.

Agencies such as the CRFM, FAO, ICCAT, the Statistical Institute of Belize, the Central Bank of Belize and the Fishermen Cooperatives request and are provided with information from the data gathered. However, it was reported that there should be more consultations with the Fishermen's Cooperatives in order to report findings from the data, and to lead to a dynamic and participatory approach to the management of the fisheries.

5.5 Past Projects in Fisheries Data Management

Starting in 1992 the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) funded a programme to collect data on numerous target marine species in Belize.

This programme led to the **Licensing Registration System** (LRS) and the **Trip Interview Programme** (TIP). The TIP was modified to specifically suit the needs of Belize. Two (2) years afterwards, the Belize Fisheries Department embarked on a frame survey to gather information from several landing sites in Belize.

On several occasions, the officers reported that there were major software problems. They complained of major data backlogs and issues of lost data. Therefore, they resorted to using Microsoft Excel® spreadsheets to input and store data.

In 2000 the Fisheries Department embarked on resurrecting the data collection system; sporadic data was collected from the few landing sites that could be accessed with the Departments financial resources (Carcamo et al 2008). The **Caribbean Fisheries Information System** (CARIFIS) database and application program was developed in 2003 to help manage fisheries data in the Caribbean region and to replace the Trip Interview Program (TIP) database.

In 2004 the CARIFIS database was adopted and implemented at the Belize Fisheries Department. However, in the initial phase the database software also began to have problems in the vessels and fishers registration procedures. Presently, many of the problems have been addressed, but nothing has been done to incorporate catch and effort data. Nevertheless, the Department has been actively collecting catch/effort and some biological data for some of the commercial species. The data collected is digitized in an Excel spreadsheet and hard copies are stored in filing cabinet (Carcamo et al 2008).

The CRFM has been conducting on-going training sessions with the Belize Data Officers in an effort to have the FD using CARIFIS consistently. However, there is some reluctance to fully adopt the system, and use of CARIFS is presently limited to Fisher Registration. The use of Microsoft Excel® hinders the integration of the various databases of the member states and the development and implementation of a regional Fisheries Information System.

5.6 Gaps in the Capacity for Management of Fisheries Information Systems

1. Human Resources

The number of staff members in the Belize Fisheries department is significantly smaller than what is required to effectively collect and manage national fisheries data. The geography of Belize also adds another dimension to the difficulty in collecting data efficiently. The Table below summaries the current situation and recommends the optimal staff complements. There is the need to reshuffle the specific roles and responsibilities of the current staff:

Table 8: Recommended staff requirement for data collection

Position	Current Staff Complement	Recommended Staff Complement	Gap	Training Required**
Data Manager-Administrator	1	1	0	Yes
Data Collectors*	2	8	6	Yes
Data Input Clerks	0	3	3	Yes
Fisheries Statistician	1	2	1	Yes
Total	**4**	**14**	**10**	

** some of these data collectors can be based at selected field locations based on logistics and level of fishing at the sites to ensure efficiency.*
***Training is required also in CARIFIS and it is necessary for this training to be conducted in-house with real data after gaps in the computer infrastructure are dealt with (as outlined below).*

2. Equipment

There is a lack of necessary equipment to effectively input, store and manage the fisheries data. Though some equipment is available for use, these are not dedicated to the Fisheries Information System; this has implications for the safety of data as well as access to the data. The system requires at a minimum:

- One (1) dedicated Server for the Unit
- Three (3) Desktop Workstations for data input
- Two (2) Desktop Workstations for validation of data, summary statistics, and data assimilation
- One (1) field-hardy laptop
- One (1) UPS dedicated for the FIS
- One (1) external hard drive (desktop)
- One (1) external hard drive (portable) that can be kept off-site.
-

3 Other Resources

One of the major factors cited for inconsistent collection of high quality data is the lack of the additional resources listed below:

- Field vehicles dedicated data collection; the data collection system requires on-going and intensive field visits.
- Consistent funding for field trip expenses such as accommodation, boat transportation, meals and other incidentals.

Chapter 6. RESULT OF THE BASELINE WORKSHOP

6.1. Output from Workshop with the Staff of the Fishery Division

Brief Overview of the Workshop

PCM and ID/OS workshops were held on the 15th and 16th of August 2009 regarding capture fisheries and aquaculture respectively in the office of the CRFM in Belize.

Problem Analysis

Since the key issue in Belize is the declining coastal resource, main root causes were broken down and organized by the workshops. One the main reason is loss of habitat caused both by natural and anthropogenic disturbances. Another is unregulated fishing activity. Despite the existence of laws and regulations for resource management, many fishers ignore them. The workshop result shows that this is due to economic hardship and a lack of understanding on the part of those fishers.

As small-scale aquaculture remains at the very initial stages of development, basic issues are addressed in the workshop. From the fisheries departments' perspective, there are both insufficient technical staff and critical aquaculture facilities. From the farmers' standpoint, a less developed market and high input cost emerged as issues to be solved for continued development.

ID/OS Analysis

During the external analysis, many environment-related threats, such as the depleting fishing grounds and over fishing, were addressed. The improvement of relationships among the stakeholders, including the community and NGOs, may be the biggest opportunity for the fisheries department to engage.

During the internal analysis, both the mission and output of the organization were identified as strengths in the workshop. However, there were also many negative cards or weaknesses in the internal framework, especially in the Strategy and R&D of the aquaculture sector.

6.2. Output from the Workshop and Interview with Local Fishers

Brief Overview of the Workshop

Two separate workshops were held at the CRFM meeting room inviting fishers and small-scale farmers nationwide. One with fishers was held on the 21st of September 2009 and the other for aquaculture farmers took place on the 22nd of September 2009.

Summary of the Community

Belize is home to strong fisheries cooperatives which work as a market focal point. They are more centralized rather than community-based organizations. However, some community-based organization has been activated. For example, fishers in Sarteneja have organized a cooperative and conducted a project for alternative livelihoods.

Regarding aquaculture, there are no community organizations. The farmers involved have their main income sources and have been testing aquaculture as an additional income resource.

Present Status of the Local Fishery

According to the workshop with fishers, characteristics of fisheries vary in different parts of Belize. The majority of northern-based fishers conduct diving fishing for lobsters, conch, and coastal fish along the coastline. Fishers from the central region meanwhile, such as Belize City conduct more line and net fishing. Some will venture to the outside reef to catch large pelagic such as dolphin fish. Fishers working in the southern areas tend to mix the above-mentioned fishing methods with tourism activity, such as sports fishing guide work. Despite the different characteristics, their common outlook of the current fishing situation is negative. They have recently faced a declining catch, despite the increasing number of new fishers.

In small-scale aquaculture, most farmers still lack a sufficient profit, mainly due to the less developed market for tilapia. Most are still in the experimental period of evaluating feasibility in terms of economics and technique.

Needs of Local Fishers

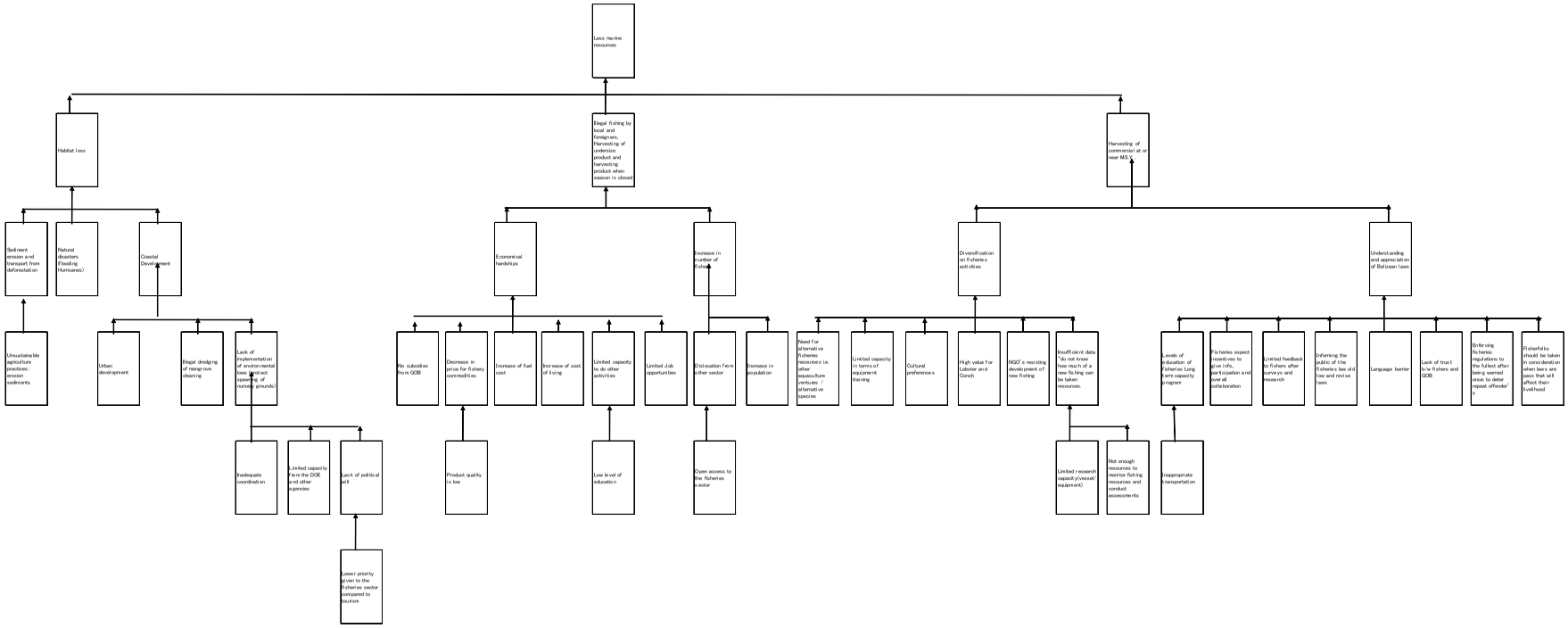
Together with the fisheries department, fishers are also concerned about the declining fish stock given the reductions in their catches. However, many would object to a resource management program which had a negative impact on their income. According to discussions in the workshop, fishers understand the importance of coastal resource management. However, there are those that still feel that CRM limits their fishing grounds and opportunity; hence they spoke of alternative income sources such as developing offshore fishing, increasing livelihood opportunities during offseason, and employment for CRM activity like MPA management.

Aquaculture farmers spoke of technical support as a vital part of small-scale aquaculture development. Difficulty in accessing funding or loans as well as the cost of feed represents obstacles to achieving economic feasibility.

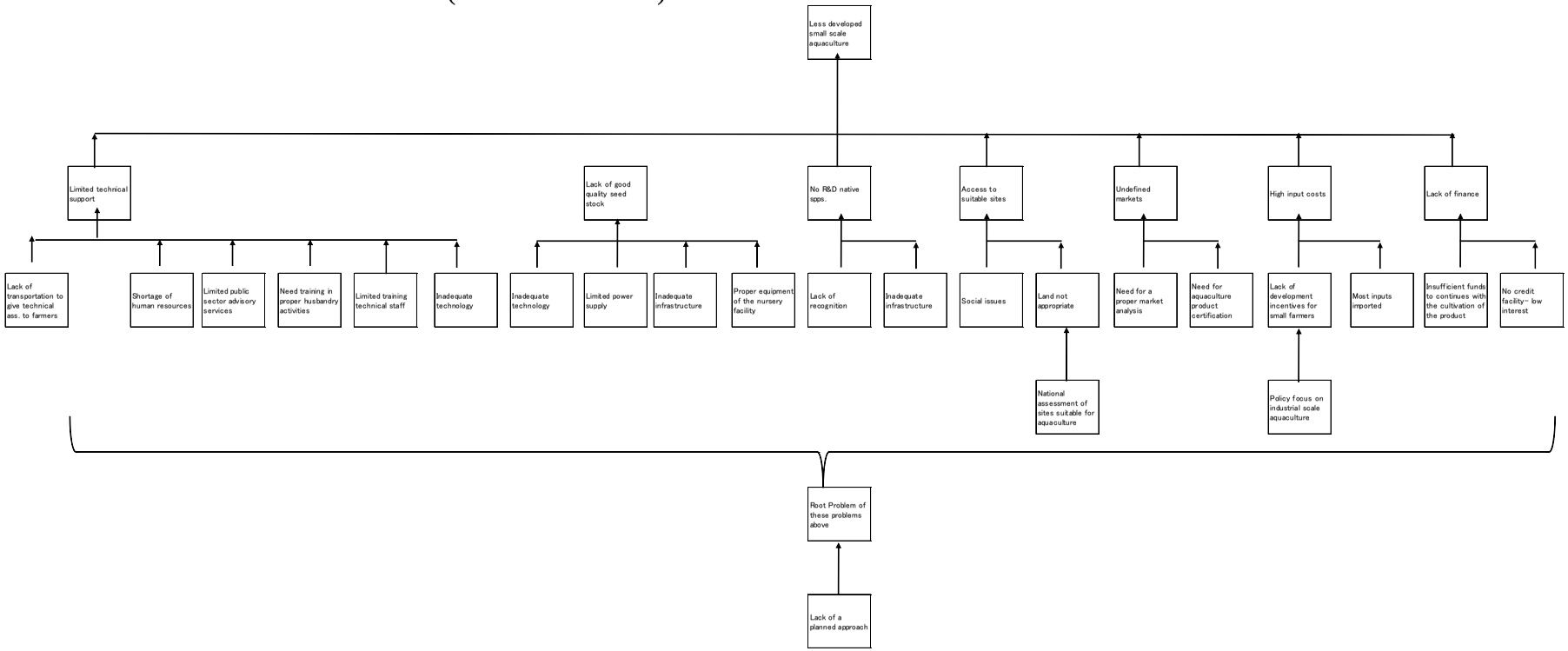
6.3. Key issues identified in coastal resources management during the workshops

Two items have been identified as key issues during the workshop. The first item concern community empowerment for coastal fishers. As shown through workshop results, many fishers are suffering from a declining resource as well as income. Thus it is necessary to create alternative income sources such as tilapia and seaweed culture. In order to enhance their efforts, community organization strengthening is needed. The second item concerns aquaculture technical improvement for the fisheries department. As there is a strong need for technical support to small-scale farmers and officers from the fisheries department to provide it, it is necessary to include training for fisheries officers, experiments for better aquaculture operation, and improvements to the aquaculture facility of the department to improve the base of aquaculture in Belize.

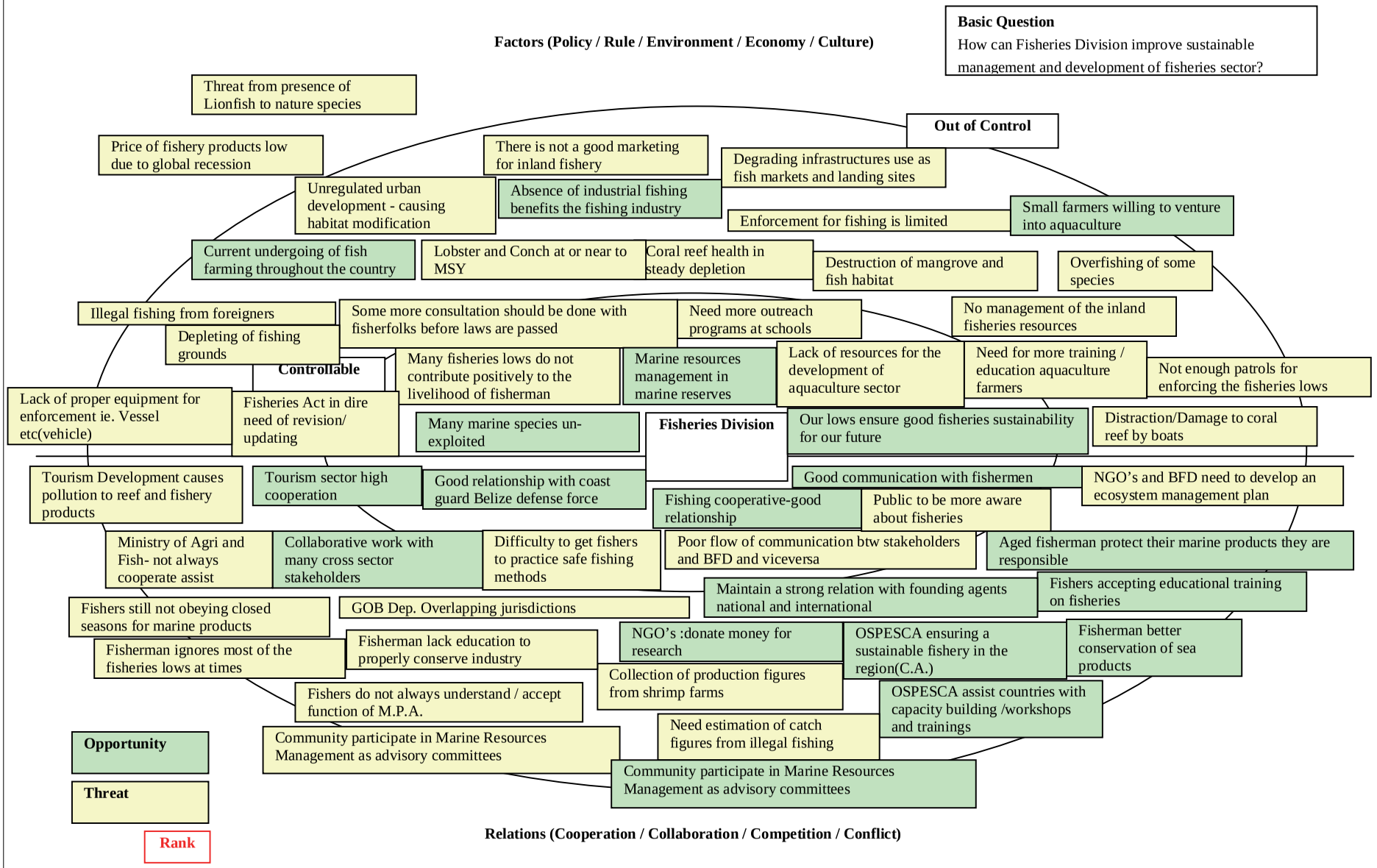
RESULT OF THE PCM WORKSHOP (MARINE FISHERY)



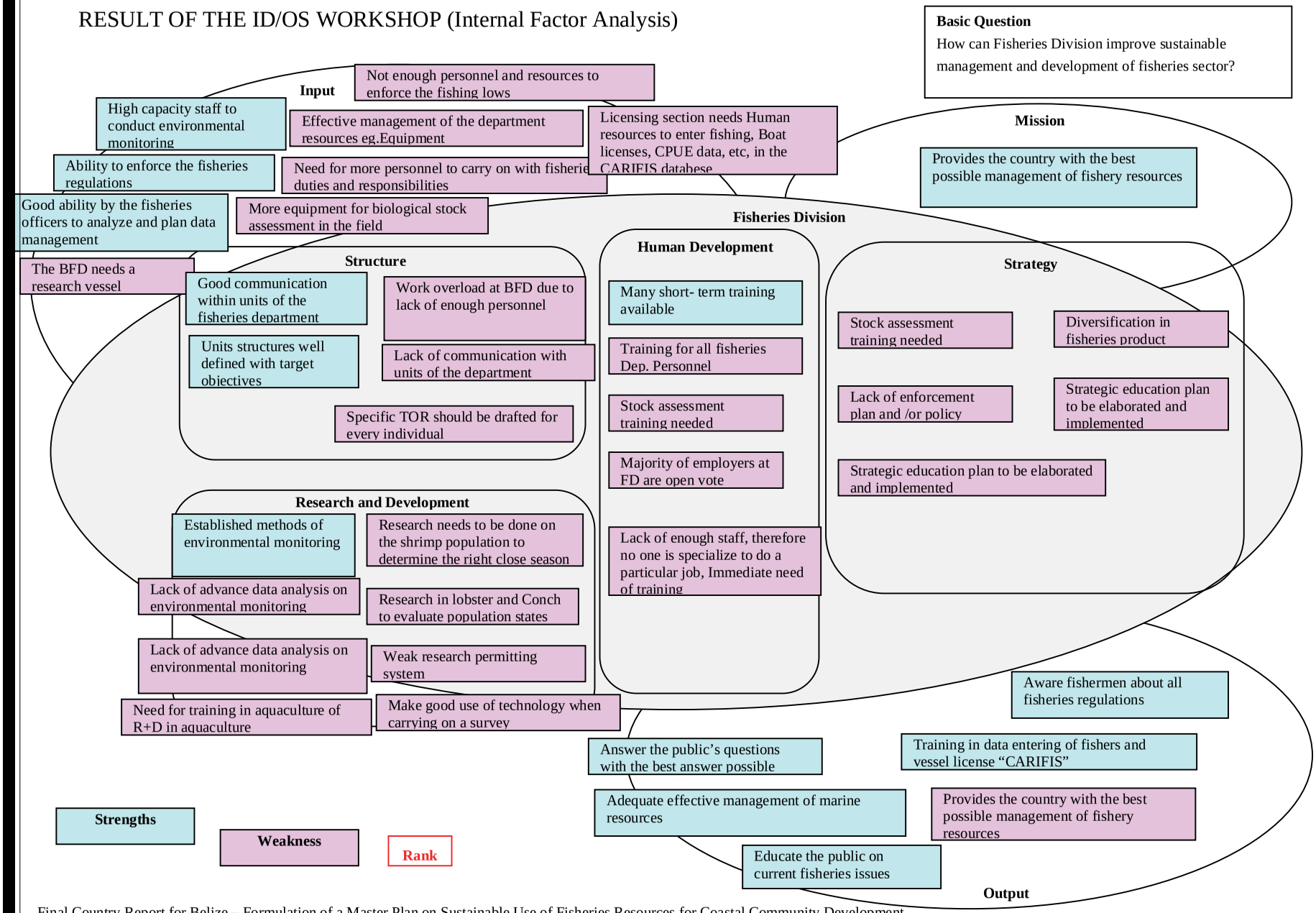
RESULT OF THE PCM WORKSHOP (ACUACULTURE)



RESULT OF THE ID/OS WORKSHOP (External Factor Analysis)



RESULT OF THE ID/OS WORKSHOP (Internal Factor Analysis)



REFERENCES

BELIZE. *Coastal Zone Management Act*. Chapter 329 (1999, Revised Edition 2000).

BELIZE. *Companies Act*. Chapter 250, Revised Edition 2000.

BELIZE. *Fisheries Act*. Chapter 210 (1948, Revised Edition 2000).

BELIZE. *Fisheries Statistical Report 2001*. Belize Fisheries Department. 2002. (unpublished).

BELIZE. *Fisheries Statistical Report 2008*. Belize Fisheries Department. 2009. (unpublished).

BELIZE. **NO FARMER = NO FOOD. The National Food & Agriculture Policy 2002-2020**. Ministry of Agriculture and Fisheries. April 2003.

BELIZE. *Non-Governmental Organizations Act*. Chapter 315, 2000.

BELIZE. *Subsidiary Fisheries Legislation*. Chapter 210, Revised Edition 2003.

BELIZE COASTAL ZONE MANAGEMENT AUTHORITY. **The National Integrated Coastal Zone Management Strategy for Belize.** *date*

BELIZE. *Gross Domestic Product (GDP) 2000-2008.* Belize Department of Statistics. 2009.

BELIZE FISHERIES DEPARTMENT. **Fisheries Development, Policy and Management in Belize.** 2003.

CARCAMO Jr., Ramon. *Belize National Fisheries Report 2007*. In **CRFM Fishery Report – 2007. Volume 1, Suppl. 1 - National Reports**. Report of Third Annual Scientific Meeting – Kingstown, St. Vincent and the Grenadines, 17-26 July 2007. Pp. 14-28.

Cooperative Annual Report 2009. **Belize capture-fishery annual report 2008**. 5p.

CRFM, 2005. *Report of the first annual CRFM scientific meeting*. 22-30 June 2004. Published by the Caribbean Regional Fisheries Mechanism Secretariat, Belize City, Belize. CRFM Fishery Report No. 11. 318p.

ENVIRONMENTAL DEFENCE FUND. *Belize Fisheries Sector*. October 2008.

ESPEUT, Peter. *Fishing for Finfish in Belize and the South Coast of Jamaica: A Socio-Economic Analysis*. Report of a Project funded by the International Centre for Ocean Development, Ottawa, Canada, and executed by the Fisheries Department, Belize, the Fisheries Division, Jamaica and the University of the West Indies, Mona, Jamaica. June 1992.

ESPEUT, Peter. *Managing the Fisheries of Jamaica and Belize: The Argument for a Co-operative Approach*. Paper presented to the Third Annual Conference of the International Association for the Study of Common Property (IASCP), Washington D.C., U.S.A., September 18-20, 1992.

ESPEUT, Peter. *A Socioeconomic Baseline Survey of Thirty Fishing Communities in Twelve CARICOM Countries*. Report of a survey conducted for the Caribbean Natural Resources Institute, (CANARI), Vieux Fort, St. Lucia, W.I., for the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP), Belize City, Belize, C.A., 1994.

GILLET, Vincent. *The Fisheries of Belize.* **Fisheries Centre Research Reports**. Vol. 11 (6). 2003. Pp. 141-147.

ICCAT, 2008. *Report of the standing committee of research and statistics*. Madrid Spain, September 29-October 3, 2008. International Commission for the Conservation of Atlantic Tunas. 2008 SCRS Report, 241p.

MYVETT, G. & R. QUINTANA. *The status of aquaculture in Belize 2001*. 50 p. 2001. (unpublished).

MYVETT, G. & . QUINTANA. *The status of aquaculture in Belize 2002*. 64 p. 2003. (unpublished)

NIGHTENGALE, Jack. *Sapodilla Cayes Marine Reserve: Strategic Management Plan*. MesoAmerican Barrier Reef System Project. August 2004

QUINTANA, R. *National Survey of Small-Scale Aquaculture Development in Belize*. 23 p. 2009. (Unpublished)

VILLANUEVA, J. 2009. **Fisheries Statistical Report 2008**. Belize Fisheries Department, Ministry of Agriculture and Fisheries. Belize City: 2009. 35p.

ANNEX I
Perspective of Vincent Gillett – Former Fisheries Administrator On Fisheries Management in Belize

Vincent Gillet, a former Chief Fisheries Officer of Belize, wrote this in 2003:

"Over the years the management efforts of the Government have not been successful in obtaining sustainable yields of fishery resources, nor to guarantee the health of the ecosystems upon which the fisheries resources depend. The primary legislative tool is the Fisheries Act (1980), which was revised in 1993 and 2000, and focuses on new formulae for fishing licensing and regulation of the aquaculture sector ... However, historically management has largely been top-down and not sufficiently participatory. Indeed, the present management of the Belize fishery which aims to maximize yield, to provide foreign currency, and to provide jobs for the disadvantaged, cannot achieve the tasks of sustainability. The inability of governments to successfully manage marine resources is not unusual … and afflicts governments even when they invest considerable time and energy in fisheries management. Indeed, some of the legislation enacted by Belize reflects advanced thinking on natural resource conservation, but the existence of a legislative framework does not always reflect or guarantee a coordinated view by agencies with responsibility and power, leading to jurisdictional and enforcement problems ... For example, while the concept of participation has been embraced by legislation, its practice lags far behind. Several problems exist:

San Pedro on Ambergris Caye

Firstly, although regulated by the Fisheries Act through prescribed closed seasons, size limits, closed areas, etc., the fisheries are largely open access. Anyone who wishes to do so can buy a license; thus licensing is not used as an effort-control mechanism ... Secondly, there is a lack of good analytical information which can be meaningfully accepted and adopted. Thirdly, there is a deliberate policy to diversify the industry, targeting new species for which little or no biological information exists. Fourthly, there is the perceived threat of declining environmental health …"[4].

Part of the Placencia coastline.

"The need to rationalize government management of its fisheries and coastal resources has been met by some innovative inputs, particularly by the cooperatives and the conservation NGO communities, often in innovative partnerships. This latter group has been remarkable in the extent to which it has taken on the responsibility of funding and managing activities in the conservation sector. This has led to a *de facto* acceptance, by the Government of Belize, of governance arrangements wherein power is shared between stakeholders. These efforts have led to the acceptance by government of the concept of establishing protected areas to sustain the country's biological diversity and, by extension, its economic viability"[5].

[4] Gillet (2003) pages 144-145.
[5] Gillet (2003) page 145.

ANNEX II

Fisheries Advisory Board (FAB)
Structure and Function
for period 2009-2011

1. Structure and Function

The new FAB consists of the following 12 members. The Fisheries Administrator or her nominee will be an Ex-Oficio member and will act as Secretary to the FAB.

New FAB:

No.	Background	Organization	Comments
1	Legal	Solicitor General Office	
1	Economic/Policy	National Development Ministry	
1	Sport Fishing	National Sport Fishermen Association	
1	Cooperative legislation	Cooperatives Department	
1	Business	Belize Chamber of Commerce	
1	Fisheries Management	Belize Fisheries Department	Ex- Oficio member
1	Conservation Community	Association of Protected Areas Management Organization	
5	Cooperative Management	National Fishermen Producers Coop.	
		Northern Fishermen Coop.	
		Placencia Fishermen Coop.	
		Caribeña Fishermen Coop.	
		Rio Grande Fishermen Coop.	

The FAB consists of twelve members, five of which will represent the fishing cooperatives. The Fisheries Administrator will act as Secretary to the Board. Members of the FAB will serve for a period of three (3) years.

The Chairperson of the Board, Mr. Lindsay Garbutt, has been appointed by the Minister of Agriculture and Fisheries. The Chairperson is a person who has ample experience and knowledge of the fisheries industry of Belize, is conservation-oriented, is deeply interested in the further development and growth of the fisheries industry and is highly committed to the sustainable and rational use of the fishery resources of Belize.

The role of the representative of the Office of the Solicitor General will provide to the FAB expertise in legal matters and will scrutinize proposals for fisheries legislation and minimize the occurrence of legal loop-holes in the policies being recommended by the board.

The representative from the Ministry of Economic Development will assist the FAB on matters related to fisheries sector development concessions and tax incentives needed to facilitate the growth of the fisheries industry.

The role of the Cooperatives Department on the board is to protect the interests of the Fishing Cooperatives and to promote the principles of cooperatives.

The representative of the Belize Chamber of Commerce will help the FAB in its deliberations with respect to business development and opportunities for Belize's fisheries products, particularly in the export market.

The representative of the sport fishing community will help the FAB in its decisions regarding the sport fishing activity, and the representative of the conservation community will promote the conservation efforts to ensure sustainable use and the conservation of the fisheries resources.

The representatives of the fishing cooperatives will advocate the interests and wishes of their fishing cooperative and their members.

2. Terms of Reference

The members of the FAB are persons who ideally have knowledge of the fisheries industry and fulfill at least two of the following requirements:

a) Good knowledge and/or experience in the fishing industry.
b) Experience in working with fishermen or in the fishing industry.
c) Actively involved in matters of or related the fishing industry.
d) Expertise in legal matters and especially the Fisheries Regulations.
e) Knowledgeable of the Cooperative Laws and the cooperative movement.
f) Expertise in management and business development.
g) Able to attend FAB meetings as requested by the Chairperson or the Vice- Chairperson.

3. Duties and Responsibilities

The FAB will be responsible for the following:

a) Provide general and specific advice and guidance in regards to all fisheries matters to the Minister of Fisheries.

b) Act as a forum and mechanism for addressing the needs of fishers, the general public and the overall industry. More specifically, the FAB will be responsible for advising the Ministry of Agriculture and Fisheries on policies, legislation, projects, development of the industry and any other management decisions that need to be formulated, revised, amended, reformulated or cancelled in the best interest of the industry and country.

c) Examine, evaluate and appraise projects and investment proposals in the Fisheries Sector including Aquaculture investments, which are presented to the Fisheries Department and make recommendations to the Minister of Fisheries.

d) Consider and discuss the findings and recommendations made by the Fisheries Department of its preliminary assessment of project proposals and investment proposals.

e) The recommendations of the FAB to the Minister on proposals submitted, whether approval or refusal, must be by consensus. If consensus is not reached after the first board meeting, the proponents may be asked to modify and resubmit the proposal to

address the concerns of the Board. If consensus is still not reached, then the Minister may make a final decision on approval or refusal of such project or investment proposal.

f) Vet proposals for introducing new management measures such as closed season and areas would be normally presented by the Fisheries Department and make recommendations to the Minister of Fisheries.

g) The FAB will examine activities considered for developmental research, exploratory fishing, deep water fishing and joint-ventures between foreign companies and local counterparts in Fisheries Sector and make recommendations to the Minister to facilitate implementation of such activities if considered appropriate.

h) The introduction of new fishing gears and specifications for currently used fishing gear and equipment whether for experimental purposes or for targeted commercial fishing must be reviewed and discussed by the FAB before a license is granted.

i) Research and commercial licenses are granted by the Fisheries. In both cases the input of the FAB must be received if the proposed activity is of national interest.

j) The FAB may request the establishment of sub-committees to discuss topics of highly technical nature. The Fisheries Administrator will be required to chair such sub-committee. The recommendations of the sub-committee are considered strictly advisory. The FAB may reject, adopt or conditionally adopt the recommendations of the sub-committees.

k) Any member of the board can submit topics for the agenda of a board meeting to the Secretariat. The Head of a Government Department, other Government representatives, investors or persons from civil society, may be allowed to make presentations on specific topics at board meetings, as long as the board agrees that such presentation is relevant to a topic on the agenda.

l) The FAB meetings are held on the second Tuesday of each month. The Chairman plus four other members of the board is considered a quorum. The chairman may appoint any one of the other members of the board as Vice-Chairman. In the absence of the Chairman, the Vice-Chairman plus four other members is a quorum. A member may be expelled from the board if he has failed to attend three consecutive meetings, if he is no longer representing a Fishing Cooperative(s), if he resigns from his current job position or is asked by the Minister to vacate his seat, or if has been caught conducting or in association with illegal fishing activities.

ANNEX III
REGULATIONS INVOLVING AQUACULTURE

Agency:	Statute or Rule:	Description:	License, Permit, Lease:
1. Belize Fisheries Department	1. Fisheries Act, Chapter 210 – Revised Edition, 2000 • #7 • #8 • #9 • #10 2. S.I. #66 of 1977, Sec. 56 to 127	• Regulate commercial "fishing" (aquaculture) • Regulate research permits • Regulate exporter's permit • Penalties for violations • Quality assurance for fishery products	License, Permit
2. Belize Agricultural Health Authority	1. B.A.H.A. Act, Chapter 211 – Revised Edition, 2000 2. S.I. #173 of 2001 – Fish and fishery products inspection • Part II • Part III • Part IV • Part V	• Provisions for issuance of import & export permits for fishery commodities as well as for certification of fishery products, aquaculture and processing facilities • Import & export • Labeling • Code Marking • Quality requirements	License, Permit
3. Forestry Department	1. Forests Act, Chapter 213 – Revised Edition, 2000 2. Forest 'protection' Act – Mangrove Regulation – S.I. #52 of 1989	• Provisions for regulating forest clearance • Provisions for regulating mangrove clearance	Permit
4. Department of Geology & Petroleum	1. Mines & Minerals Act, Chapter 226 – Revised Edition, 2000 • #36 • Part VII	• Quarry permit & mining license • Provisions for the protection of the environment	License, Permit
5. Department of the Environment	1. Environmental Protection Act, Chapter 328 – Revised Edition, 2000 • Environmental Protection Act, #22 of 1992 • S.I. #107 of 1995 - Environmental Impact Assessment Regulations • S.I. #94 of 1995 – Effluent Limitation Regulations • S.I. 24 of 2007 – Environmental Impact Assessment (amendment) Regulations	• Prevention & control of environmental pollution • Requirement & regulations for E.I.A. • Limitations on effluent discharge • Requirement & regulations for E.I.A. – describes which aquaculture projects require EIA or Limited Level Environmental Study	License, Permit
6. Department of Lands	1. Land Utilization Act, Chapter 188 – Revised Edition, 2000 2. National Lands Act, Chapter 191 – Revised Edition, 2000	• Regulate land use & provisions for conservation measures	License, Permit, Lease
7. Ministry of Investment	1. Export Processing Zone Act, Chapter 280 – Revised Edition, 2000 2. Fiscal Incentives Act, Chapter 54 – Revised Edition, 2000	• Provide exemptions from various duties and taxes	License
8. Coastal Zone Management Authority & Institute	1. 1. Coastal Zone Management Act, Chapter 329-Revised Edition, 2000	• Provisions relating to the development & utilization of the resources of the coastal zone	Recommendations to the N.E.A.C.

FINAL COUNTRY REPORT: DOMINICA

October 2009

Dominica

Country Profile

Geographic coordinates	15° 25' N, 61° 20' W
Total area	751 sq km
Land area	751 sq km
Water area	0 sq km
Length of Coastline	152 km
Shelf Area	304 sq km
Territorial Sea	3,788 sq km
Claimed EEZ	24,917 sq km
Highest point (m)	1,447 m (Morne Diablatins)
Climate	tropical; moderated by northeast trade winds; heavy rainfall
Natural hazards	flash floods are a constant threat; destructive hurricanes can be expected during the late summer months
Population	72,660 (July 2009 est.)
Annual Population Growth Rate	0.208% (2009 est.)
Life Expectancy at birth	total population: 75.55 years
Languages	English (official), French patois
Ethnic Mix	black 86.8%, mixed 8.9%, Carib Amerindian 2.9%, white 0.8%, other 0.7% (2001 census)
Work force	25,000 (2000 est.)
Unemployment	23% (2000 est.)
GDP (PPP)	$726.3 million (2008 est.)
GDP Growth rate	3.2% (2008 est.)
GDP per Capita (PPP)	$10,000 (2008 est.)
Currency Unit	East Caribbean dollars (XCD) US$1 = EC$2.7
Area of Mangrove Forests	
Percent of Mangrove Forests Protected	
Per Capita Food Supply from Fish/Fishery Products (2000)	47 kg/person
Exports	bananas, soap, bay oil, vegetables, grapefruit, oranges

Sources: CIA World Factbook – Dominica (2009); EarthTrends Country Profiles – Dominica

Abbreviations and Acronyms

CARICOM	Caribbean Community
CARIFIS	Caribbean Fisheries Information System
CFO	Chief Fisheries Officer
CFRAMP	CARICOM Fisheries Resource Assessment and Management Programme
CRFM	CARICOM Regional Fisheries Mechanism
EU	European Union
FAO	Food & Agriculture Organization of the United Nations
FAC	Fisheries Advisory Committee
FD	Fisheries Department
FMP	Fisheries Management Plan
GEF	Global Environmental Facility
GOD	Government of Dominica
IHHN	Hypodermal Hematopoietic Necrosis
JICA	Japan International Co-operation Agency
MAFF	Ministry of Agriculture, Forestry and Fisheries
MPA	Marine Protected Area
mt	Metric Ton
OECS	Organization of Eastern Caribbean States
TIP	Trip Interview Program
TSV	Taura Syndrome Virus
UNDP	United Nations Development Program

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CHAPTER 1: INTRODUCTION

The Commonwealth of **Dominica** is a single-island nation situated between the two French territories of Guadeloupe (to the north), and Martinique (to the south). Dominica is the most mountainous island of the Lesser Antilles, and it has an extensive national park system. English is the official language, but French Patois is also spoken. It is a member of the Caribbean Community (CARICOM), the Organization of Eastern Caribbean States (OECS), and the British Commonwealth of Nations.

Description of the Fisheries

Dominica's fisheries are largely artisanal, and it has one of the smallest fishing industries in the Caribbean. Lobsters are highly valued and targeted mainly for the hotel industry and illegal trade with neighboring French islands (FAO 2002). Deep slope and bank fisheries are exploited heavily, especially by fishermen from the French islands with more advanced gear (FAO 2002). Several conflicts exist regarding illegal French fishing. All fish caught is for local consumption and most fish landed is sold directly to the public at the landing sites (FAO 2002). Sebastian (2002) reports 1,800 part-time fishermen, and 435 full-time fishermen. The fishing fleet has increased from 913 vessels in 1994 to more than 1100 in 2000. There has been a marked transition from the traditional dugout canoes to the more advanced keel boats and most recently, to the fibreglass reinforced plastic (FRP) vessels. The majority of new entrants invest in the latter two types. These vessels are propelled by outboard engines that range from 15hp to 225hp, with 48hp the average size.

Table 1: Registered Fishers by Site

Operating Site	Work Status		Grand Total
	Full-Time	Part-Time	
Anse De Mai	16	24	39
Batalie	3	1	4
Bioche	13	24	37
Calibishie	12	25	37
Canefield	3	6	9
Capuchin	9	17	25
Castle Bruce	3	32	35
Clifton	2	4	6
Colihaut	16	21	37
Coulibistrie	11	26	37
Delaford	2	12	14
Dublanc	14	16	30
Fond Cole	20	16	36
Fond St. Jean	53	28	81
Layou	17	26	43
Loubiere		1	1
Mahaut	32	45	77
Marigot	25	65	90
Massacre	12	20	32
Mero	4	12	16
Newtown	34	37	71
Petite Savanne	5	17	22
Pointe Mitchel	3	5	8
Portsmouth	51	40	91
Pottersville	46	34	80
Roseau	2	2	4
Saint Sauveur	33	40	73
Salisbury	10	24	34
Salybia	4	27	31
Scotts Head	57	17	74
Soufriere	14	9	23
St. Joseph	10	36	46
Stowe	9	5	14
Tan Tan	1	2	3
Tarou	3	2	5
Thibaud	2	13	15
Toucarie	10	20	30
Vieille Case	1	19	20
Wesley	1	20	21
Woodford Hill	5	15	20
Grand Total	568	805	1373

There is a limited island shelf around Dominica. The shelf is especially narrow on the west coast, less than 5 km in some places, but there is a fairly large shelf on the east coast, about 10 km wide. Within 20 km to the west and south, depths exceed 3000 meters in the Caribbean Grenada Basin. Although there are fewer reefs on the west coast, they are better studied due to the calmer waters on that side of the island. In these areas, demersal shelf and reef fisheries target triggerfish, goatfish, parrotfish, grunts and squirrelfish. Lobsters are also harvested here. Coastal demersal species are subject to high fishing pressure, and are highly overexploited.

Deep slope and bank fisheries target species that inhabit 100 m or more of depth, such as larger species of snappers and groupers. Coastal pelagics are found in the water column above the reef ecosystem. Species targeted are jacks, sprats, ballyhoo and mackerel (FAO 2002). The Catches in this fishery are trending upward. Migratory pelagics that are targeted further offshore are yellowfin and skipjack tunas, swordfish, marlin and other billfishes, as well as dolphinfish, kingfish and flyingfish. Flyingfish is the main pelagic species caught.

Demersal shelf species are mainly targeted with Antilles Z-type fish traps, bottom gillnets, and handlines. The minimum mesh size for traps is 1½ inches (FAO 2002). Deep slope and bank fisheries are relatively under-exploited due to the lack of automated line hauling gear needed for fishing at such depths (FAO 2002), as well as the expense of maintaining bottom longlines and palangues. However, on the only significant bank, Macouba Bank, located about 15 miles of the Southwest coast, species are heavily and illegally exploited by French fishermen equipped with more advanced gear. The long distance from shore, the small size of the fishing vessels and alleged threats from French fishermen

have discouraged Dominican fishermen from further exploiting this resource. Sebastian (2002) gives descriptions of vessels and species targeted, which may apply to the deep slope and bank fisheries described in FAO 2002.

Table 2:
Registered Boats by Landing Site

	Vessel Type					
Operating Site	Canoe	FRP	Keel	Metal	Unspecified	Grand Total
Anse De Mai	1	12	15			28
Atkinson	1					1
Batalie			2			2
Bioche	22	5	11			38
Calibishie		3	6		1	10
Capuchin			1			1
Castle Bruce	1	1	3			5
Colihaut	21	2	6			29
Coulibistrie	1		8			9
Delaford			1			1
Dublanc	16	3	13		1	33
Fond Cole	3	10	33	1	5	52
Fond St. Jean	2	4	28			34
Layou	5	2	18		1	26
Mahaut	2	3	16			21
Marigot	1	22	25			48
Massacre	3	3	7		1	14
Mero	1		2			3
Newtown	1	4	30		1	36
Portsmouth		3	10	1	1	15
Pottersville			1			1
Roseau		1				1
Saint Sauveur	5	9	13		1	28
Salisbury	1					1
Salybia	6		1			7
Scotts Head		6	8		1	15
Soufriere		1	1			2
St. Joseph	9	1	7		1	18
Stowe			5			5
Tan Tan			1			1
Tarou	2					2
Thibaud					1	1
Toucarie		4	2			6
Wesley			1		1	2
Woodford Hill		2			1	3
Grand Total	104	101	275	2	17	499

Coastal pelagics are targeted year round by fishermen on the west coast, and caught using beach seines. If the beach is unsuitable (steep or rocky), divers capture fish in nets and then haul the fish into boats (FAO 2002). Trammel nets are banned, and have been exchanged for legal nets (FAO 2002).

The migratory pelagic fishery has the greatest potential for development. Current restraints on the exploitation of this fishery include the small size of boats, lack of use of navigational aids, and the 12 mile radius around the island at which the fleet currently operates. Dolphinfish and kingfish are captured by trolling, and flyingfish are caught using dip nets or gillnets (FAO 2002).

Development of the longlining industry has been attempted multiple times with help from Taiwan. However, these attempts have not been very successful due to the expense, and to the predominantly older fishermen, who it is believed, slow the transition to more modern gear and methods. While only 2-3 longline vessels are reported for Dominica, with some artisanal fishermen deploying non-mechanized longlines, one report indicates that the typical longline operation is a 7.5 meter open boat with a 25 horsepower outboard engine and a crew of 5-6 men, with a 16 kilometer-long line; the catch might consist of 50-60 yellowfin tunas averaging about 35-45 kg each when the lines are set before dawn.

It is a requirement in Dominican law for fishing boats to be

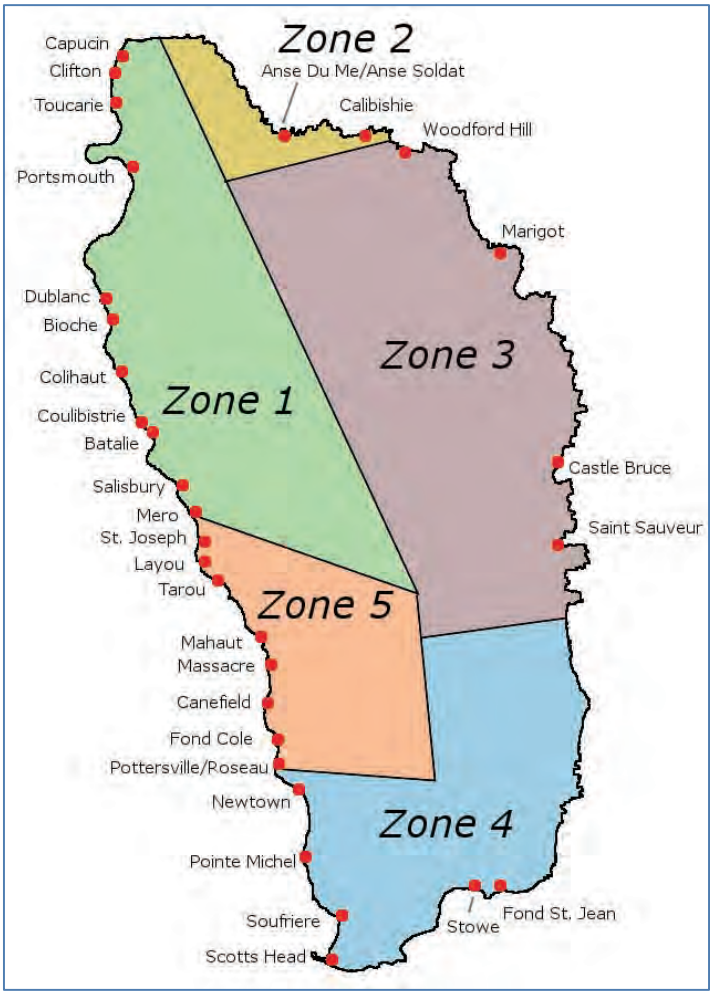
registered and licensed, but there is no legal imperative for fishers to be licensed or registered. Many fishers choose to be registered in order to access benefits. There are thirty-six (36) official landing sites in Dominica, at which 499 boats were registered. So far 1,373 fishers have registered at forty (40) operating sites across Dominica. According to the CRFM website Dominica has forty-two (42) landing sites and 2,338 fishers.

Table 3:
Most Active Fish Landing Sites and Fish Catch (kg), Dominica, 2005

Landing Site	TOTAL	Landing Site	TOTAL
Bioche	25,296.1	Newtown	14,598.7
Batalie/Coulibistrie	39,646.1	Portsmouth	282,319.1
Colihaut	62,980.3	Scotts Head	5,107.9
Dublanc	46,206.6	Saint Sauveur	41,608.6
Fond Cole	35,301.3	St. Joseph	8,709.9
Fond St. Jean	109,672.4	Mahaut	35,301.3
Layou	20,031.6	Anse De Mai	109,672.4
Marigot	221,611.0	Others (11)	95,808.6
Sub-total	**560,745.2**	**Sub-total**	**593,126.3**
		TOTAL CATCH	**1,153,871.5**

Source: Severin (2005)

Table 3 lists fifteen (15) fish landing sites and the weight of fish landed there. The largest quantity is landed in Portsmouth, followed by Marigot.



Stakeholders

There are eleven (11) registered fishermen's co-operatives in Dominica, as listed below;

Table 4:
Fishers' Organizations, Locations, Dominica

	Name of Organization	Location
1	Woodbridge Bay Fisheries Co-operative	Roseau
2	Dominica Fisheries Co-operative	Roseau
3	Newtown Fisheries Co-operative	South of Roseau
4	St. Mark's Fisherfolk Co-operative	
5	Font St. Jean Fisheries Co-operative	
6	St. Andrew's Fisheries Co-operative	Vielle Case
7	Marigot Fisheries Co-operative	Marigot
8	St. Peter's Fisheries Co-operative	Dublanc
9	St. Joseph Fisheries Co-operative	
10	St. Paul's Fisheries Co-operative	Maho
11	San Sauveur Fisheries Co-operative	San Sauveur

Source: NAFCOOP (personal communication)

Most of the co-ops are in their infancy. Another three (3) co-operatives are in formation: the ones at Woodford Hill and Capuchin will soon be registered, while the one at Portsmouth is just getting organized.

One can see that the fishers' organizations are located in communities where there are relatively large numbers of fishers and boats. Previous efforts at establishing a co-operative in Portsmouth failed because of local divisions among the fishers. There is a new commitment at this time since Portsmouth is about to receive a fisheries complex, and any co-operative which exists would more than likely get the franchise to operate and manage it.

The National Association of Fisherfolk Co-operative Associations (NAFCOOP) is the umbrella organization for fishing co-operatives in Dominica. They occupy an office downstairs the office of the Fisheries Division. NAFCOOP is placing FADs at sea to increase the catch of pelagics.

Their **Mission Statement** is:

To provide proper representation and greater visibility at the local, regional and international levels, while ensuring the sustainable utilization of the marine resources and enhancing the livelihood of the fisherfolk.

Their **Vision Statement** is:

The NAFCOOP will become the ultimate representative of all fisherfolk in Dominica and raise the operations of the industry to a professional level.

Their **Goals** are:

- To ensure that fisherfolk are adequately understood and become more visible as an important player in national development.
- To strengthen the capacity of NAFCOOP and its affiliates to manage the industry and raise the confidence level of all members.
- To put in place mechanisms that will promote the safety and well being of all fisherfolk
- To develop the fishing industry in a sustainable manner

Their programme areas are: Advocacy, Training, Communications, Safety and Security, Health and Well-Being, Institutional Strengthening, Networking, Income Generation and Infrastructure.

The Contribution of Fisheries to the Dominican Economy

The Fisheries sub-sector accounts for 14% (3,500 persons) of the national workforce. Since the crash of banana production in Dominica, many farmers have become dependent on fishing to make a living. Additionally, there is greater demand for fish in the country, which is directly correlated to an increase in number of tourists visiting Dominica. Hence, in 2000 the gross value of fisheries output was estimated at US$13 million, nearly 30% of the GDP of the Agriculture sector (value added), which was estimated to be 40.20 millions.

Table 5:
Dominica GDP at 1990 Constant Prices

Sector	1995	1999	2000	2001	2002	2003	2004	2005p	2005 In US
Agriculture	83.19	82.90	81.98	76.59	76.09	73.31	75.71	74.55	**27.5**
Crops	65.62	63.73	62.81	57.20	56.48	53.42	55.56	54.17	**20.0**
Livestock	6.93	7.35	7.42	7.49	7.56	7.65	7.72	7.72	**2.8**
Forestry	3.22	3.38	3.41	3.44	3.47	3.48	3.49	3.50	**1.3**
Fishing	7.42	8.44	8.34	8.46	8.58	8.76	8.94	9.16	**3.4**
Total GDP	**410.31**	**450.47**	**456.35**	**437.35**	**415.15**	**414.99**	**431.32**	**443.16**	**163.5**

Source: Severin (2005)

THE ADMINISTRATION OF FISHERIES IN DOMINICA

The Dominican Fisheries Department, a unit of the Ministry of Agriculture and the Environment, oversees the fishing sector.

Its Mission Statement is:

To optimize the contribution of the fisheries sub-sector to the Dominican economy through its sustainable management and development by creating an enabling environment for sustained employment, enhanced food security, reduction of poverty and for enhancing the contribution of fisheries to the economic diversification of food production in Dominica.

Its Vision is:

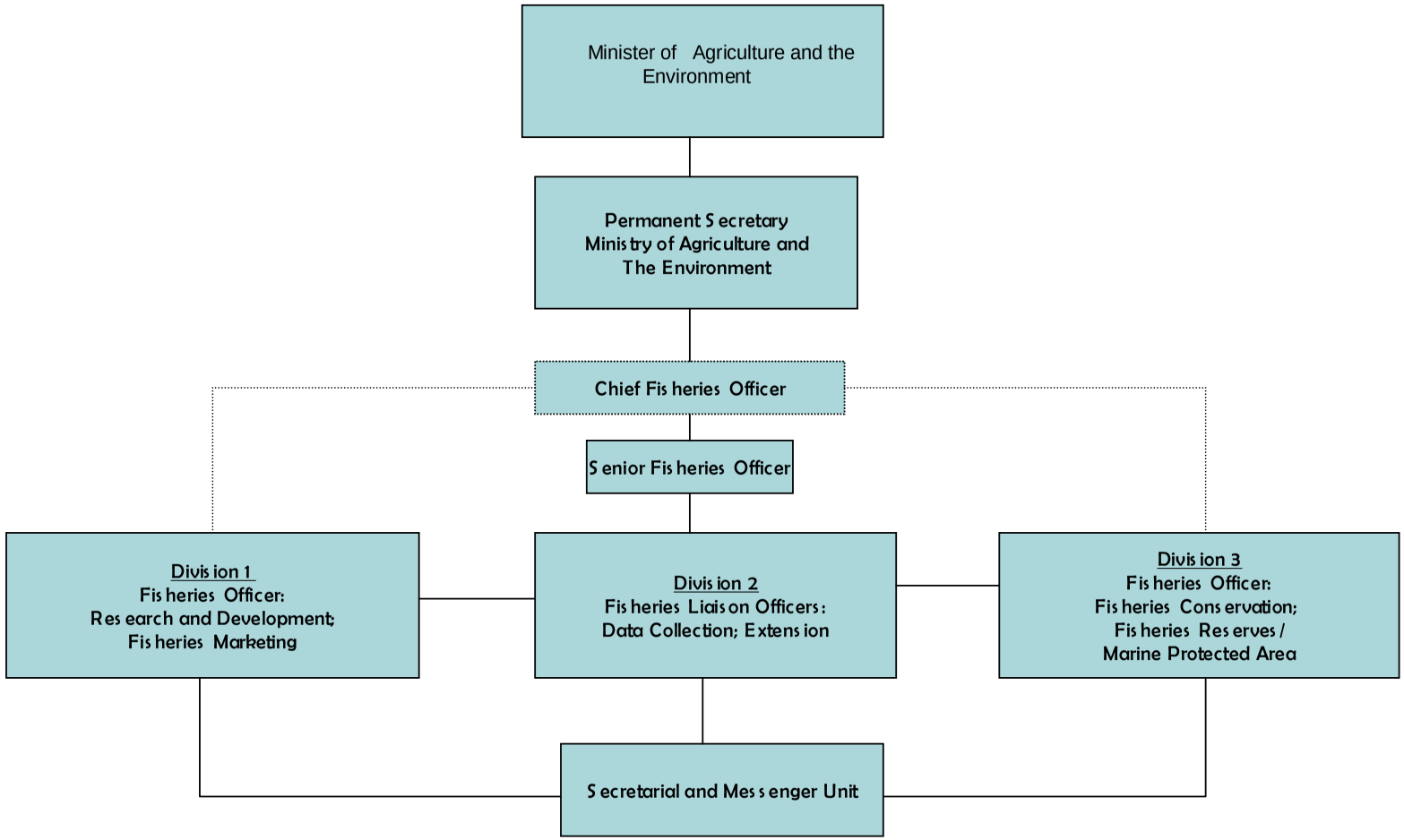
To be accepted as an efficiently managed government agency by fishers and related institutions and the general public at large, by delivering high quality support, research and developmental advice and regulatory services.

An organogram of the Department follows below.

The Dominican Fisheries Department offers training to fishers. The Basic Fisherman Training Course (BFTC) is designed to include all critical areas necessary for the survival of the industry. It takes into consideration the multiple roles fishers play as Captains, Mechanics, Boat Owners, and Managers. Participants in the course are drawn from the increasing number of banana farmers divesting their interests by investing in the fishing industry. These new entrants however are ill-equipped, and come with little prior experience. In response, the BFTC was organized by the Fisheries Division as a mandatory training programme to guide participants into a mindset of viewing the investment as a business and fishing as a renewable resource as oppose to an extracting industry.

The BFTC therefore seeks to introduce fishers and prospective new entrants to the industry about the basic requirements for assessing small business loans and managing their small business enterprises, to train fishermen to better understand fish behavior and fishing gear construction, to conduct various aspects of 'safety at sea' training and navigation, learn fish handling, processing and marketing and the development of fishing cooperatives, and become knowledgeable on the basic fisheries law.

Organizational Structure of the Fisheries Division



CHAPTER 2: COMMUNITY-BASED FISHERIES MANAGEMENT COMPONENT

2.1 Coastal Community Characteristics

A significant fraction of the population of Dominica reside along the coast of the island. There is tremendous economic activity occurring along the coast which includes fisheries, quarry operations, dive tourism, coastal agriculture, and recreational activities as well as significant manufacturing and commerce. Fishing forms a major part of the commercial activity in that zone and is a noteworthy contributor to the social and economic livelihood of many people, especially the rural poor.

The coastal system within which the fishing industry operates is a very dynamic one with various users and activities. Some of those activities are complementary, others compete for space and resources, while yet others are in conflict, and require strategic management interventions. Over the years the fishing industry itself has undergone many changes as it relates to use of gear, fishing methods, changes in size, type and number of boats and movement of persons in and out of the industry.

The major coastal settlements in the Commonwealth of Dominica with their populations as measured by the Dominica 2001 Population Census are:

TABLE 6:
Populations of the Main Coastal Settlements, Dominica, 2001

SETTLEMENT	PARISH	MALE	FEMALE	TOTAL
Roseau	St. George			14,847
Marigot	St. Andrew			2,676
Vielle Case				726
Dublanc				423
San Sauveur	St. David			
Portsmouth				2,977
Bioche				250
Colihaut				773
Fond Cole				
Scott's Head	St. Mark			721
Fond St. Jean				
Coulibistrie				
Anse De Mai				
Mahaut				2,399
St. Joseph				2,029

Source: Dominica, 2001 Population Census, Central Statistical Office.

The male populations of some of these coastal settlements re quite small, and when one compares the population data with the number of fishing boats in Table 6 above[1], the importance of fishing to the local economy becomes apparent.

[1] Each boat may have as many as four or five crew members, and each boat may supply three or more fish vendors; and each player in the industry may support two or three other family members.

2.2 Policy, Legislation, and Supporting Institutional Arrangements

POLICY

The GOD has not chosen to prepare a **National Fisheries Policy** for Grenada. In May 2005 the draft **Fisheries Development and Management Plan (Strategy) 2005-2010** [FDMPS 2005-2010] for Dominica was published; it might serve a similar function. The ten (10) Objectives included in the mandate of the Fisheries Division are to:

- Ensure the sustainable utilization and conservation of the marine resources
- Maximize employment opportunities in the fisheries sector where possible
- Increase fish production and raise the per capita fish consumption
- Encourage responsible utilization of the marine resources
- Encourage foreign exchange earnings from fishery resources
- Enhance the socio-economic status of fishermen
- Create the opportunities for private sector investment and economic growth from the utilization of marine resources
- Promote Aquaculture Research and Development
- Public awareness, training and education

None of these objectives speak to the promotion of the participation of fishers or other stakeholders in the process of fisheries management.

No planning process diagram was provided to show how the FDMPS 2005-2010 was prepared. The document itself states:

> *The plan was developed through a participatory approach involving input from the staff of the Fisheries Division and users of the marine environment. Throughout the process participants were routinely reminded to be mindful of the General Principles of the Code of conduct for Responsible Fisheries. Special care was taken to ensure that the design of the plan had realistic linkages with the social and economic realities of Dominica.*

The participatory process undertaken to prepare this draft **FDMPS 2005-2010** is unclear. It does not seem to reflect a great deal of stakeholder consultation.

The copy of the **FDMPS 2005-2010** obtained from the FD was an incomplete draft, and the period it covers has almost expired. It would seem that a whole new draft needs to be prepared.

The draft **FDMPS 2005-2010** contains a review of the core activities from the previous work plan (ending in 2004), together with an analysis of the results and lessons learnt. The ones relevant to stakeholder participation in fisheries management are reproduced below.

The first relevant activity (No. 4) has not targeted fishers, but persons in school and those who use libraries. The second relevant activity (No. 5) is directed at the wider community to reduce land-based sources of marine pollution. The third relevant activity has to do with transferring new FAD technology to fishers, and the activity was considered unsuccessful because "*Fishers are uncooperative in areas requiring collective management*"; in the next planning cycle the recommendation is to "*Continue to encourage active fisher involvement in an effective FAD management program*".

The fishery planning period ending in 2004 did not really have any core activities directly dealing with the participation of fishers in the management of fishery resources. It does not speak to the formation of a Fisheries Advisory Council (FAC) or the involvement of fishers in enforcement or monitoring.

Review of Core Activities from the Previous Work Plan (Year Ending in 2004), Together with an Analysis of the Results and Lessons Learnt				
Core activities for previous year	**Successful outcomes from this activity**	**Unsuccessful outcomes from this activity**	**Lessons learned**	**Key challenges for next planning cycle**
4.Environmental education	Successful implementation of awareness activities in primary school programme, at Dominica State College, CALLS, National Library, Optimist Club and SSMR.	None	The education program is critical to the future success in marine environmental awareness	Sourcing necessary funding for continuation of the programme
5.Community awareness on marine environmental impacts	Community consultation in Colihaut and Layou on the impact of Quarrying on the marine aquatic resources and the surrounding coastal environment. Consultation meetings on turtle resource management in three coastal communities.	An unwillingness of some private sector companies/operators to comply with operational guidelines.	Engaging the communities on issues of environment and their respective roles in mitigating unwarranted negative impacts. Contributes to greater success in program implementation	Building the required capacity to effectively address these issues on a timely basis. Effective inter-sectoral collaboration
7.Fishing technology transfer	Increase production of offshore pelagic and deep slope species resulting from FAD technology and vertical longline respectively	Unwillingness of fishers to adopt appropriate FAD management measures.	FAD fishing improves the economic returns to fishers and fishing communities. Fishers are uncooperative in areas requiring collective management	Continue to encourage active fisher involved in an effective FAD management program. Allocate adequate financial and human resources to ensure sustainability of these measures

Source: draft FDMPS 2005-2010

The **draft FDMPS 2005-2010** identified five (5) strategies for 2005-2006; the last two are:

Identification and Analysis of Strategies resulting from Key Result Area (KRA) 4:
Move away from the existing command and control system of management and to promote and adopt a participatory approach to community based fisheries resources management.

Identification and Analysis of Strategies resulting from Key Result Area (KRA) 5:
To conduct marine environmental education and awareness and management programmes for fishermen and the general public.

These objectives are a radical change from the previous planning period, and suggest that the objectives of the Dominica Fisheries Division are consonant with the objectives of the present JICA-CRFM project.

A breakdown of the proposed activities for 2005-2006 intended to achieve these objectives shows that the Dominica FD has a fair idea how to "*promote and adopt a participatory approach to community based fisheries resources management*". The fishers' organizations can be strengthened with training in managerial skills. The process needs to be deepened by creating a

strong FAB, and delegating real managerial and enforcement authority and responsibility to fishers organizations and individual fishers. That is what is going to "*move away from the existing command and control system of management*".

KRA 4			
Strategic objectives	**Activities**	**Achievements**	**Outcomes**
1. To strengthen fisher's and community organizations	1. Hold consultations/ discussions with fishers and community personnel. 2. Implement the "Adopt a cooperative approach" 3. Conduct managerial skill training programmes for group members	Successes with Fond St. Jean, Newtown and St. Peter's fisheries groups/co-operatives	Greater involvement of fishers' organizations in Fisheries management. Increased participation of co-op membership and closer relations with the Fisheries Division Greater involvement of fisheries group in Saint Sauveur, Anse De Mai, Bioche, Newtown, Scotts Head, Fond St. Jean
2. To create a greater sense of responsibility among fishers in fisheries management	Information packaging and dissemination for fishers and stakeholders. Workshops conducted.	Increase in the number of fishers/prawn farmers who keep at least some form of basic records Increase in awareness and use of ice holds that allow for longer stretches of fishing activities	- Improved record keeping and financial management. - Better conservation practices.

One of the hoped-for outcomes from activities under KRA 5 is "*Co-management practices adopted*". Co-management is one of those words that can mean as many things as there are people who define it. The **draft FDMPS 2005-2010**, however, does not define what they mean by the term, and so it is difficult to evaluate whether the proposed activities will achieve it. However the verbs they use for the activities – training, consultation, develop a plan – are more geared to participation than co-management.

In summary, the **draft FDMPS 2005-2010** seems to engage more with the involvement of fishers, fisher organizations, fishing communities and other stakeholders in the management of fishery resources than the plan for the previous period; however there is still quite a bit of room to take the process further. Hopefully the activities of this JICA-CRFM will see advances in this area.

KRA 5			
Strategic objectives	**Activities**	**Achievements**	**Outcomes**
1.To reduce user conflict and to promote sustainable use of coastal and marine resources	1. Conduct training on best practices for trap, seine and FAD fishers as well as recreational boaters. 2. Consultation with fishers and recreational users of coastal marine resources on alternative management issues. 3. Develop a draft coastal zoning plan.		1.Reduction in user conflict 2. Co-management practices adopted. 3. Involvement of youth in management (re OPAAL) 4. Develop an integrated fisheries coastal zoning plan
2. To collaborate with relevant stakeholders in the coastal and marine environmental management	3. Conduct SSMR day celebrations annually on June 30 4. Conduct educational sessions in schools island-wide on marine environmental issues. 5. Conduct at least three mass media discussion sessions on issues of marine conservation and marine environmental management. 6. Deliver a thirteen week long semester course at the Dominica State College on "Introduction to Fisheries Studies". 7. Prepare a hand book on Fisheries and the Marine environment in Dominica for public information.	Talking point discussion on the coastal marine environment with emphasis on resource conservation & sustainable livihoods	Greater awareness on the conservation and judicious use of marine resources and the minimization of user conflicts

LEGISLATION

The **Fisheries Act No. 11 of 1987** and the **Territorial Sea and Contiguous Zone, Exclusive Economic and Fishery Zone Act No. 26 of 1981** provides the Fisheries Division of the Ministry of Agriculture and Environment with the legal authority to manage the affairs of the marine capture fisheries in Dominica. This legal authority also extends to coordinating the discharge of national obligations to legally binding international fisheries agreements and instruments such as the UN Convention of the Law of the Sea (Part V), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the International Commission on the Conservation of Atlantic Tuna (ICCAT).

The Fisheries Act No. 11 of 1987 is based on OECS harmonized legislation. It provides for conservation measures such as closed seasons, gear restrictions, the prohibition of noxious chemicals or explosives for catching fish and the establishment of marine reserves. The Territorial Sea, Contiguous Zone and Exclusive Economic Zone (EEZ) legislation establishes the 12, 24 and 200 nm limits of these three zones, in accordance with **Fishery Zones Act No. 26 of 1981**.

With respect to community involvement in fisheries management **The Fisheries Act No. 11 of 1987** calls for:

Section 4: The Chief Fisheries Officer to prepare and keep under review a Fisheries Management and Development Plan

Section 5: Minister may appoint a Fishery Advisory Committee to advise on the management and development of fisheries.

Section 18: The Minister may designate an area as a local fisheries management area, and may designate any local authority, fishermen's co-operative of fishermen's association or appropriate body representing fishermen in the area as the Local Management Authority for that area. Where there is no appropriate body representing fishermen in the area, the Minister may promote the formation of such a body.

Section 19: The Local Management Authority shall make by-laws regulating the conduct of fishing operations in the designated area. They must be approved by the Minister.

Section 20: The Minister may declare a fishing priority area.

Section 22: The Minister may declare a marine reserve.

Section 26: The Minister may designate such persons as he sees fit to be authorized persons (enforcement officers) under this Act.

Other countries who have based their Fisheries Act on the OECS harmonized legislation have a section saying that in preparing and keeping under review a Fisheries Management and Development Plan "*The Chief Fisheries Officer shall consult with the local fishermen, local authorities, other persons affected by the fishery plan and with any Fishery Advisory Committee appointed*". The Dominica Fisheries Act has omitted this section, indicating possibly a reluctance at the time to involve stakeholders in fisheries management.

The Dominica **Fisheries Act No. 11 of 1987** was passed almost two decades before the **draft FDMPS 2005-2010**, yet it contains more provisions for community participation in fisheries management than the **FDMPS**. Section 18 allows local fishers' organizations ***to actually manage*** a local fisheries management area, and Section 19 states that this local fishers' organization ***shall make by-laws*** regulating the conduct of fishing operations in the designated area. This gives local fishers' organizations real power, and not just the right to be consulted.

Other countries which have based their Fisheries Act on the OECS harmonized legislation have regulations specifying the composition of the FAC, and its terms of reference. Dominica has not; and it has no FAC.

There is no mention in the Dominica **Fisheries Act No. 11 of 1987** or the Fisheries Regulations of any requirement for fishers either to be registered or licensed.

Of the ten (10) protected areas in Dominica, two are marine: Cabrits National Park (declared under the Forestry Act) has both a terrestrial and marine area; and the Soufriere/Scott's Head Marine Reserve (SSMR) is wholly marine. By Order in the Gazette (SRO 19) the SSMR was created in 1998 under the Fisheries Act; by Order in the Gazette (SRO 20) the Soufriere/Scott's Head Fishing Priority Area was created in 1998 under the Fisheries Act; by notice in the Gazette (SRO 18) the SSMR was designated as the Soufriere/Scott's Head Fisheries Management Area in 1998, and (by SRO 17) the Local Area Management Authority (LAMA) of the SSMR was designated the Fisheries Management Authority. The LAMA's stakeholder membership includes the fisher organizations and village councils of the three surrounding communities (Soufriere, Scott's Head, Pointe Michel), the Dominica Watersports Association, the hospitality industry, community groups, the coast guard and the Fisheries Division.

Other fisheries-related legislation:

- Exclusive Economic and Fishery Zones Act
- Territorial Seas Act;
- Contiguous Zone Act;
- International Maritime Act (2000);
- Statutory Rules & Orders #16-20 of 1998:
- SSMR - Declaration of the area as a Marine Reserve
- LAMA - Management body of the SSMR
- Fishing Priority Area in the SSMR.

SUPPORTING INSTITUTIONAL ARRANGEMENTS

While the concept of participation has been embraced by the Dominica **Fisheries Act No. 11 of 1987**, its implementation lags far behind. The draft **FDMPS 2005-2010** does not reflect the approach of the legislation. The majority of Dominican fishers are not members of an association, and there is no mechanism for them to participate in fisheries management. Although the Minister may appoint a National Fisheries Advisory Board, he has not chosen to do so. There is no staff member at the Fisheries Division trained in the formation and strengthening of fishers' organizations.

The Act allows the Minister to create "local fisheries management areas", and to designate any fishermen's association as the Local Management Authority for that area; the SSMA has been created, and the LAMA of the SSMA has been designated as the Local Management Authority; fishers and fishers' organizations are involved.

There is much room for improvement in the provision of institutional support for fishers, fisher organizations, fishing communities and other stakeholders to participate in the management of fishery resources.

2.3 National Programmes to promote the Involvement of Fishers, Fisher Organizations, Fishing Communities and other Stakeholders in the Management of Fishery Resources

The Dominica **Fisheries Act No. 11 of 1987** specify a requirement for a Fisheries Advisory Committee (FAC) to be appointed by the Minister. Despite the legal requirement there is no FAC in place.

Communications with the fishing industry are now channelled through NAFCOOP. This mechanism puts the FD out of touch with the vast majority of fishers, as only a small minority of fishers in Dominica are members of co-operatives.

There do not appear to have been efforts to involve stakeholders other than direct resource-users. There has been little experimentation with other forms of participation in the management of fishery resources such as community enforcement and participatory monitoring.

2.4 Effectiveness of National- and Community-Level Participatory Approaches to Fisheries Management

Except for the SSMA, national- and community-level participatory approaches to fisheries management are at a rudimentary stage in Dominica, and have not yet had the opportunity to be effective. There is scope for deeper initiatives to be undertaken under the Master Plan being developed.

At present SSMA has a LAMA made up of representatives of stakeholder groups, which is responsible for its management. It would appear that this mechanism is working well.

2.5 *Socio-Cultural and Attitudinal Issues related to Participatory Approaches to Fisheries Management and Introduction of Alternative Livelihoods*

Baseline workshops were held with government staff and the community. The results are presented in the Chapter 6 of this report.

CHAPTER 3: PELAGIC FISH RESOURCE MANAGEMENT AND DEVELOPMENT COMPONENT

3.1 Policy, Supporting Legislation, and Fishery Development and Management Plans

There is no **National Fisheries Policy** for Dominica. There is a draft **Fisheries Development and Management Plan (Strategy) 2005-1010** [FDMPS 2005-2010] for Dominica.

Fisheries Development and Management Plan (Strategy) 2005-1010

The Dominica **Fisheries Act No. 11 of 1987** requires the implementation of a Plan for the Management and Development Plan for Dominican fisheries. Accordingly, a "Plan for Managing the Marine Fisheries of Dominica" was completed in May 1996 (FMP 1996). The most important management objectives by fishery were as followed:

- **Large pelagic fishery:**
  - Cooperate with members of ICCAT particularly Caribbean States to assess, protect and conserve the large pelagic resources;
  - Promote development of commercial and sport fisheries.
- **Coastal pelagic fishery:**
  - Achieve optimum level of exploitation;
  - Maintain fish habitats.
- **Lobster fishery:**
  - Rebuild stocks in depleted areas.
- **Conch fishery:**
  - Rebuild stocks in depleted areas;
  - Rebuild stock to sustainable levels.

Further, according to a recent survey conducted by Headley and Singh-Renton (2009), the most important management objectives of Dominica were:

- **Large pelagic fishery:**
  - Maximize employment opportunity;
  - Collaborate with international agencies for conservation of juvenile stocks;
- **Small coastal pelagic fishery:**
  - Maximize employment opportunity;
  - Protect Juvenile stock;
  - Habitat recovery and conservation.
- **Conch fishery:**
  - Maximize biological yield;
  - Protect juvenile stocks;
  - Habitat recovery and conservation;
- **Lobster fishery**
  - Maximize biological yield.

Management Policy Strategy

Based on the "Fisheries Regulations of 1989" several restrictions have been imposed on the exploitation of the fishery resources in Dominica such as:

- **Coastal pelagics**:
  - Minimum size for beach size.
- **Lobster fishery:**
  - Minimum-size limits:
  - Restriction on fishing gears: use of SCUBA, spear guns, loops are prohibited;
  - Prohibition on taking berried or molting individuals;
  - Closed season;
  - Ban on landing dead lobsters.
- Conch fishery:
  - Size restrictions:
    - minimum shell length and meat weight;
    - Harvesting only flared lip conchs permitted.
  - Closed seasons.

It is important to note that these regulations are not enforced; hence they are mostly used as a matter of "show" policy.

Legislation

The **Dominica Fisheries Act No 11 of 1987** is the major law that addresses the development and management of fisheries and the regulation of fisheries and fishing related activities in Dominica. This Act provides an institutional framework for the management, planning and development of fishery resources in Dominica. This Act is based on the harmonized OES legislation, and thus provides for:

(1) Creating fisheries management and development plans;
(2) Creating and enforcing fishing regulations;
(3) Licensing of local and foreign fishing vessels;
(4) Regulating the processing of fishing products;
(5) Regulating the exportation of fishing products;
(6) Regulating scientific/research and testing operations;
(7) Preserving marine resources by creating management and priority areas, and by establishing marine reserves;
(8) Appointing a Chief Fisheries Officer and such other Fisheries Officers and Officers;
(9) Creating a Fishery Advisory Committee;
(10) Entering into arrangement/agreements dealing with access or otherwise in regard to fisheries matters.

The Fisheries Act 1987 gives the Minister responsible for fisheries the authority to create new regulations for the management of fisheries as and when necessary. Under this framework, the "*Fisheries Regulations, 1989"* were created. These regulations replace the "Fisheries Rules of 1939" and create measures for the management of various fisheries, including the costal pelagic fisheries, and the conch and lobster fisheries.

Finally, in 1991 the government of Dominica also enacted **The Territorial Sea, Contiguous Zone, Exclusive Economic and Fishery Zone Act (1981)** that lays the framework for the management of natural resources within Dominican waters.

Enforcement of Regulations

The agencies involved in the enforcement of fisheries regulations in Dominica include:

- The Police Force of Dominica;
- The Coast Guard of Dominica;
- The Fisheries Division has the primary enforcement role for domestic fisheries, but the Police are called upon for arresting purposes.
- *Coast Watch Program*: an initiative of local fishers and dive operators aims at the informal control of illegal fishing.

Level of enforcement

- Poor coastal surveillance;
- *Problems*:
    - Enforcement of fisheries regulation is not a priority for the Coast Guard, likely due to limited human and financial resources;
    - Illegal foreign fishing is wide spread, but the Coast Guard responds only to specific alerts.

Level of compliance

- We cannot assess the level of compliance with fisheries regulations, because the Fisheries Departments did not complete and return the "Information Request Sheet" for this Baseline Survey.

3.2 Fishery Development Status regarding stated Policy Goals and Development and Management Objectives

No data or information was available to assess the development status regarding policy goals and management objectives in Dominica. This is because the Fisheries Division of Dominica did not fill out and return the "Information Request Sheet" of this baseline survey.

However, based on the stated management objectives reported by Headley and Singh-Renton (2009) we can see that the priorities of the Dominican government regarding management of the coastal pelagic and the lobster and conch fisheries have changed little. Hence, it appears that not much progress has been made in term of protecting the habitat of conch and lobster and in exploiting these resources at sustainable levels.

3.3 Fishery and Market Characteristics

FISHERIES CHARACTERISTICS

Exploited Species

Table 7 summarizes the exploitation and the management status of coastal pelagic fisheries in Dominica. Exploitation of coastal pelagic fish is mostly done by small artisanal fishers. Large pelagics such as wahoo, dolphinfish, king mackerel and blackfin tuna are primarily harvested by trolling gear, although longlines have also been used and are becoming more and more popular. Small coastal pelagic fish such as sardines (*Sardinella* spp.) and robins or scads (*Decapterus* spp.) are primarily caught in nearshore waters by beach seines. Flyingfish are mainly captured using gillnets (fillet net), handlines and dipnets after being attracted with tethered fish-attracting devices (FADs) and Chum (FMP 1996).

Lobsters are harvested on the island shelf mainly by Antillean Z-traps, although on the northeast coast some fishermen target this species using illegal trammel nets. Also, small catches of lobsters are taken by skin divers by hand.

Conch is the least harvested species in Dominica. They are harvested mostly off the northwest coast by skin divers over seagrass beds and coral rubble.

Table 7:
Status of Coastal Pelagic Fisheries in Dominica

	Stock Status		Fishery Status			
Species	Type of exploitation	Over-exploited	Developed	Sustainable	Monitored	Managed
Wahoo (*Acanthocybium solandri*)	Artisanal-Trolling, Longlining /Recreational			Yes		Not
Dolphin fish (*Coryphaena hippurus*)	Artisanal-Trolling, Longlining /Recreational			Uncertain		Not
Black fin tuna (*Thunnus atlanticus*)	Artisanal-Trolling, Longlining /Recreational			Uncertain		Not
King mackerel (*Scomberomus cavalla*)	Artisanal-Trolling, Longlining /Recreational			Uncertain		Not
Jack Mackerel (*Trachurus spp.*)	N	?				
Flying fish (*Hirundicthys spp.*)	Artisanal-Gillnet	?				Not
Sardines (*Sadinella aurita*)	Artisanal-Beach seine	?				
Scaled Herring (*Harengula Jaguana*)	N	?				
Atlantic thread herring (*Opisthonema oglinum*)	N	?				
Jack (*Selar spp.*)	Artisanal-Beach seine	?				
Robin (*Decapterus spp.*)	Artisanal-Beach seine	?				
Diamond back squid (*Thysanoteuthis rhombus*)*	N	?				
Conch (*Eustrombus gigas*)*	Artisanal	Yes		Endangered		Yes
Caribbean spiny lobster (*Panulirus argus)**	Artisanal- Z-Trap	Potentially		Not		Yes
Spotted spiny lobster (*Panulirus guttatus*)*	N					

Notes

****: These species are pelagic species but information is required on their status***

?: No data are available to evaluate the level of exploitation of these species in this fishery

N: Species are not exploited in the fishery or no catch records are available

Stock Status

The overall status of Dominica's coastal pelagic stocks is uncertain because of their regional dynamics. It is generally believed that most stocks are moderately exploited and their local exploitation is usually assumed to be sustainable. However, more formal studies need to be conducted to better understand the dynamics of these populations and to assess their level of abundance.

Further, the catch of large pelagic species in the Atlantic are commonly monitored by the International Commission for the Conservation of Atlantic Tunas (ICCAT 2008). Also, in 2004 the CRFM conducted an evaluation of wahoo stocks in the eastern Caribbean. This evaluation of the stock determined the wahoo catches to be sustainable in the region (CRFM, 2005).

Lobster populations off the south and west coasts of Dominica substantially declined in abundance in the 1990s. However, stocks off the northeast were generally considered to be healthy. A stock assessment conducted by FAO (Fisheries Technical Paper 313 cited by FMP 1996) estimated the potential yield of lobsters in Dominica to be 15 mt/year.

In the 1990s the conch stocks of Dominica were over-exploited. As a result the population abundance decreased and landings plummeted. During this period, sampling of shell length and meat size from the fishery pointed out that most of the catches comprised lobsters that were below legal size. Nevertheless an assessment done by FAO estimated that the potential of Dominican stock was 18 mt/year (Fisheries Technical Paper 313 cited by FMP 1997).

MARKET CHARACTERISTICS

All fish landings are directed toward local consumption. Most fish are sold fresh at landing sites to the public. However in1997 the construction of the Roseau Fisheries Complex was completed with financial support from the Japanese government. Since then fishers have been selling their catch mostly to this complex (FAO 2000). The Roseau Fisheries Complex is outfitted with cold storage and retail vending facilities, and has a slipway and ramp for the hauling of boats. The vendors in this complex act mostly as middlemen for local fishermen living in rural areas.

In 2004, the construction of the Marigot Fisheries Complex was completed. This complex is equipped with modern fish storage and hauling facilities, and was also funded by the government of Japan based on financial aid of US$14.4 million (AJTT 2009). Note that another fisheries complex is being built in Portsmouth with US7.4million from the Japanese Grant Aid Scheme. This complex will include the construction of a new jetty, ice-making, cold storage, a fish processing room, fishermen's lockers and machine shops (Rolle 2009).

Nevertheless, actual fish production is not sufficient to support an export market. During the off-season the country relies mostly on fish imports to satisfy local consumption. Prepared or preserved mackerel is among the most imported fishery products to Dominica, ranging from US$66,000 to US$335,000 annually from 1997-2007. Smoked marine fish are also in high demand on the Dominican market, with an average annual value of US$118,363 from 1997-2007. Small amounts of frozen lobsters are also imported, averaging US$3,625 in value per year from 1999-2007.

Table 8:
Value (US$'000) of some Processed Fishery Imports, Dominica, 1997-2007

	Year										
Fishery Products	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Lobsters (nei, frozen)	.	.	6	6	3	3	1	-	1	3	6
Mackerel (prepared or preserved)	72	335	89	87	81	66	69	100	99	107	197
Marine fish (smoked)	-	-	28	22	1	51	17	4	1	3	1

Catch and Effort

Pelagic fish catches are landed in about thirteen (13) landings sites on Dominica. Large pelagics are landed in nine (9) of these sites, whereas small pelagics were mostly landed in eleven (11) sites (Table 9). In the 1990s Newton and Colihaut had the most productive catches for large pelagics with approximately 94-95 lbs/trip; whereas Portsmouth, Layou and Fond St Jean fishers were the most productive in catching coastal pelagic, yielding 127-241 lbs/trip. Finally, Figure 1 shows the geographic distribution of these sites around Dominica.

Table 9:
Number of Fishing Trips and Average Yield per Trip,
Offshore and Coastal Pelagic Fisheries of Dominica, 1990-1992*.

Species category	Landing site	Activity (trips)	Landings	Yield/Trip
			(x1000 lbs)	Lbs
Offshore pelagic	Newton	1549	148.6	95.93
	Marigot	1467	102.5	69.87
	Fond Saint Jean	1327	121.1	91.26
	Pottersville	1005	64.1	63.78
	Saint Sauveur	990	84	84.85
	Mahaut	628	37.9	60.35
	Bioche	279	3.1	11.11
	Colihaut	258	24.3	94.19
	Portsmouth	169	14.6	86.39
Coastal pelagic	Pottersville	1191	64.1	53.82
	Layou	929	118.7	127.77
	Colihaut	821	85.2	103.78
	Portsmouth	808	195.3	241.71
	Dublanc	727	37.2	51.17
	Scotthead/Soufriere	605	33.1	54.71
	St Joseph	524	51.8	98.85
	Bioche	515	20.3	39.42
	Newtown	360	25.7	71.39
	Mahaut	349	33.9	97.13
	Fond Saint Jean	31	4	129.03

Source: Guiste et al. (1996)

Effort Data

The fishing industry in Dominica is usually considered a small-scale artisanal economic activity. Total effort, in number of boats used, has increased only from 993 vessels in 1994 to more than 1,100 in 2000 (FAO 2000). However, there has been a significant transition from dugout canoes to the more advanced keel boats, and recently to fibreglass reinforced plastic (FRP) vessels (15-30 feet). These vessels are propelled by outboard engines ranging from 15-225 hp (FAO 2000). A few of the larger vessels have been equipped with tuna longline wheels and tackle box to accommodate the fishing gear. In 2000, there were about 10 longline fishermen in Dominica, who were targeting migratory tunas.

Current effort data were not provided by the Dominica FD to this survey; therefore a present evaluation of level of fishing pressure on the exploitation of pelagic fish cannot be made over the

last decade. However Guiste et al. (1996) analyzed the level of fishing effort and productivity per landing site in Dominica. Their results for the pelagic fisheries are summarized in Table 9.

According to Table 9 Dominican fishers harvesting offshore pelagic fish made 7,672 fishing trips in 1992 yielding a total of 600,200 lbs of fish. Fishers from Newton and Colihaut were the most productive in catching large pelagics, averaging 94-95 lbs/trip.

In 1992, fishers harvesting coastal pelagic fish conducted 6,868 trips and harvestd a total of 669,300 lbs. Fishers working in Portsmouth, Layou and Fond St Jean had the most productive operations, averaging 127-241 lbs/trip.

Further, large pelagics are usually caught by trolling east of the island from canoes and keel boats and in the channel to the north and south (FMP 1996). In addition, longlining has been introduced in recent years and is becoming more and more popular.

Small coastal pelagics are captured in the shallow shelf and coral reef zone. The principal gear used in this fishery is the gillnet, beach seine and trolling line. Note that beach seines may be also used as encircling gear in deep waters.

Catch Data

Table 10 shows the temporal trends in landings for the most important coastal pelagic fish caught by the artisanal fishery of Dominica. Wahoo landings have fluctuated greatly, ranging from 6mt to 58mt from 1998 to 2007. Dolphin fish are the top pelagic species landed from 2002-2007. Their catches ranged from 52mt to 211mt during this period. Since 1999, catches of blackfin tuna have ranged from 20-83 mt. Finally king mackerel landings ranged from less than 0.5mt to 36mt. Note that these catch levels are likely to have been underestimated, as it appears that Dominica has not been consistent in reporting fishery data to FAO FishStat.

Table 10:
Estimated Landings (lbs)* of some Pelagic Fishes, Dominica, 1998-2007

Species	Year									
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Wahoo	58	50	46	11	37	10	6	12	16	15
Dolphin fish	.	.	.	.	211	153	118	53	177	170
Blackfin tuna	.	79	83	54	78	42	20	64	52	32
King mackerel	-	36	35	2	.	.	.	1	<0.5	<0.5

Source: FAO FishStat

Technology Improvement & Extension Programs

No data and information were provided by the Dominica Fisheries Division on this topic, because the Information Request Sheet of this survey was not filled out and returned. So, we cannot make any accurate report on technology improvement and extension programs.

Technical and Research Capabilities of the Dominica Fisheries Division

No data or information were provided by the Dominica Fisheries Division on this topic, because the Information Request Sheet of this survey was not filled out and returned. So, we cannot make an accurate report on the technical and research capabilities of the division. Also, note the survey conducted by Hardley and Singh-Renton (2009) also did not report on the experience and qualification of the staff of this Fisheries Division.

CHAPTER 4: AQUACULTURE DEVELOPMENT COMPONENT

4.1 Policy, Supporting Legislation, Development Plans

Policy and Supporting Legislation

There is no **National Fisheries Policy** for Dominica. There is a draft **Fisheries Development and Management Plan (Strategy) 2005-1010** [FDMPS 2005-2010] for Dominica.

The Fisheries Division (FD) of the Ministry of Agriculture, Lands, Fisheries and Forestry (MALFF) is the government office responsible for aquaculture policy making and for the co-ordination of all planning in this sector of the fisheries industry. The main objectives of the FD concerning aquaculture development are:

- to complement the supply from the marine capture fishery and therefore increase protein intake;
- to reduce expenditure of foreign exchange by cutting down fish imports;
- to create employment;
- to promote agricultural diversification by making use of marginal agriculture land and resources;
- to promote conservation of natural resources (wild and indigenous stocks);
- to increase overall socio-economic status of the people; and
- To ensure food security/sovereignty.

There is no national policy or written development plan for aquaculture; however the government at present has indicated that Aquaculture is a priority agenda item in Dominica.

The Fisheries Act of 1987 and the Draft Fisheries Regulations makes some provision for the establishment of aquaculture facilities, but is inadequate.

The Act can be deemed to be complemented by a series of laws issued by other ministries, such as the Ministries of Health and the Environment.

The Fisheries Division essentially acts as the permitting agency reviewing prospective aquaculture development projects on individual merit and degree of conformity to the national development objectives of the country.

There is a clear need for policy and legislation.

Institutional Support for Aquaculture in Dominica

Institutional support for aquaculture in Dominica is generally weak and falls under the jurisdiction of the Aquaculture Unit of the FD. In the past there has been collaboration between Dominica and other OECS countries. More recently the Government through the EU/PSDP initiative will be making soft financing available for aquaculture projects. There is also collaboration with the Ministry of Development.

4.2 Aquaculture Development Status regarding Stated Policy Goals and Development Objectives

Though there is public display of support by the government for aquaculture development in Dominica the feeling is that this level of enthusiasm does not translate to projects on the ground.

Markets to Martinique and Guadeloupe were lost due to absence of the phytosanitary standards prescribed by the EU and its sovereign states. To meet the EU phytosanitary standards legislation must be enacted to ensure proper process/production standards. Re-entry to these markets then demands that Government as a policy objective needs to develop legislation and safeguards to ensure compliance. The constant mention of markets for fresh Tilapia and Prawn within other OECS countries is, in essence, anecdotal and a proper market survey/and analysis should be conducted. The results of this survey would then guide the direction of the level and nature of investment and accompanying target points for same.

Loans for farmers interested in commercial aquaculture operations can be obtained either from the National Commercial Bank (a semi-government institution) and the Agricultural Industrial Development Bank (AIDB) under the Ministry of Development. The AIDB has established a main credit line of US$1 million for the development of the fishery and aquaculture industry, which however has been underutilized. The loans available through the above mentioned banks are offered at an annual interest rate of between 11.5-17% per year.

More recently the Government through the EU/PSDP initiative will be providing soft financing for aquaculture projects at an interest rate of 3%.

The current *ad hoc*/low-key sector development observed can be blamed on:

- Absence of a clear nationally accepted strategy, supporting policy objectives and accompanying legislation.
- Absence of clear definition of existent and potential; markets.

4.3 Aquaculture and Market Characteristics

Initial tilapia and freshwater prawn production was government controlled and benefited from subsidized rates of production with ex-farm prices of US$1.11 and US$5.50/pound live weigh of tilapia and shrimp respectively.

The government having divested itself of grow-out operations resulted in loss of subsidies and currently, marketable size products (i.e. 1 pound/fish and 10–15 prawns/pound) is US$6.51/Kg and US$11.89/Kg for a pound of live weight fish and prawns, respectively.

The ex-farm price for sea moss was approximately US$7.5 a pound of dried product. This is subsequently used within households to make a drink and porridge.

Weekly undetermined /undisclosed quantities of *Macrobrachium* and fresh whole gutted tilapia were exported to Martinique and Guadeloupe where the product is favored with high levels of market acceptance; however EU food safety requirements saw an end to this trade.

At present, production from aquaculture operations (like most of the catch of the capture fishery) is sold fresh, either in the vicinity of the culture sites or in small outlets in the major inhabited centers. Freshwater prawns are usually graded according to size, and mainly sold directly to hotels and restaurants. The existence of an offshore medical school population, a growing Asian population, and the high per capita consumption of fish, ensure growing market demand.

Once the private sector started producing the prawn with severely reduced production subsidies, costs became higher, which resulted in an increase in the retail price of the product.

4.4 Current Levels of Aquaculture Production by Species

The main focus is on fresh water culture. Dominica has an abundance of fresh water resources and available land for this type of culture. Assistance is required for the introduction of fresh water species other than *M. rosenbergii* and tilapia for which the technology is already known.

An analysis of the potential for Mariculture in Dominica needs to be undertaken, and expert advice given regarding suitable species and locations. There are very few sheltered bays in Dominica where such activity can be done. The coastline of Dominica is very much exposed, and with the incidence of hurricanes in the region, this could pose a serious challenge for pen- or cage-culture. However there are areas where sea water could be pumped into coastal enclosures i.e. tanks, to do intensive culture.

Inland Aquaculture

Presently there is an estimated 11 hectares of aquaculture operations in Dominica, with some 9,000 lbs (4,000 kg) of prawns, and 30,000 lbs (13,600 kg) of tilapia being produced annually; up from 1991 production figures of 67 kg and 266 kg for prawns and tilapia respectively.

The Asian freshwater prawn *Macrobrachium rosenbergii* and the Nile tilapia *Oreochromis niloticus* are the two species cultured in Dominica. The culture of the prawn is semi-intensive, and exclusively carried out in small earth ponds ranging between a few hundred square meters to a couple of thousand square meters.

Tilapia, on the other hand, is reared extensively, mainly in small earth ponds (several hundred square meters) and – at a much smaller extent – intensively in concrete tanks. The ponds are usually fed by a continuous flow of pumped freshwater or gravitational flow-through from small streams (the water is often recycled for irrigation).

Marine Aquaculture

The only marine species which has received considerable attention and is currently being cultured using a simple technology is a local strain of seamoss known as GT (*Gracilaria* sp.).

No reliable annual production estimates are available.

The Department of Fisheries organized a national workshop in August 1992 to inform and assist farmers to start a common production monitoring system. Despite this, production data has not been officially registered, due to the relatively small scale nature of the activity. It must be mentioned that over the years the production of seamoss has declined due to Hurricane effects.

The culture of seamoss was originally carried out on floating bamboo rafts, which have been replaced since 1990 by the long-line method, mainly due to its stronger resistance to wave action. The long-lines are made of polypropylene (¾-1 cm φ), 10–20 m long, suspended by used oil bottles and kept in position with concrete or metal anchors. The seamoss talli usually grow to the harvestable size within 4–6 weeks, and are harvested at about 50 mm from the rope, and usually individual plants are about 200 mm long. Production yields of GT grown on rafts are about 2 kg fresh weight per meter of line in two months. The majority of the culture plots were concentrated in the south-east coast and some locations in the south-west.

4.5 Knowledge on Aquaculture Issues by Category

With the anticipated global food crisis and impending fallout in sugar and bananas, aquaculture is being promoted to support agricultural diversification. This renewed interest will continue to limp along if the basic and fundamental framework and enabling environment to support the sector are not put in place

The low levels of productive capacity, despite the several interventions, indicate that there are hurdles – known or unknown – in place.

Possible issues that need to be addressed to support the renewed interest in aquaculture are as follows:

- Determination of the presence and abundance of appropriate clay soil and flat gently sloping lands
- Lack of National strategy.
- Lack of central government support
- Capacity of the Government hatchery to produce reliable high quality seed
- Lack of market survey
- Lack of inventory/zoning of suitable lands
- Absence of financial incentives; and
- High import tariffs on feed and associated imports.

Table 11. COST STRUCTURES

	US$
Electricity (Kwh)	0.29
Gas (/Litre)	1.50
Diesel (/Litre)	
Wild caught fish (/Kg)	4.59
Wild caught shrimp(/Kg)	
Farmed fish(/Kg) Tilapia	6.51
Farmed shrimp(/Kg)	
Fish Food(/Kg)	2.43
Farmed Prawns	11.59
Beef(/Kg)	2.0
Chicken(/Kg)local	1.8
Pork(/Kg)	2.4
Rice(/Kg)	2.70
Pond construction/Ha	7,000
Land costs Lease/Ha	?
Labor/week unskilled	92

4.6 Technical Aspects of Small-Scale Aquaculture Operations and Stock Enhancement

No stock enhancement program exists because the species being cultured are exotic species and cannot be placed into the natural environment. There is a great need for research on local species both for commercial use and for enhancement of wild stocks.

The potential exists for stock enhancement of *Macrobrachium carcinus* (local freshwater prawn) and other fresh water fish species which occur in the rivers of Dominica which are presumed to be good candidates for research. It is critical that the technology for hatchery rearing of those species be determined.

- The Agricultural Mission of Taiwan (Province of China)? constructed a marine hatchery at Canefield and began growing tilapia in saltwater, but the mission closed the facility for reasons unknown in 1998.
- With regard to the Asian freshwater giant prawn (*Macrobrachium* sp.), the Fisheries Division feels that the available hatchery technology is acceptable to world standards, particularly when considering the level of post-larvae survival. However, the refinement of the on-growing technology is presently affected by the lack of facilities and technical experience, particularly in the field of nutrition. It is the belief of the person in charge of the aquaculture unit and two farmers met, that the current brood stock is highly inbred, and an injection of new genetic stock is desirable.
- Coastal aquaculture (mariculture) to grow seamoss (*Gracilaria* sp.) in sufficient quantity to supply two local beverage manufacturers has been attempted on a number of occasions. The quantities demanded were never produced, so the beverage manufacturers have to import some of the raw materials (dried seamoss) from other neighboring islands. The problem of larceny and hurricane threat currently restrict any further expansion of this activity.
- A project to propagate hard and soft corals using local species for export and reef restoration was granted a license in 1998. The licensee attempted to export a shipment of stony corals which is listed on CITES Appendix II. The shipment was confiscated in the US, so only soft corals can be exported at present. The facility has however shifted focus and an intensive brackish water recirculation system is currently being used to produce tilapia. The continued viability of this system is questionable given the high cost of electricity and problems with marketing.

4.7 Technical and Research Capabilities of Fisheries

Dominica has its own state college, formerly named Clifton Dupigny Community College.

Some Dominicans get scholarships from the Cuban government to attend universities in Cuba. For higher education others go to UWI or to schools in the United Kingdom, the United States, or other countries.

Ross University, a medical school, is located in Portsmouth. In 2006, another medical school called **All Saints School of Medicine** opened in temporary facilities in Loubiere, with a permanent campus being constructed in Grand Bay.

The **Archibald Tropical Research and Education Centre**, a biological field station owned by Clemson University, is located at Springfield Estate between Canefield and Pond Cassé.

There was a marine biology school in Mahaut, I.T.M.E (Institute for Tropical Marine Ecology), however this facility is now closed.

There is also access to the UWI. Despite the presence of a tropical research station and marine lab, limited aquaculture training and research and development takes place on the Island.

The FD is made up of five units including the Aquaculture Unit. The Aquaculture unit is staffed by a senior fisheries officer (M.Sc. training) and an Aquaculture assistant (farm-based training) who pilot and direct the day to day affairs of the field station and *macrobrachium* hatchery

The aquaculture activities at the government field station have stopped due to resource-use conflicts associated with the PetroCaribe Fuel Storage and Refinery facility.

The Fisheries Division provides as much support as possible to the private sector with regard to advice and extension. The support provided to interested investors and existing farmers include (i) land survey for site suitability,

(ii) technical assistance for pond construction and water management; and

(iii) facilitating the supply of prawn post-larvae and tilapia fry, free of import duties or at subsidized cost.

From time to time there have been overseas volunteer persons from China (Taiwan) and Japan; however the cultural differences usually develop into feelings of mistrust, and technology transfer is not effective.

It would appear as though there is need to develop an aquaculture policy and have it approved in order to provide the context for the legislative and institutional arrangements and an aquaculture development plan that would cover research, technology transfer, training, fiscal incentives, environmental protection, SPS, marketing, etc.

CHAPTER 5: REGIONAL FISHERIES DATABASE DEVELOPMENT COMPONENT

5.1 Policy and Data Management Documents

There is currently no policy or documented data management plan that is used to guide the Fisheries Information System (FIS) of Dominica. There are some general understandings of the process, but it does leave room for misinterpretation and subjectivity, which may lead to inconsistency.

There is some level of screening before certain data is deemed accessible to certain clients. Personal information such as fishers names, date of birth and contact details are treated as being very sensitive data.

5.2 Data Collection – Current Situation

There are about 32 landing sites on the island, with the majority on the west coast. A map of the landing sites is shown in Chapter 1. Locally thirteen (13) landing sites are utilized as fish catch and effort sampling sites. The fisheries targeted for collection of catch and effort data are large pelagics (such as Yellowfin Tuna, Dolphinfish, Marlin), demersals (such as snappers and groupers) and small coastal pelagics (such as ballyhoo and jacks).

Data is collected on catch and effort as well as the registration of fishers and vessels. Below is an outline of the data fields collected based on the field collection sheets and the registration forms:

Data Fields Collected:

a. With regard to fish catch and effort:
   i. weight of fish caught/landed at a landing site;
   ii. identification of fishing vessel which made the landing;
   iii. description of the fishing operations of that boat; including the gear used, crew size, area fished, time spent fishing, and whether the vessel was motorized for that trip
   iv. name of the species of fish caught;
   v. description of the type of fishing vessel

b. For registration of fishers:
   i. Basic personal data: name, date of birth, sex, address, contact number, ID, family status
   ii. Basic details of one or more contact person (or next of kin): similar to above
   iii. A recent photo of the fisher
   iv. Industry role of the fisher (whether boat owner, captain, crew or vendor)
   v. Fisher group or co-operative affiliation
   vi. Education level and status as well as fisheries experience and training
   vii. Identification or registration number, operating site (landing site) and operations conducted on all applicable fishing vessels
   viii. Registration number of the fisher (issued by the FD)

c. For registration of fishing boats:
   i. Registration number of the boat (issued by the FD)
   ii. Description of the boat: dimensions, color, materials of construction,
   iii. Names of all persons affiliated with the vessel (owner(s), captain, crew)
   iv. Propulsion method, including engine details (if engine is used)
   v. Safety equipment carried
   vi. Details on the boat maker (name, address, when built boat)

All data is collected by staff of the FD. Fish catch and effort information is captured on site at the time of landing by field data collectors. Registration details are captured in-office by the secretary or other Fisheries Officer . There are nine (9) Data Collectors (DC) who work towards capturing fish catch and effort data. There is the secretary plus five Fisheries Officers who are available for registration of fishers and boats.

5.3 Data Management – Current Situation

The Fisheries Division of the Ministry of Agriculture, Fisheries and Forestry is the sole agency responsible for the fisheries database. Two computers are currently utilized by the FD for FIS activities (Appendix 2). There are two full-time staff members responsible for the FIS, plus the secretary who works part-time with the registration database. MS Access is used for data entry and storage. The rationale for using this programme is that this was the only database-building application that the Officer responsible for the FIS was familiar with. No other staff member has database building skills. No strict timeline for data entry is exercised. Data is usually entered after books are returned to the office by DCs. Data is checked for errors before analysis. Basic analysis is conducted on the data, such as production estimates. No stock assessments are done in house.

5.4 Information Dissemination

Currently the data gathered is not published. The agencies who request information on a regular basis are the FAO, ICCAT and the Central Statistical office of the Government of Dominica. Certain non-sensitive information can be provided to the public upon request to the FD.

The information in the database is used to guide management decisions, but only in a limited manner. There are limited mechanisms currently available informing or involving fishers and others involved in the planning and decision-making process.

5.5 Gaps in the Capacity for Management of Fisheries Information Systems

1. Human Resources

The number of staff members in the Dominica Fisheries Department is what reasonably would be required to effectively collect and manage the national fisheries data. The table below summaries the current situation, and recommends the optimal staff complement.

Position	Current Staff Complement	Recommended Staff Complement	Gap	Training Required**
Data Manager-Administrator	0	1	1	Yes
Data Collectors*	9	9	0	Yes
Data Input Clerks	2	2	0	Yes
Fisheries Statistician	0	1	1	Yes
Total	**11**	**13**	**2**	

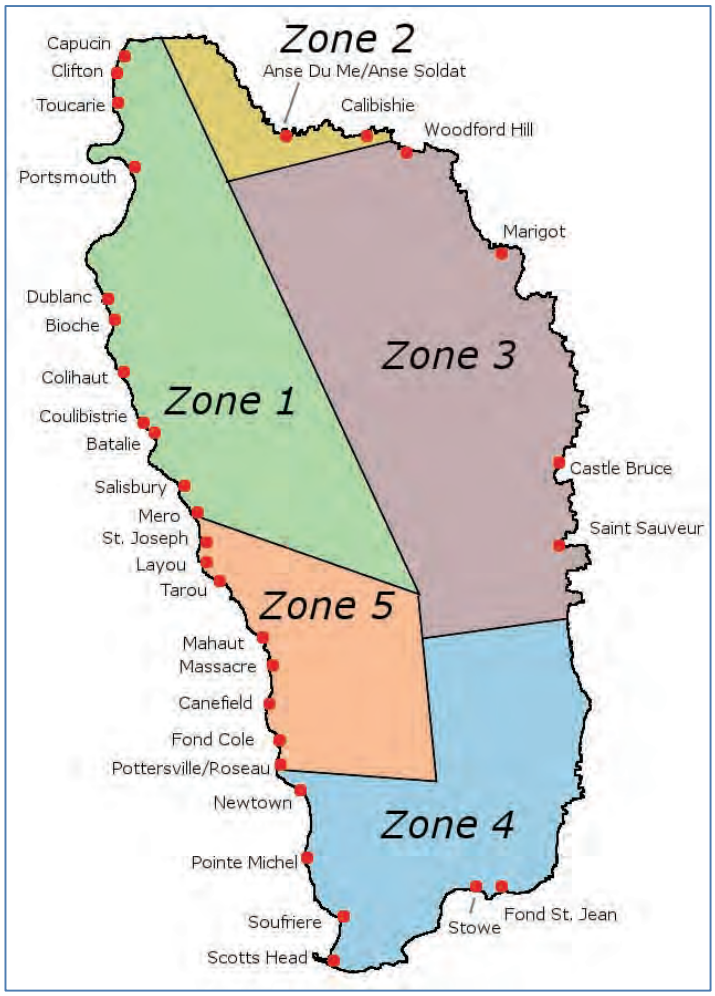
** some of these data collectors can be based at selected field locations based on logistics and level of fishing at the sites to ensure efficiency.*
***Training is required also in CARIFIS and it is necessary for this training to be conducted in-house with real data after gaps in the computer infrastructure are dealt with (as outlined below).*

2. Equipment

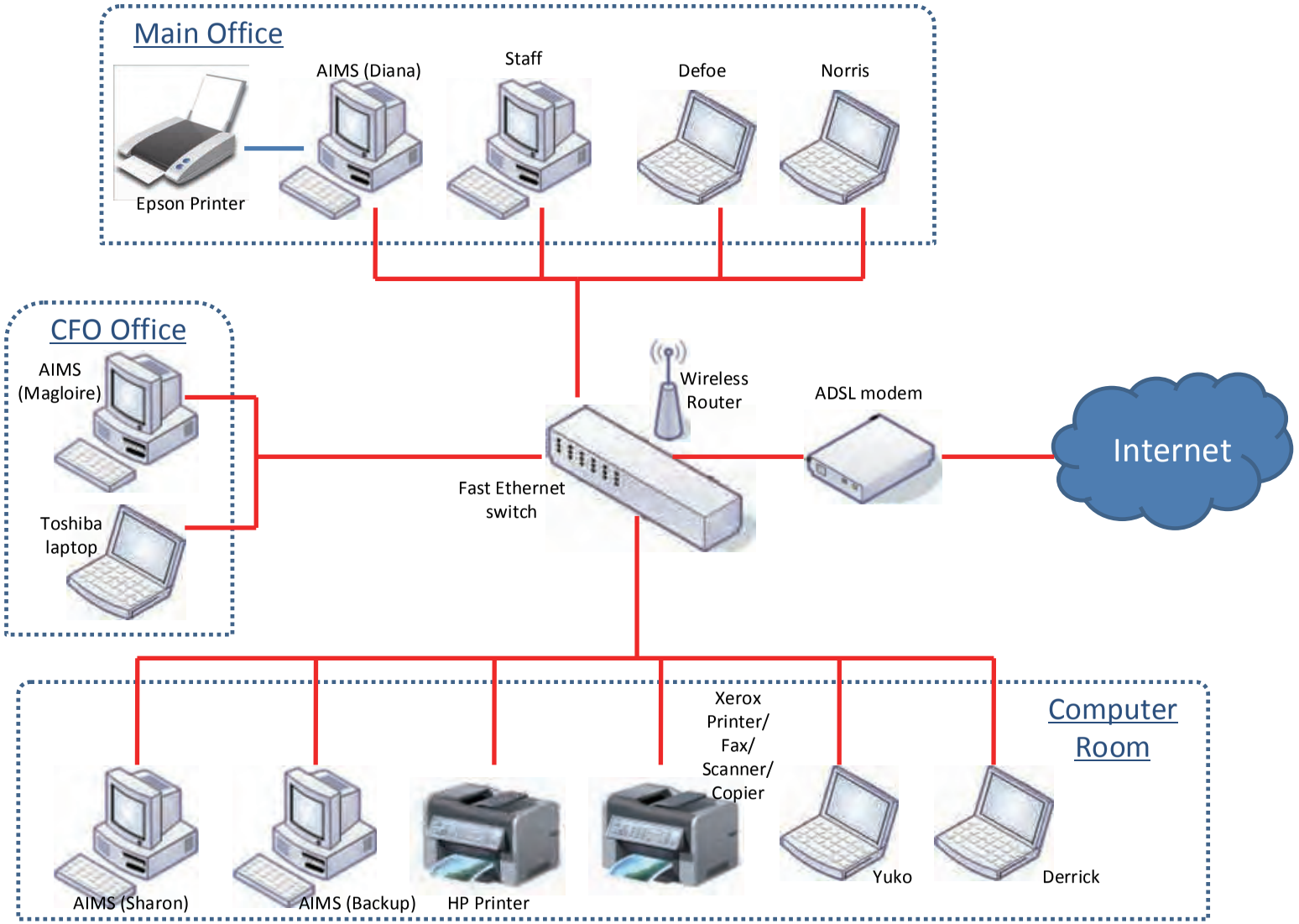
There is a lack of equipment to effectively input, store and manage the fisheries data. Though some equipment is available for use, these are not dedicated to the Fisheries Information System, and this will have implications for safety of data as well as access to the data. The system requires at a minimum:

- One (1) dedicated Desktop Workstations for data input
- One (1) Desktop Workstations for validation of data, summary statistics, and data assimilation
- One (1) field-hardy laptop
- One (1) UPS dedicated for the FIS
- One (1) external hard drive (desktop)
- One (1) external hard drive (portable) that can be kept off-site

Index	LANDING SITE	Zone
1	Anse du Me	2
2	Batalie	1
3	Bioche	1
4	Calibishie	2
5	Canefield	5
6	Capuchin	1
7	Castle Bruce	3
8	Clifton	1
9	Colihaut	1
10	Coulibistrie	1
11	Dublanc	1
12	Fond Colé	5
13	Fond St. Jean	4
14	Layou	5
15	Mahaut	5
16	Marigot	3
17	Massacre	5
18	Mero	1
19	Newtown	5
20	Pointe Michel	4
21	Portsmouth	1
22	Pottersville	5
23	Roseau	5
24	Saint Sauveur	3
25	Salisbury	1
26	Scott's Head	4
27	Soufriere	4
28	St. Joseph	5
29	Stowe	4
30	Tarou	5
31	Toucarie	1
32	Woodford Hill	3



FD Network Plan



6. RESULT OF THE BASELINE WORKSHOP

6.1. Output from Workshop with Staff of the Fishery Division

Brief Overview of the Workshop

The workshop was held at the conference room of the Fisheries Division on the 29th of September 2009 in which the Chief Fisheries Officer and 8 staff participated. The basic question (workshop theme) was discussed among the participants and decided as follows: "How can the Fisheries Division improve the sustainable management and development of the fisheries sector?"

Problems Analysis

The key problem to be solved was identified as follows:
Fishermen's organizations do not function well at present.
The following 2 problems were analyzed as the major causes:
The low level of participation among members of the organization
The fact that 25% of fishermen do not register as coop members

ID/OS analysis

The ID/OS method was applied to the workshop in the Fisheries Division. The workshop analyzed external and internal factors (problems, conditions, potential and so on) regarding the basic question, "how fisheries division can improve sustainable management and development of fisheries sector" for the Fisheries Division. Participants pointed out 15 opportunities and 26 threats in the external factors of the Fisheries Division. Following five external factors then were selected as key subjects by the participants:

A fisheries complex for fishermen to operate in (Marigot, Roseau) set to come to Portsmouth
Acquisition of a research boat by JICA to continue research work
Mining/quarry practice alteration of the seabed
A lack of political will to enact fisheries regulations
Illegal fishing actions by French nationals impacting on the fishery potential of local fishers

In the same way, 22 strengths and 10 weaknesses were identified in the internal factors and then the following 5 strengths and 5 weaknesses were selected as the most important internal factors by the participant.

(Strengths)
Development of infrastructures at landing sites
Dedicated and committed staff
5yrs development plan in place
R&D in ghost fishing
Establishment of fisheries division basic fisherman training course

(Weaknesses)
Duty free concession on vehicles for traveling officers (on the field)
Need for specialized training for staff
Lack of permanent employment for staff numbers, hindering their personal development
Limited capacity for fisheries data analysis
Need for implementation of monthly newsletters by fisheries division to broadcast activities of the division

Two external factors were then identified as indications of Strategic Options, which relate to the CRFM/JICA project.

A fisheries complex for fishermen to operate in (Marigot, Roseau) set to come to Portsmouth
Acquisition of a research boat by JICA to continue research work

Two internal weaknesses were also identified. Overcoming these will be an effective strategic option for improving fisheries management and development.

Need for specialized staff training
Limited capacity for fisheries data analysis

*result of the workshop is attached at the end of this chapter

6.2. Output from Workshop with Local Fishers

Brief Overview of the Workshop

The workshop was held at seven fishing communities as shown in Table 12.

Table 12: Fishing communities where the workshop held

Name of Fishing community	Date of Workshop	Number of Participants
Anse De Mai	30 September 2009	13
Marigot	30 September 2009	7
Fond St. Jean	2 October 2009	10
Scotts Head	5 October 2009	7
Portsmouth	6 October 2009	9
Roseau	7 October 2009	10
Dublanc	8 October 2009	17

Summary of the Community

The characteristics of the communities in which the workshop were held were shown in Table 13.

Table 13: The characteristics of the communities

Name of Fishing Community	Location of the Community	Number of Fishing Boats
Anse De Mai	North	20 boats
Marigot	North-Eastern area	40-45 boats
Fond St. Jean	South-Eastern area	13 boats
Scotts Head	South-Western area	51 boats
Portsmouth	North-Western are	25 boats
Roseau	South-Western area	N/A
Dublanc	North-Western area	30 boats

Present Status of Local Fishery

The fish targeted by local fishers has shifted from small inshore species to larger offshore species over the 10 years of FADs usage. However, their catches have often fluctuated from year to year. In particular, the fishing periods for dolphin fish are similar for any landing sites around the island. It may show that there is a relationship between the fishing period and the spawning migration during the period March to May (Figure 1).

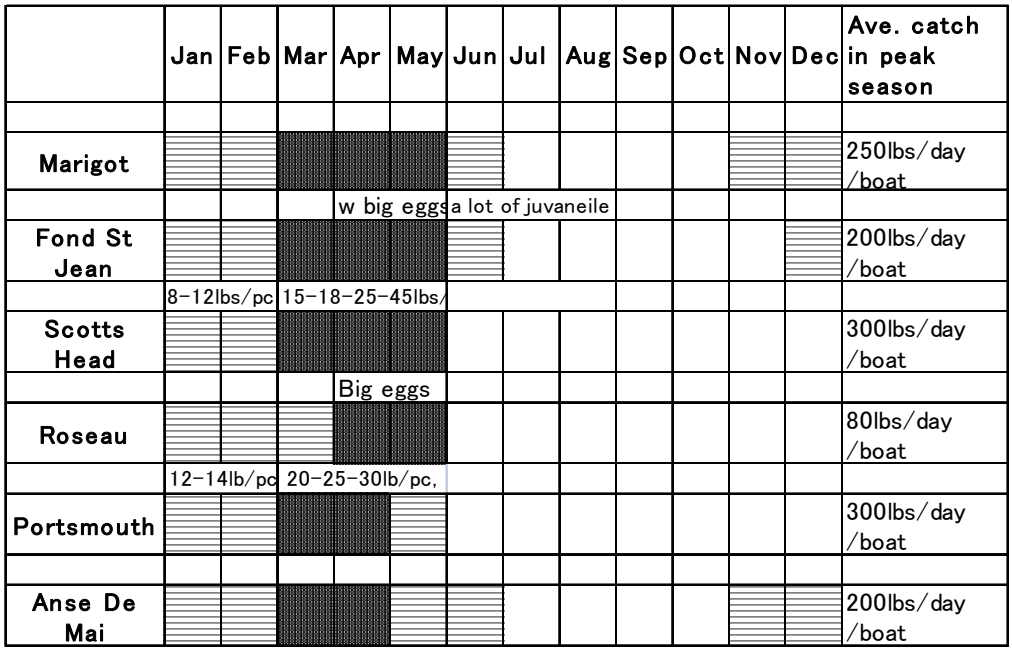


Figure 1: Fishing Period of Dolphin Fish

The fishing period for yellowfin tuna is not synchronized among the fishing areas. Two groups of tuna may exist (Figure 2).

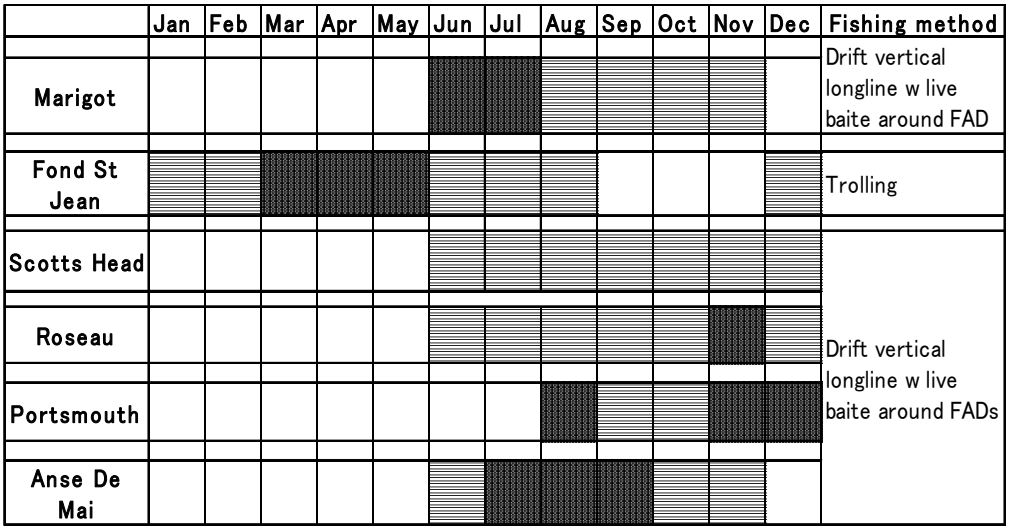


Figure 2: Fishing Period of Yellowfin Tuna

Needs of Local Fishers

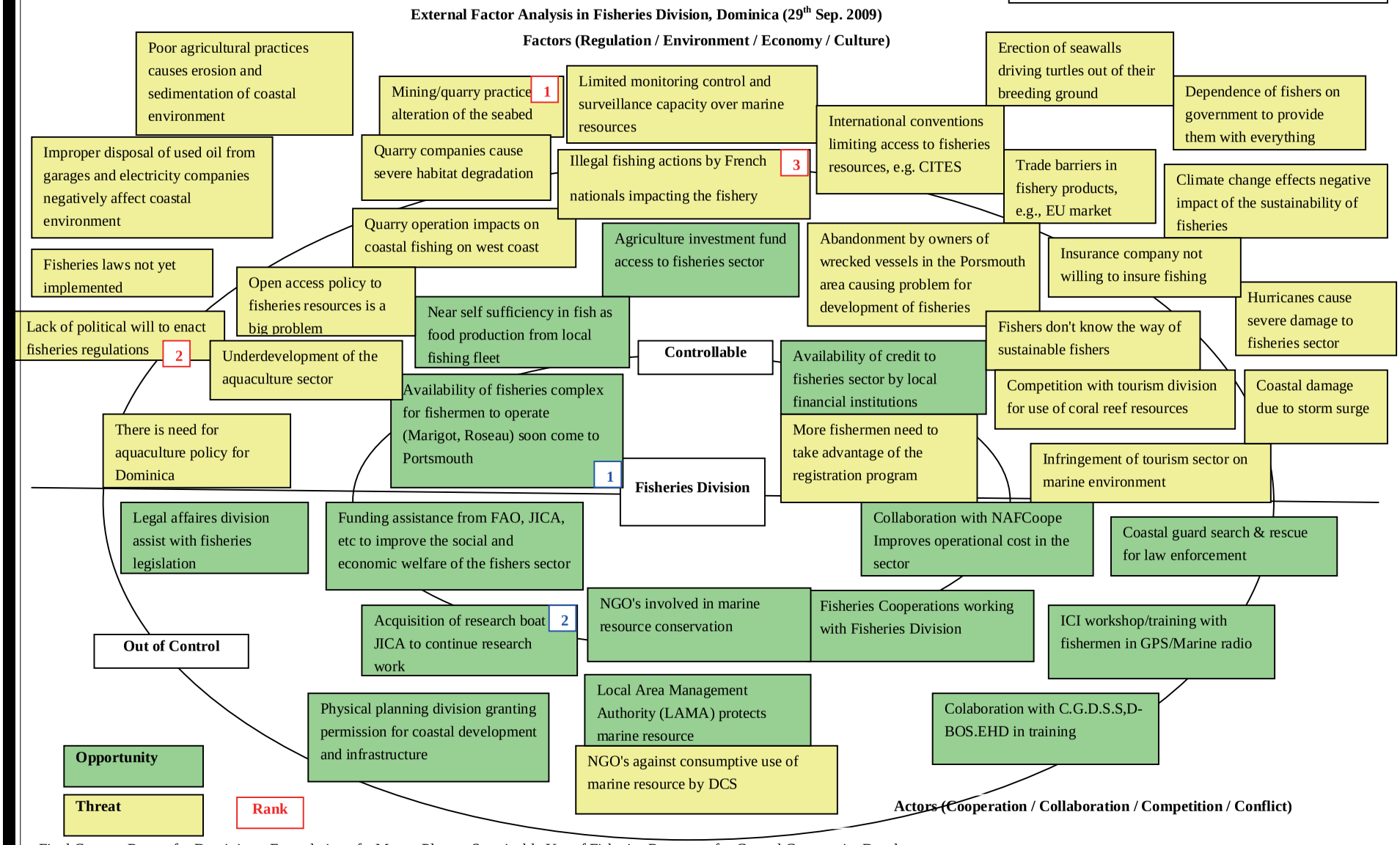
FADs are popular among local fishers. However, the increased number of deployed FAD members has also sparked some conflict within local fisher groups. These circumstances mean local fishers deploy their FADs in discreet areas, hence expanding the area of FAD fishing and increasing the operational costs. Moreover, the life spans of FADs are shortened due to the lack of skills among local fishers in assembling and deploying them. Such issues concerned with FADs must be solved.

6.3. Key issue identified for the coastal resource management in the Workshops

In the workshops with the staff of Fisheries Division and local fishers, FAD management by participatory approach was identified as key issue for the sustainable use of coastal resources.

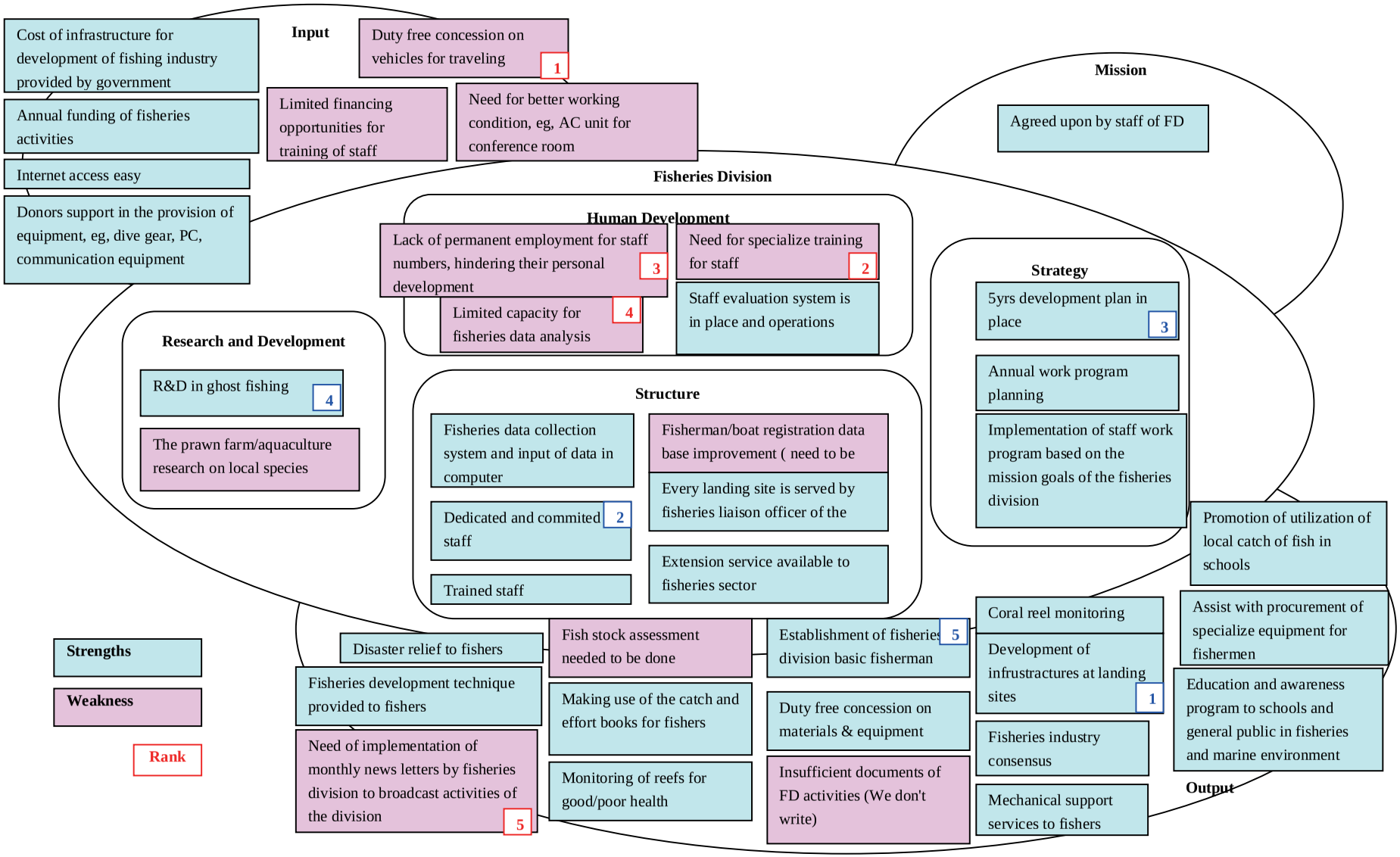
RESULT OF THE ID/OS WORKSHOP (External Factor Analysis)

Basic Question
How can Fisheries Division improve sustainable management and development of fisheries sector?



RESULT OF THE ID/OS WORKSHOP (Internal Factor Analysis)

Appendix 4-4-3 **Internal Factor Analysis in Fisheries Division, Dominica (29th Sep. 2009)**



VI. REFERENCES

AJTT, 2009. *What' news*. Website of the Embassy of Japan in Trinidad and Tobago. December 1, 2004. www.tt.emb-japan.go.jp/dominica/marigot-fisheries-complex.htm

CRFM. *Report of the first annual CRFM scientific meeting*. 22-30 June 2004. Published by the Caribbean Regional Fisheries Mechanism Secretariat, Belize City, Belize. CRFM Fishery Report No. 11. 318p. 2005.

CRFM. *Report of the fourth annual scientific meeting*. Kingstown, St Vincent and the Grenadines. 10-20 June 2008. Caribbean Regional Fisheries Mechanism Secretariat, Belize City, Belize. CRFM Fishery Report 2008, 76p. 2008.

DOMINICA. *Fisheries Act, 1987*. The Dominica Fisheries Act No 11 of 1987.

DOMINICA. *Fisheries Census of Dominica 2008*. Fisheries Division, Ministry of Agriculture, Fisheries and Forestry. May 2008.

DOMINICA. *Fisheries Development and Management Plan (Strategy) for 2005-2010*. Fisheries Division, Ministry of Agriculture. May 2005.

DOMINICA. *Medium-Term Growth and Social Protection Strategy (GSPS)*. Fisheries Division, Ministry of Agriculture. April 2006.

ESPEUT, Peter. *A Socioeconomic Baseline Survey of Thirty Fishing Communities in Twelve CARICOM Countries*. Report of a survey conducted for the Caribbean Natural Resources Institute, (CANARI), Vieux Fort, St. Lucia, W.I., for the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP), Belize City, Belize, C.A., 1994.

FAO. *FAO Fishery Country Profile: Commonwealth of Dominica*. April 2002.

GUISTE, Harold. *Consideration of Socio-Economic and Demographic Concerns in Fisheries and Coastal Area Management and Planning in Dominica.* In TIETZE, Uwe, Milton HAUGHTON and Susana V. SIAR (Eds.). **Socioeconomic Indicators in Integrated Coastal Zone and Community-Based Fisheries Management: Case Studies from the Caribbean.** Rome: FAO. 2006.

GUISTE, H., B. GOBERT, G. DOMALAIN. *Statistical analysis of the fisheries of Dominica (West Indies)*. Dominica Fisheries Division. Document Scientifque du Centre ORSTOM de Brest. 53p. 1996.

HEADLEY, M., and S. SINGH-RENTON. *A questionnaire study providing and overview of fisheries management priorities and the existing supporting technical framework within 13 CRFM countries*. CRFM Research Paper Collection. Volume 5. No, 2. 39-143p. 2009.

ICCAT. *Report of the standing committee of research and statistics*. Madrid Spain, September 29-October 3, 2008. International Commission for the Conservation of Atlantic Tunas. 2008 SCRS Report, 241p. 2008.

LOVATELLI, Alessandro and Luigi LORIA. *Status Report on Caribbean Aquaculture.* Mexico City: FAO. 1993

PROJECT GLOBAL. *Country Profile: Dominica*. n.d.

ROLLE, H. *PM ensures that Portsmouth Fisheries Complex is coming soon*. **Dominica Online News**. September 7, 2009. www.dominicanewsonline.com/politics/7217.html

SEVERIN, Reginald Oliver. *Dominica Fisheries Industry: Current Status, Challenges and Prospects*. **Economic & Financial Review.** Eastern Caribbean Central Bank. 2005.