

NATURAL RESOURCES SYSTEMS PROGRAMME
PROJECT REPORT¹

DFID Project Number

R8134

Report Title

Belize case study: Marine protected areas co-managed by Friends of Nature.
Annex B(IV) of the Final Technical Report of project R8134.

Report Authors

Pomeroy, R.S. and Goetze, T

Organisation

Caribbean Conservation Association

Date

2003

NRSP Production System

Land Water Interface

¹ This document is an output from projects funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.



**BELIZE CASE STUDY:
MARINE PROTECTED AREAS
CO-MANAGED BY FRIENDS OF NATURE**

Robert S. Pomeroy and Tara Goetze

Caribbean Conservation Association (CCA)

in association with the
University of the West Indies
Centre for Resource Management and Environmental Studies (CERMES)
and
Marine Resources Assessment Group Ltd. (MRAG)



2003

Acknowledgements

The authors thank the staff of Friends of Nature for their assistance in preparing this report.

Contents

Executive summary.....	1
1 Introduction	2
2 Research framework	3
2.1 Definitions and concepts	3
2.2 Research framework	5
2.3 Pro-poor perspectives	7
3 Case study overview	7
4 Research methods	9
5 Resource assessment.....	10
5.1 Reef conservation and MPAs in the western Caribbean.....	10
5.2 Reef conservation and MPAs in Belize	10
5.3 Southern Coastal Zone and Southern Reef Complex of Belize	12
5.3.1 Coastal Southern Belize.....	12
5.3.2 Laughing Bird Caye National Park	14
5.3.3 Gladden Spit (Silk Cayes) Marine Reserve	16
5.3.4 Placencia Lagoon.....	19
5.3.5 Fisheries.....	20
5.3.6 Other Concerns and Issues.....	24
6 Socioeconomic attributes	24
6.1 Stakeholders	24
6.2 Fishing.....	26
6.3 Tourism	27
6.4 Seaweed Production	29
6.5 Shipping	29
6.6 Oil Prospecting.....	29
6.7 Other Economic Activities	29
6.8 Public Services and Infrastructure.....	29
6.9 Fish Market Characteristics.....	30
6.10 Perceptions	32
6.11 Alternative livelihoods for fishermen and other residents.....	33
6.12 Poverty profile	33
7 Community-level Institutional and Organizational Arrangements	35
7.1 Management of the Laughing Bird Caye National Park	36
7.2 Management of Gladden Spit Marine Reserve	37
7.3 Friends of Nature.....	38
7.4 Government Structure.....	40
8 External to the Community Institutional and Organizational Arrangements including Integrated Coastal Management.....	40
8.1 Coastal Zone Management Authority and Institute	40
8.2 Department of Environment	43
8.3 Belize Tourist Board.....	43
8.4 Fisheries Department.....	43
8.5 Forestry Department	43
8.6 Meso-American Barrier-Reef System (MBRS) Project.....	44
8.7 Ministry of Natural Resources	44
8.8 Belize Port Authority.....	44
8.9 Marine Protected Areas.....	44
8.10 Belize Barrier Reef World Heritage Site	47
8.11 COMPACT	47

9	Exogenous Events	47
10	Co-management incentives and patterns of interaction	49
11	Outcomes and performance of co-management arrangements in Belize and FON	53
12	Conditions for successful co-management at FON.....	54
12.1	Type of co-management	54
12.2	Phase of co-management	55
12.3	Conditions for co-management	55
12.3.1	Boundaries	55
12.3.2	Membership and stakeholders	55
12.3.3	Resource use problem	55
12.3.4	Management objectives	55
12.3.5	Scale of management	56
12.3.6	Management adaptation.....	56
12.3.7	Cooperation.....	56
12.3.8	Leadership.....	56
12.3.9	Collective action	56
12.3.10	Conflict management.....	56
12.3.11	Effective communication.....	56
12.3.12	Effective coordination	56
12.3.13	Trust and respect.....	57
12.3.14	Organizational capacity	57
12.3.15	Financial resources	57
12.3.16	Net benefit	57
12.3.17	Representation in decision-making	57
12.3.18	Enforcement	57
12.3.19	Property rights	57
12.3.20	Sharing decision-making	58
12.3.21	Decentralization and delegation	58
12.3.22	Social and cultural fit	58
12.4	Priority Action	58
13	References.....	58
14	Appendix	64
14.1	Appendix 1: Project case study summaries	64
14.1.1	Barbados	64
14.1.2	Belize.....	64
14.1.3	Grenada	64

Figures

Figure 2.1.	Sliding scale showing various degrees of co-management.....	4
Figure 2.2	Degrees and labels of co-management.....	4
Figure 2.3.	Phases of co-management.....	5
Figure 2.4.	Modified ICLARM/IFM Institutional Analysis and Design Research Framework	6
Figure 3.1	Belize country map	8
Figure 3.2	Districts in Belize	8
Figure 8.1	The three zones proposed in the MPA Initiative	46
Figure 9.1	Post-Iris coral reef assessment showing hurricane path	48

Tables

Table 5.1	Comparison of coral health at selected areas in Belize	17
Table 6.1	Populations of coastal villages.....	25

Table 6.2 Numbers of registered fishers and vessels in FON communities	26
Table 6.3 Number of tour guides	27
Table 6.4 Number of tour operators.....	27
Table 6.5 Number of hotels.....	28
Table 6.6 Number of rooms	28
Table 6.7 Number of hotel employees	28
Table 6.8 Occupancy rates (%)	28
Table 6.9 Placencia Producers Cooperative 1988-2002 membership and production (lbs.).....	31
Table 10.1 Unsustainable fishing practices	49
Table 10.2 Tourism industry	49
Table 10.3 Improper land use	50
Table 10.4 Effluents	50
Table 10.5 Management of MPAs	50
Table 10.6 Policy and enforcement	51
Table 10.7 Transboundary	51
Table 10.8 Coral	52
Table 10.9 Mangroves	52
Table 10.10 Seagrass beds	52
Table 10.11 Fish population.....	52
Table 10.12 Water quality	52

Boxes

Box 1.1 Structure of call for proposals	2
Box 2.1 Main analyses included in the framework.....	6

Citation

Pomeroy, R.S. and T. Goetze. 2003. Belize case study: Marine protected areas co-managed by Friends of Nature. Caribbean Coastal Co-management Guidelines Project. Caribbean Conservation Association, Barbados. 69p.

This document is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

Executive summary

This case study focuses on Friends of Nature (FON), a non-governmental organization based in Placencia, Belize which has co-management responsibility (with Forest Department and the Fisheries Department) for day-to-day management of Laughing Bird Caye National Park (LBCNP) and Gladden Spit Marine Reserve (GSMR). The areas of specific interest in this case study are the southern coastal zone and the Southern Reef Complex that includes the two MPAs that are co-managed by FON and the government. Both MPAs lie within the Meso-American Barrier Reef Reserve System. In addition to the two MPAs, FON has become active in the management of the Placencia Lagoon. Fishing and tourism dominate the cayes-based economy of the area. Threats to the marine and coastal resources include unsustainable fishing practices, tourism industry, improper land use, effluent discharges, policy and enforcement, and transboundary issues. The type of co-management used by FON is that of co-management of public protected areas between government and FON with a local advisory committee. This is regarded as a delegated form of co-management where management authority is delegated to local institutions (in this case FON). In return, the government is informed, and reviews and endorses, where it sees fit, decisions to be taken by FON. The establishment of co-management can be viewed as having three phases: pre-implementation, implementation, and post-implementation. The co-management arrangement with FON is currently in the implementation phase. FON has a strategic plan, a Board of Directors, an Executive Director and staff. It has an office and equipment. A management plan exists for both MPAs. Financing has been secured for the immediate future. The MPAs are in operation and the resources are being conserved. However, there are both positive and negative aspects of the co-management arrangement with FON.

1 Introduction

The purpose of the Caribbean Coastal Co-management Guidelines Project is to ensure that mechanisms for implementation of integrated pro-poor natural resource management in coastal zones are developed and promoted. This is assisted by understanding the requirements for establishing successful co-management institutions for coastal resources under various conditions in the Caribbean. These ideals reflect the policy and objectives of the United Kingdom (UK) Department for International Development (DFID) on eliminating world poverty. The project is part of the Natural Resources Systems Programme (NRSP) Caribbean programme for Land Water Interface (LWI) production systems. This component of the NRSP has the purpose: *“Benefits for poor people in targeted countries generated by application of new knowledge to natural resources management in the land water interface”*. It entails:

- ❖ An understanding of livelihood strategies;
- ❖ An understanding of natural resource management opportunities;
- ❖ Identification of the means to implement management opportunities relevant to the poor.

The project is a response to a September 2001 call for proposals from the NRSP to implement parts of the LWI logical framework (or logframe) (Box 1.1).

Box 1.1 Structure of call for proposals

Output 1: Improved resource-use strategies in coastal zone production systems developed and promoted

Activity 1.3: Mechanisms for implementation of integrated pro-poor natural resource (and pollution prevention) management in coastal zones developed and promoted

Sub-activity 1.3.1: Mechanisms for the improvement of sustainable livelihood outcomes for poor people living in coastal zones through integrated participatory resource management and prevention of pollution developed and promoted

Sub-activity 1.3.1, milestone (b): Understanding the requirements for developing successful co-management initiatives and mechanisms for promoting them

Target region: Caribbean

Source: DFID-Natural Resource Systems Programme

Project implementation is lead by the Caribbean Conservation Association (CCA) under its Coastal and Marine Management Programme (CaMMP). Project partners are the Marine Resources Assessment Group Ltd. (MRAG) of the UK and the Natural Resources Management (NRM) Programme of the University of the West Indies (UWI) Cave Hill Campus in Barbados where the CCA has its office. The execution period is 1 April 2002 to 30 June 2003 (15 months) with a budget of £87,112 (or approximately \$125,000 US dollars).

The Caribbean Coastal Co-management Guidelines Project seeks to ensure that people in the Caribbean, especially the poor, can effectively engage in successful partnerships with government for sustainable livelihoods in the context of well-managed coastal resources. The study addresses both the natural resource and human institutional aspects of co-management. Through a series of participatory investigations in case studies of conditions that favour, or do

not favour, the co-management of coastal and marine resources at selected sites the project derives guidelines for developing successful co-management in the Caribbean. Uptake is promoted by interaction with target institutions and potential beneficiaries, and wide dissemination of outputs. The project's main outputs are listed below.

1. Selection of co-management analysis research framework
2. Ecological and environmental assessments of the natural resource systems and their utilisation
3. Institutional, socio-economic, cultural, political and other human dimension assessments
4. Comparison of how the natural resource and human factors assessed in 2 and 3 favour or constrain the establishment of successful, pro-poor and integrated co-management
5. Development of regionally applicable guidelines on successful, pro-poor and integrated co-management in the wider Caribbean
6. Capacity of target institutions and beneficiaries for co-management built through project participatory processes

This case study report is intended for access and uptake by a broad readership. Readers are also guided to the project's newsletters, reports and published papers for further information. This case is combined with others in a comparative analysis. Guidelines for successful co-management are developed from these outputs.

In the next chapter, the research framework and methodology are described, followed by socio-economic dimensions of the case, including poverty. Resource system and human system institutional analyses precede descriptions of exogenous factors, incentives to cooperate and patterns of interaction. Outcomes and performance are analysed prior to the final chapter of discussion and conclusions on the lessons learned about what may favour successful co-management in this case.

2 Research framework

This section sets out concepts that guide the research based on previous work in coastal co-management around the world. It sets the stage for presenting the case study results.

2.1 Definitions and concepts

Definitions of co-management focus on sharing management responsibility and authority between government and stakeholders (e.g. Pinkerton 1989; McConney 1998; Brown and Pomeroy 1999; Pomeroy 2001; Berkes et al. 2001). The fundamentals of what co-management should be, and is in practice, have been extensively researched (Jentoft 1989; Kuperan and Abdullah 1994; Pomeroy and Berkes 1997). Co-management encompasses several possible arrangements that are often depicted as a scale constructed from the relative sharing of responsibility and authority between government and stakeholders (Pomeroy and Berkes 1997; Berkes et al. 2001) (Figure 2.1).

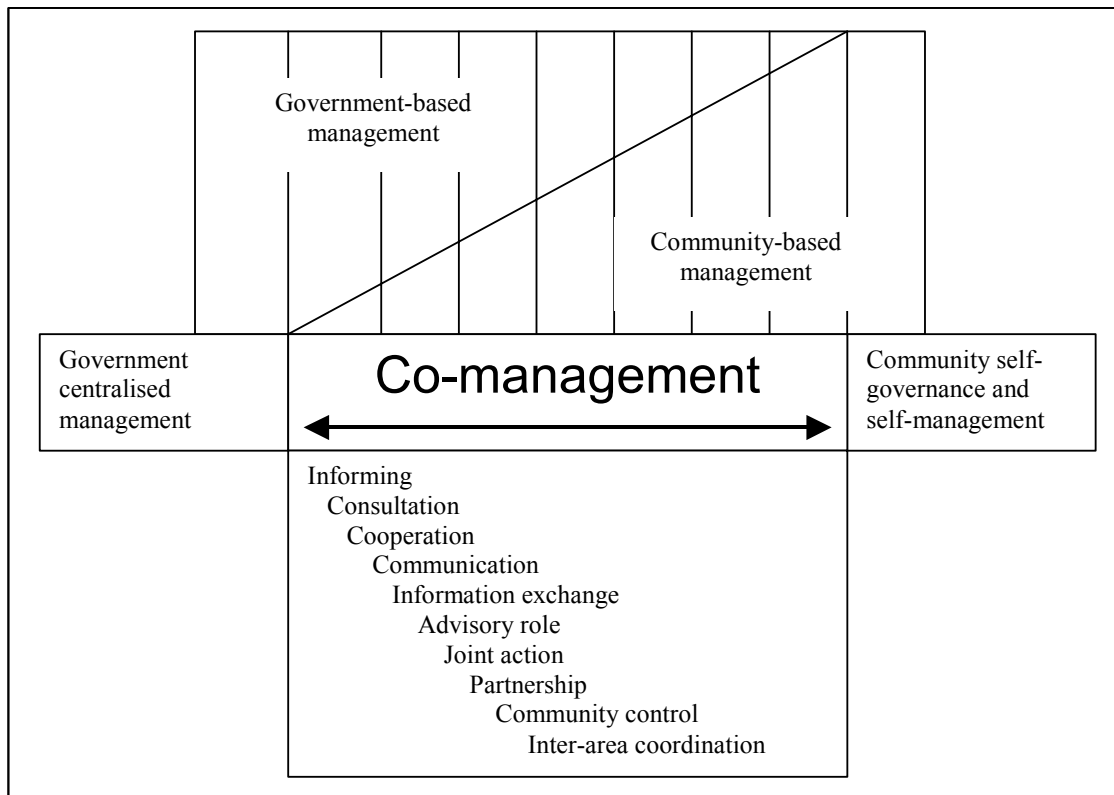


Figure 2.1. Sliding scale showing various degrees of co-management

Based on Pomeroy and Williams 1994

As in the case of participation (Arnstein 1969), there are various positions on the scale, and authors use different terms for co-management and its degrees. For example, the Caribbean Natural Resources Institute (CANARI) uses “participatory management” (see extensive document list at www.canari.org). The terms participatory management or co-management are gaining popularity in Caribbean government and NGO circles, and among some resource users (Almerigi et al. 1999; CANARI 1999; CANARI 2000; CANARI 2001; CCA 2001). These concepts, however, are not always fully understood by their users. Conceptual and practical research issues therefore include the degrees of co-management and which terms to use.

Based on international and Caribbean literature it was determined that three degrees and labels would be appropriate (Figure 2.2). The first is “consultative co-management” which represents what is most common in several locations (Brown and Pomeroy 1999). People commonly use and understand the term consultation.

	Consultative co-management	Collaborative co-management	Delegated co-management	
<i>Government has the most control</i>	Government interacts often but makes all the decisions	Government and the stakeholders work closely and share decisions	Government lets formally organised users/stakeholders make decisions	<i>People have most control</i>

Figure 2.2 Degrees and labels of co-management

Adapted from: ICLARM and IFM 1998

Next is joint action and decision-making. This is where several countries seem to be headed. The term “collaborative co-management” was preferred to “cooperative co-management” because it connotes stronger partnerships, and the use of “cooperative” may be confused with the formal organisation types of the same name (Kurien 1988; McConney et al. 1998).

Third is “delegated co-management” that includes, but is not limited to, community-based management since national co-management structures are especially common in fisheries management (McConney and Mahon 1998). Few cases in the Caribbean appear to be at this level, but it is not uncommon in other areas of the world (Baird 2000).

Establishing successful co-management is seldom immediate. Like most participatory processes it takes time and careful tending. Pomeroy (1998) recognises three phases of co-management and describes the sequence of steps within these in some detail. A much-simplified version is in Figure 2.3.

Pre- implementation →	Implementation →	Post- implementation
Realise need for change	Try out new management	Maintain best arrangements
Meet and discuss change	Educate people in new ways	Resolve conflicts and enforce
Develop new management	Adjust and decide what is best	Accept as standard practice

Figure 2.3. Phases of co-management

Based on: Pomeroy 1998

Like cases in Africa (Normann et al. 1998; Sverdrup-Jensen and Nielsen 1999), the Caribbean is generally at the pre-implementation or early implementation phase (McConney and Mahon 1998; McConney 1998). A few situations such as the Soufriere Marine Management Area (Renard 2000) may be mature enough to be labelled post-implementation. A very significant consequence is that neatly comparing “before” and “after” conditions arising from a co-management intervention such as a discrete project will be less feasible in the Caribbean than other locations such as in Asia where much of the literature on methodology originates (e.g. Pomeroy and Carlos. 1997; Pomeroy et al. 2001).

2.2 Research framework

The International Centre for Living Aquatic Resources Management (ICLARM) and Institute for Fisheries Management and Coastal Community Development (IFM) (ICLARM and IFM 1998) developed the methodology referred to above for the African and Asian cases (Figure 2.4).

The main analyses conducted within the framework are in Box 2.1. They are reflected in the logical framework for this project in terms of the assessments to be performed. Institutional analyses are of critical importance in researching co-management (Renard 1991; Noble 2000).

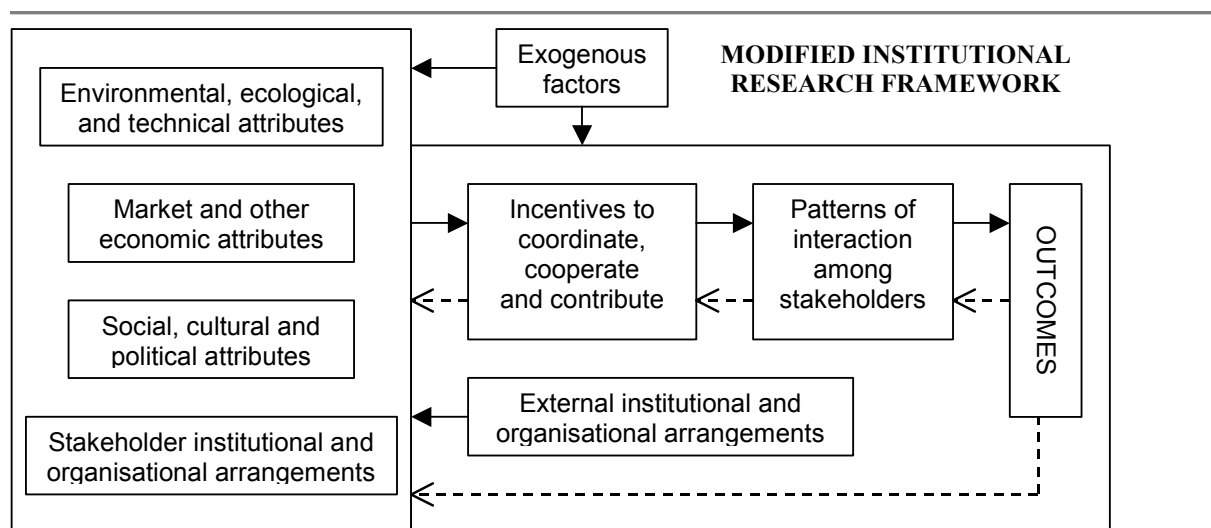


Figure 2.4. Modified ICLARM/IFM Institutional Analysis and Design Research Framework

Box 2.1 Main analyses included in the framework

1. **Institutional Arrangements Analysis:** This component links contextual variables characterizing key attributes of the resource (biological, physical) and the resource users (technology, market, social, cultural, economic, political) with the management institutional arrangements (rights and rules). The contextual variables are each composed of a number of attributes. A causal relationship exists among and between the contextual variables, the institutional arrangements (the focus of the analysis) and the resulting transactional (action) situations. The institutional arrangements and the contextual variables affect the actions of the resource users and authorities responsible for fisheries management by shaping the incentives and disincentives they have to coordinate and cooperate in resource governance, management and use; the incentives, in turn, shape the patterns of interaction and behaviour between the co-management partners, i.e. the types of co-management arrangement established and the way it functions.

2. **Co-management Performance Analysis:** The co-management arrangement results in outcomes. These outcomes will, in turn, affect contextual variables as well as behaviour of resource users, other stakeholders and public authorities. Time is a critical element. All the contextual variables can change through time. This may cause change in institutional arrangements which, in turn, affect incentives, patterns of interaction and outcomes. The outcomes of co-management institutional arrangements can be evaluated in terms of e.g. management efficiency, equity, and sustainability of resource utilisation.

3. **Characteristics of Successful Co-management Institutional Arrangements:** The most important aspect of this analysis is the specification of what conditions and processes bring about successful long-enduring, fisheries co-management arrangements. From the analysis we can identify a list of principles and propositions about conditions and processes.

Source: ICLARM and IFM 1998

This project pays particular attention to integrated and pro-poor coastal management. Since poverty concepts may be new to some readers, a few words on the topic are warranted.

2.3 Pro-poor perspectives

DFID-NRSP (2001) emphasises the importance of a systems perspective on what is poverty and pro-poor, and how to address them. The concepts of poverty and the development of pro-poor strategies are complex social, cultural and economic issues (Centre for Development Studies 2000). Eradication or alleviation of poverty is often accompanied by attention to sustainable livelihoods (Carney 1998; Geoghegan and Smith 1998; Dorward et al. 2001).

In the Asia-Pacific region the focus is on alternative livelihoods since coastal resources are severely depleted and habitats are degraded. In the Caribbean, resources are often still adequate for use to be sustainable if supplementary livelihoods are found to ease the pressure without completely changing lifestyles. For example, fishermen displaced by MPAs in Belize are being re-trained to be fly-fishing and nature tour operators to obtain additional income in the tourist season, and facilitate increased compliance with fishing restrictions (Heyman and Hyatt. 1996; Heyman and Graham 2000).

Although the above initiative may be considered a pro-poor strategy it does not necessarily mean that it was specifically intended and designed as such. Poverty and pro-poor orientation by objective and implementation were not prominent in a recent institutional characterisation of Caribbean MPAs (Geoghegan et al. 2001). Statements such as improving welfare and the quality of life, without explicitly mentioning poverty, are more typical of planning documents for small-scale fisheries in the region (e.g. Government of Barbados 1993). Research must note direct and indirect, positive and negative impacts on poverty by both public and private sector initiatives. The attention of Caribbean governments to poverty has been relatively recent in most places. Poverty assessment studies from the mid-1990s to the present provide fairly current data for most countries (e.g. Kairi Consultants 1999).

Institutional analysis provides insight into how social and economic institutions interact with each other and contribute either to the perpetuation or reduction of poverty. Poverty in the Caribbean is often associated with youth and female-headed households, making age and gender important variables (Brown 2001). There are chronic, structural and seasonal poor in the Caribbean, with fishers as an example of the latter (Brown 2001). Fishers and other coastal resource users in the informal sector may easily slip through the net of employment surveys.

Often critical to the success of co-management is the extent to which community-based organisations can engage in poverty eradication and alleviation (Centre for Development Studies 2000). This encompasses empowerment and the concept of “voice”. Pro-poor strategies must address causes that operate at the micro as well as the macro levels, and ensure that government policy effectively engages these causes either directly or by creation of an environment that facilitates positive action by other entities (Brown 2001).

3 Case study overview

The six selected case studies, two each in Barbados, Belize and Grenada, are summarised in Appendix 1. Belize lies between 15° 53' to 18° 30'N and 87° 15' to 89° 15'W, between Mexico and Guatemala (Figure 3.1). The country has a coastline measuring roughly 280 km from north to south. Total land area, including the cayes, is 22,960 km² in a jurisdiction of about 46,620 km² including the territorial sea. The claim by Guatemala to terrestrial and marine portions of Belize is still under active negotiation. Belize is divided into six districts, 9 municipalities and over 240 villages. Over 70% of Belize is dominated by natural vegetation, and population density is relatively low over large areas of the country. Belize's barrier reef is the largest in the western

hemisphere, second largest in the world, one of the “Seven Underwater Wonders of the World”, and has been designated a World Heritage Site.

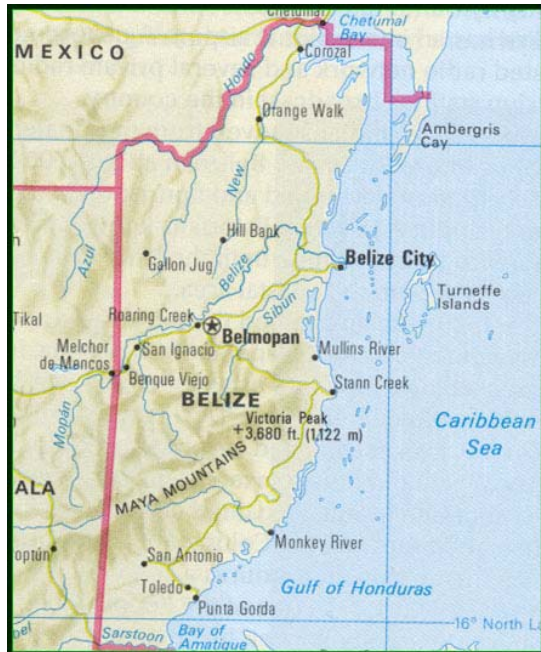


Figure 3.1 Belize country map



Figure 3.2 Districts in Belize

According to Belize Central Bank (2002) reports, real economic growth slowed to 4.6% in 2001 compared to 10.8% in 2000. This was mainly due to declining revenues from international markets and the diverse impacts of recent hurricanes. The main engine of continued growth was the primary sector, particularly forestry and fishing (36% growth), and specifically shrimp farming within the latter. Shrimp farm productivity declines due to disease were outstripped by expanding pond areas. In the marine capture fisheries, Hurricane Keith’s destruction of habitat and lobster traps reportedly caused a decline in the 2001 harvest of 24% compared to 2000. Conch recovered by a 2% increase in landings as sea grasses recovered from Hurricane Mitch. Hurricane Iris disrupted fishing in southern locations in 2001.

Agriculture, of which fisheries is a sub-sector, is the leading productive sector and mainstay of the rural economy. At least, 35% of Gross Domestic Product (GDP) and 41% of total employment is directly dependent on agriculture, fisheries and forestry. This is because 90% of all manufacturing is based on inputs from or for the primary sectors of agriculture, fisheries and forestry (MAFC 2002). Over 27% of the employed population is found in these sectors combined, but males (37.0%) dominate the national workforce compared to females (6.5%) (Central Bank 2002). Belize’s trade is dominated (88% in 2000) by agricultural exports, particularly of the traditional products (sugar, bananas and citrus) plus, in recent years, marine products. These crops and fish products accounted for 83.3% of domestic exports and 94.5% of total agricultural exports (excluding forestry products). Yet, over 75% of all farmers, the majority of whom are small-scale (often slash and burn or “milpa”), are poor. These farmers include recent immigrants from Central America, who work primarily as farm labourers in the citrus and banana industries.

The fisheries sub-sector has been of growing importance to the Belizean economy since the 1970's. Contribution to employment (over 3,200 fishers), GDP (5%), and foreign exchange earnings by capture fisheries and aquaculture, rank this industry third in importance to the economy of Belize (MAFC 2002). Fishing has traditionally revolved around lobster and conch harvest for export, but shrimp and finfish are now also important to the economy, the latter including recreational fishing. Exports of fisheries products are expected to continue increasing due to the growth of aquaculture. Farmed shrimp is the largest contributor to foreign exchange followed by lobster and conch. According to Belize's national food and agriculture policy 2002-2020, the key to fisheries development is the fishers themselves since sustainable development must be "people centred" and focused on involving the stakeholders (MAFC 2002).

In this case study, we focus on Friends of Nature, a non-governmental organization based in Placencia, Belize which has co-management responsibility (with Forest Department and the Fisheries Department) for day-to-day management of Laughing Bird Caye National Park and Gladden Spit Marine Reserve. FON co-manages public protected areas with the government and with a local advisory committee. This can be considered to be a delegated type of co-management where management authority is delegated to local institutions (in this case FON) and government is informed of decisions to be taken and government reviews and endorses those decisions. The area of specific interest in this case study is the southern coastal zone and the Southern Reef Complex that includes the two MPAs that are co-managed by FON. Both protected areas contribute to the Meso-American Barrier Reef Reserve System. In addition to the two marine protected areas, FON has become active in the management of the Placencia Lagoon. Fishing and tourism are the dominant caye-based economic activities in the area. There are a number of threats to the marine and coastal resources including unsustainable fishing practices, tourism industry, improper land use, effluent discharges, policy and enforcement, and transboundary issues.

4 Research methods

The general action research methods used in the case studies include:

- ◆ Document analysis
- ◆ Questionnaire surveys
- ◆ Semi-structured interviews
- ◆ Focus groups, informants
- ◆ Workshops and seminars
- ◆ Periodic e-mail, newsletters
- ◆ Transfer of skills and concepts

The cases in this project are mainly in pre-implementation or early implementation phases of co-management. Emphasis is on understanding the conditions and factors for successful co-management as perceived by the stakeholders at the research sites. Because an objective of the project is uptake of co-management concepts and practices that may lead to success there is active promotion of co-management in addition to research on it. This is action research.

The data collected for use in preparing this case study were collected using three methods:

1. Document analysis. An extensive collection of secondary data was reviewed and included statistical reports, MPA reviews, government documents and reports, 'gray literature' including theses and academic project reports, non-governmental organization reports, and internet searches.

2. Focus groups. Focus group meetings were held with staff and Board of Directors of Friends of Nature, fishermen in Placencia, and government officials from the Fisheries Department and Coastal Zone Management Authority and Institute.
3. Key informant. Key informant interviews were held with senior fishermen, government department heads, business-people in Placencia and Independence, FON staff, and FON Board of Directors.

5 Resource assessment

This section will present an overview of the biological, ecological and technical attributes of the area in which Friends of Nature operates. It begins with a broad description of reef conservation in the western Caribbean, and then focuses on the coastal southern Belize region, Laughing Bird Cay National Park, Gladden Spit (Silk Cayes) Marine Reserve, Placencia Lagoon, and capture marine fisheries.

5.1 Reef conservation and MPAs in the western Caribbean

The western Caribbean has been a focal area for coral reef conservation for many years owing to its extensive reef areas associated with the Meso-American Barrier-Reef System (MBRS), the second largest barrier reef in the world, after Australia's Great Barrier Reef. There are numerous MPAs and research stations throughout the MBRS area. Research and conservation efforts in the area have been carried out through a plethora of national, regional and international agencies, both governmental and non- governmental. There has been a bewildering array of programs and projects. These continue, but there is, in the form of the Meso-American Barrier-Reef System (MBRS) Project, a recent attempt to integrate many of these initiatives by taking a holistic approach to the MBRS (see section 8.6 for more information on the MBRS project).

5.2 Reef conservation and MPAs in Belize

Belize has an extensive and diverse coral reef ecosystem, with all the main reef types represented: fringing reefs, barrier reef, offshore atolls, inshore patch reefs and faroes. There are also extensive related habitats such as mangroves and seagrass beds. The Belize Barrier Reef is the largest barrier reef in the Western Hemisphere. It extends from the northern border with Mexico south for about 260 km to the Sapodilla Cays near the border with Guatemala (Figure 5.1). These reef habitats are of considerable economic importance to Belize, with fishing and tourism being the two main users.

The Belize reef ecosystem is, like most others in the world, threatened by a number of human activities, as well as natural events, primarily hurricanes (Gibson et al 1998). Global climate change is believed to be responsible for the increase in several coral diseases and coral bleaching. Reefs in some nearshore coastal areas close to population centers are affected by nutrient enrichment from land based pollutants mainly in the form of sewage and agricultural chemical run-off. Areas around Belize City, Dangriga and the developed cays are particularly affected. Tourism growth is likely to exacerbate these problems. Transportation of oil and fuel by sea is common in the waters of Belize and poses an ongoing threat to the marine ecosystems.

Sedimentation also threatens the health and functioning of the coral reefs. Tourism snorkel and dive activities may have local impacts, but most sedimentation arises from the removal of coastal mangrove forests and dredging for coastal development. Diving and boating activities also result in direct damage to or destruction of corals. Both tourism and fishing activities are involved here.

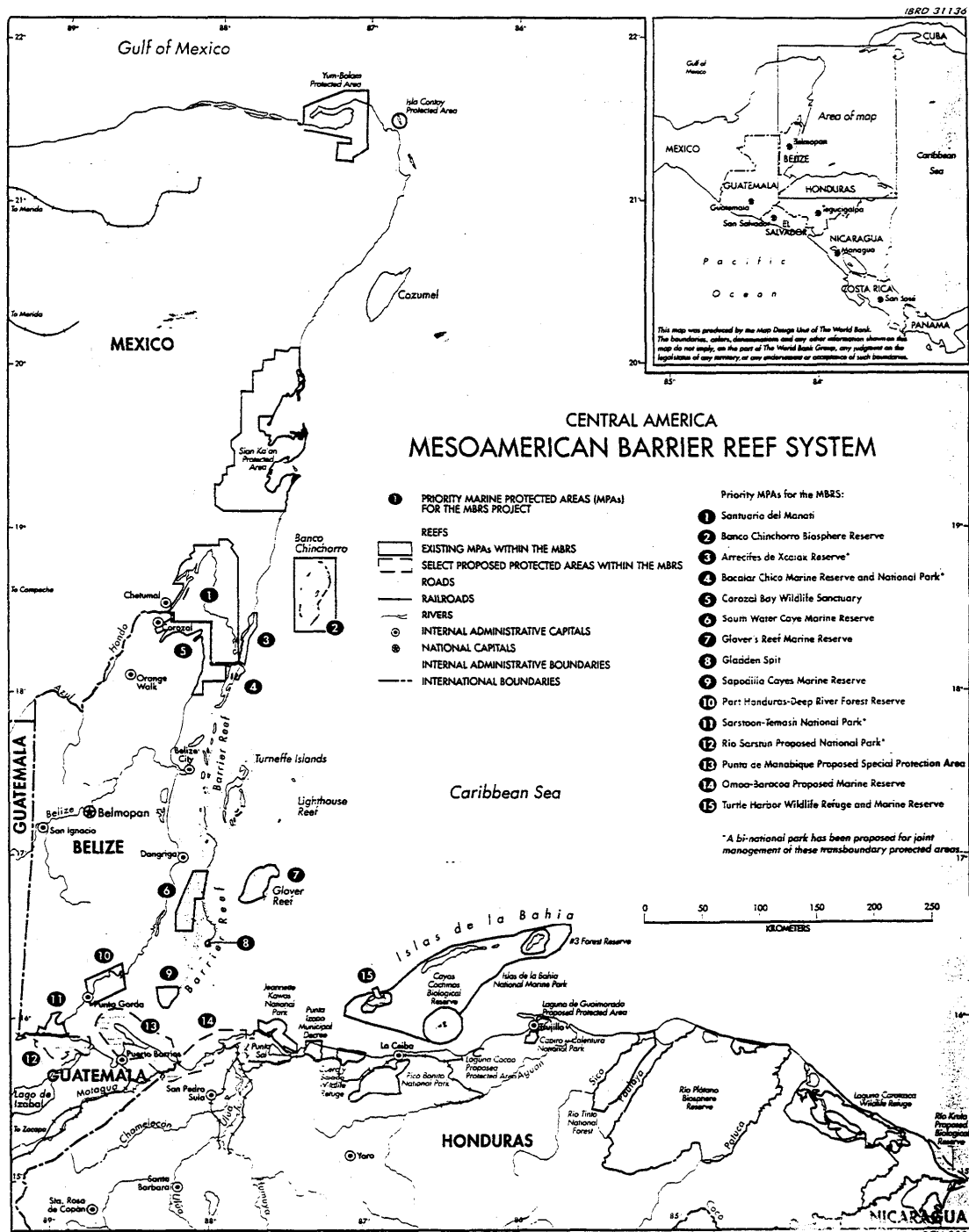


Figure 5.1 The Meso-American Barrier Reef System

Overfishing is another main source of impact on reef systems. The main fisheries in Belize, those for lobster and conch, are carried out in reef habitats. Lobster are considered to be at least fully fished, if not overfished (Auil et al. 1999); while conch are clearly overfished, and have been for many years. Finfish fisheries are less intensively fished, and Belize has been considered to have some of the most healthy reef fish stocks in the Caribbean. Reef fish fisheries are used either for subsistence, as an interim activity during closed seasons for the main species, or opportunistically targeting spawning aggregations of valuable species, mainly snappers and groupers, from which large catches can be made rapidly. A study of the reef fish fishery in 1990-91 concluded that this resource was only lightly to moderately exploited (Auil et al. 1999). However, fishing pressure has increased recently, and in particular the targeting of spawning aggregations (SPAGs) has been an issue of considerable concern. SPAGS throughout Belize have been severely impacted by fishing and several are thought to have disappeared (Heyman 2001).

The groupers and snappers found on Caribbean coral reefs are amongst the most important commercial species taken in the region. They also play an important ecological role as high-level carnivores in the food web of coral reef ecosystems. The majority of these species form spawning aggregations at predictable times and places which makes them highly vulnerable to fishing pressure. When fishermen locate these sites, they are able to greatly enhance their catch rates of these species due to the greater density of fish present. Large reductions in the biomass of these species as a result of aggregation fishing will likely result in significant changes in the ecosystem, thus not only impacting on the current population, but also jeopardizing future generations.

These changes may lead to ecological imbalances with consequent impacts on biodiversity. As the spawning which occurs at SPAGs often represents most or all of the total annual reproductive output of the population, the reduction in population abundance caused by heavy fishing pressure can have both ecological and socio-economic consequences.

5.3 Southern Coastal Zone and Southern Reef Complex of Belize

The area of specific interest in this case study is the southern coastal zone and the Southern Reef Complex that includes the two MPAs that are co-managed by FON: Laughing Bird Caye and Gladden Spit (Silk Cayes). In addition to the two marine protected areas, FON has become active in the management of the Placencia Lagoon. The physical and biological attributes of each of these three areas will be discussed separately following a brief discussion of the biophysical characteristics of coastal southern Belize.

It is important to note that “To a large extent what takes place on land will determine the development of the Southern Coast more than what takes place offshore. Already we have seen the large-scale impact of banana and shrimp farming. Most of the land between Placencia and Monkey River is privately owned. The portion closer to the beach, as in other areas of the Southern Coast, is being held in speculation for anticipated tourist development.” (Palacio 2001) The Government of Belize sees the southern region as a gateway to future economic development through tourism.

5.3.1 Coastal Southern Belize

Coastal Southern Belize can generally be described as a series of low-relief land types, characterized by the presence of swamps, lagoons, estuaries, mangroves, littoral forests, beaches, the barrier reef, cayes and atolls. The coastal marine environment is characterized by the presence of seagrass beds, hundreds of sand and mangrove cayes, and the barrier reef,

which extends 230 km and runs parallel to the coastline from the border with Mexico in the north to the Sapodilla Cayes south, almost to the border of Guatemala. Approximately 1,061 sand and mangrove cayes are distributed along Belize's coast and are associated with three atolls lying east on the main reef system.

Laughing Bird Caye and Gladden Spit occupy part of the southern reef complex, which extends at its greatest width (between Placencia Caye and Gladden Spit) for about 25 miles and, taking the Barrier Reef as the eastern limit, covers an estimated total of 90,400 acres of sea and cayes. It consists of approximately 75 cayes, mostly no larger than one or two acres. The region can be viewed as comprising three sections:

- The 'barrier reef cayes', characterized by cayes such as Gladden, Buttonwood, Hatchet, Little Water, Pompion and Silk Cayes;
- The 'inner reef cayes', including the Pelican Cayes, Quamino, Tarpon, Bakers, Rendezvous, Lark, Moho, and Laughing Bird Caye;
- The 'shoreline cayes', such as False, Placencia, Palmetto, Rocky Point and Great Monkey.

There are few obvious indicators of sea level rise; it is reported that several sand bars and shoals have become more pronounced in recent years. Hurricanes seem to be a major determining factor in alterations to the physical characteristics of the cayes, especially the barrier reef cayes. Considerable erosion is reported on the mainland, along the Placencia peninsula (which could be at least partially caused by alteration and development on the shoreline).

Depths between Belize City and Punta Gorda range from 10-30 m with salinities between 28-32 parts per thousand. Salinity patterns vary seasonally due to flooding of rivers resulting in heavy outflows of freshwater on to the coast. Currents tend to flow N-NE outside of the main barrier reef, and S-SE near the coast behind the main reef system. Climatic conditions on the southern coastal plains of Belize can be quite variable from one location to another. The rainy season is from May to January and the dry season occurs from February to May, with a hurricane season from June to November. Average rainfall is 2,500 mm per year.

The mangrove communities in the area include black mangrove, over 30 m tall, and provide habitat for a large diversity of insects and birds. Five types of seagrass have been identified along the coast. There is a variety of wildlife in the area. There are numerous cayes noted as bird nesting sites, particularly for pelicans and frigates, though some ospreys nesting and egrets have been reported. Hawksbill, loggerhead and leatherback turtles have been reported to nest on the cayes. Manatees are sighted around Pelican Cayes and the Lark Range, although the greatest concentration is in and around the mainland lagoons (Placencia and Indian Hill).

Out of the approximately 75 cayes in the Placencia region, 84% are identified as National Lands and 16% as private property. Forty-one percent are nationally owned cayes with leases to cover all or part of them and 43% have no identifiable leases on them (this includes Laughing Bird Caye, North and South Silk Cayes, and Little Monkey Caye). In July 2001, there were approximately 39 approved leases on 29 of the cayes. Previously, leases were approved for up to 30 years, however over the last few years, leases are approved in the first instance for only 7 years; following development compliance or request for lease fiat, an individual may receive approval from the Lands Department for extensions of between 20 to 30 years. There is some concern among local residents at the rate at which cayes are being privatized.

Many of the cayes are semi-permanently inhabited and some intermittently occupied, mainly as fishing camps during various fishing seasons. The small number of cayes used for purely

residential purpose are mainly private. Growing tourism activity in the area often results in the cayes being used for short stays of a day or two. Of the current eight resorts/tourist accommodations on cayes within the region, four are on national land.

5.3.2 Laughing Bird Caye National Park

National Parks in Belize are established under the National Parks System Act with the management objectives of habitat and species protection, preservation of natural and scenic features of national significance, research and education, tourism and recreation. Formal responsibility is exercised by the Conservation Division of the Forest Department, though the Division has no budget for the management of the parks.

Laughing Bird Caye National Park (LBCNP) is located in the Southern Reef Complex, an area that stretches from Blue Ground Range to Ranguana Caye along the reef system. The park was declared in 1996, originally only designating the terrestrial area of the cayes. In 1999, the park was expanded to include a one-mile radius of marine area in order to include the faro within park boundaries. A broad lagoon filled with a variety of reef structures – pinnacles, patch reefs, and atolls – characterizes this Complex. LBCNP comprises a 1.4 acre island, with several patch reefs. It lies halfway between Placencia Village and the barrier reef at latitude 16° 26.59'N and longitude 88° 11.85'W. The LBCNP is located just twelve miles off the coast of the Placencia Peninsula and nine miles from the Barrier Reef platform. The Laughing Bird faro lies east of a deep channel, known as the Victoria Channel, that hosts a variety of marine organisms and twenty-four species of fish including snook, tarpon and jacks. This well formed “faro” is a large submerged limestone structure that consists of an outer rim enclosing other reefs and lagoons. The rim walls are narrow and steep and the inner reefs are variable in size and form. This complexity forms the habitats for a wide diversity of organisms.

The cayes obtained its name from the Laughing Gulls (*Larus atricilla*) that once nested on the north end of the cayes. Anecdotal evidence indicates that the birds moved off the Cayes in the mid-70s after the combined impacts of increased human presence, damage from Hurricane Fifi in 1974, and local residents harvesting the eggs (Bevier and Young, 1999). The gulls have moved to nearby cayes for nesting and still can be seen occasionally on Laughing Bird Caye. Many other birds also frequent the Cayes including the Brown Pelican (*Pelicanus occidentalis*), Green Heron (*Butorides viriscens*), Melodious Blackbird (*Dives dives*), and osprey (*Pandion haliaetus*).

Laughing Bird Caye is a sand and shingle island of 1.4 acres located on the windward rim of the Faro about 19 km from Placencia and nine miles from the Barrier Reef platform. The Caye is about 425 m (1400 feet) long and ranges in width from 6 to 36 m (20 to 120 feet). The windward side holds a ridge of coral rubble and a sandy beach on the leeward edge (Naturalight, 1999). The island is covered with coconut trees and mangroves. Seven plant species are listed for Laughing Bird Caye:

- ◆ Coconut palm (*Cocos nucifera*)
- ◆ Spider lily (*Hymenocallis littoralis*)
- ◆ Seaside purslane (*Sesuvium portulacastrum*)
- ◆ *Euphorbia* sp.
- ◆ Red mangrove (*Rhizophora mangle*)
- ◆ Morning glory (*Ipomoea* sp.)
- ◆ Black mangrove (*Avicennia germinans*).

Anole lizards and hermit crabs are abundant on Laughing Bird Cay. However no surveys of these creatures have been done (Naturalight 1999).

Laughing Bird Faro rises out of deep (ca. 150 feet) water, Victoria Channel to the east and the inner lagoon to the west; it encloses a densely pinnacled lagoon. The lagoon floor is about 80 feet deep with spires rising 50-60 feet. The windward side of these are within 10 feet of the surface in most places. The reef on the windward rim is a *Montastrea - Acropora palmata* community similar to that found on the main barrier platform. A well-developed beach ridge composed mainly of *A. palmate* rubble stripes the windward side of Laughing Bird Caye. The leeward rim and the deep slopes of the faro are mantled by dense stands of *Acropora cervicornis* (Wandtland & Pusey, 1971).

In 1991 Coral Cay Conservation surveyed the Faro along 8 transects. They found healthy coral growth along all transects with two exceptions. T1 passing over the inner rim was rated poor with blade-like green algae dominant and human litter present. Also the lagoon end of T2 was rated poor with filamentous algae present. Surveyors were also struck by the paucity of fish life. (Coral Cay Conservation, 1991). In 1999, CEDAM International initiated data collection to construct an accurate and detailed map of the Faro. The expedition established a transect – Dooby Wall – across the Faro about ½ mile south of Laughing Bird Caye. Expedition members were surprised by the absence of hard coral growth at the rim crest. On this transect, the shallowest part of the reef rim is heavily colonized by soft corals and gorgonians. The best coral growth lies on the windward side of the rim and in patches on the leeward side of the crest. Members noted that the rim of the Faro is much deeper (15-30 feet) than the rims of oceanic atolls (Thompson 1999). Abundance and diversity curves of corals are similar -- an indication of a healthy ecosystem. During this expedition, turbidity was consistently greater on the lagoon side. If this difference is persistent, then species should exhibit zonation from fore rim to back rim. Unfortunately, expedition data were not of sufficient quality to show species differences.

The expedition attempted to extend the Dooby Wall transect westward, but they missed by several hundred feet. The fact that the sand valley changes significantly within a few hundred feet implies that the submarine topology is very irregular within the faro. Prolific coral growth on the rim at the western end of Dooby Wall Transect is surprising. Additional ridge areas should be checked within the Faro for prolific growth. Members reported very few fish (Thompson 1999).

In 1996 James Azueta of the Belize Department of Fisheries surveyed fish on fringing reefs on both windward and leeward sides of Laughing Bird Caye. Twenty-four species belonging to 12 families were observed. Three families had three or more species: Lutjanidae(5), Sparidae (4), and Pomocentridae (3). The Sparidae represented 39.8% of individuals (Azueta, 1996).

In October 2001, Hurricane Iris devastated the southern portion of Belize. Hardest hit were the villages of Placencia and Monkey River and Laughing Bird Caye National Park. Laughing Bird Caye lost significant vegetation on the island, infrastructure was destroyed, and changes occurred in the physical structure of the island. The damage to Laughing Bird Caye's reef was considerable. Coincidentally, coral surveys had been done one month before the storm. Follow-up surveys after Iris showed an increase in recent mortality from 2.8% to 19.6% and an increase in mechanical damage from <1% to 70.7%. This damage coupled with results of an horrific bleaching event in 1998 has had massive effects on Laughing Bird Caye's reefs. There has been a high degree of bleaching at LBCNP, as studies conducted in September 2001 showed almost half the area to have been negatively affected (McField 2001).

Fishers from Placencia, Monkey River, Independence, Hopkins and Riversdale have used the area for harvesting finfish, conch and lobster using a variety of fishing gear though the level of activity had begun to decrease into the 1980s. Fishermen camped on Laughing Bird Caye and fished in the area, taking advantage of coconuts found on the cayes. The Placencia area has the third largest concentration of fishing vessels in the country. Fishing is important to Placencia, with 69 registered fishing vessels in 1999. There has been intensive visitation and disturbance of the cayes area from visitors, fishers and tourists.

Laughing Bird Caye has been a favorite snorkeling destination for tourists visiting Placencia. There has been considerable degradation of the reef in LBCNP primarily due to high turbidity and physical damage from uncontrolled tourism activities that began in the early 1980s. Physical damage from improper anchoring of tourist vessels and fishing boats has been reported in the Park. The stocks of fish continue to decline and be threatened by illegal fishing and camping by fishermen, which has also led to the destruction of the cayes's vegetation.

With the development of tourist facilities on the mainland, deleterious effects to the park can be observed as a result of agricultural runoff and inappropriate disposal of sewage and solid waste. Dredging within Placencia Lagoon may also be having negative effects on the Park. A number of dredging permits have been granted recently which give way to suspended sediments in the water and threats to coral reefs.

5.3.3 Gladden Spit (Silk Cayes) Marine Reserve

Marine Reserves in Belize are established under the Fisheries Act for the management and preservation of all biological communities and species including commercial species and their habitats, research, visitation, and controlled extractive use (within specified zones). Marine reserves may include terrestrial areas either as islands or adjacent mainland. All marine reserves are under the responsibility of the Fisheries Department. A minimal budget allotted to the Department means that there is little support for enforcement activities, or for the management and development of reserves.

The central region of the Barrier Reef contains the best-developed and most continuous reef due to its elevation, good water quality, and modified wave regime. However, the southernmost tip of this area lies just below the wave shadow of Glover's Atoll. It is called The Elbow, "Point-of-Reef" (in creole), or Gladden Spit, and it lies about 36 km from the coast at Placencia. It is well-known locally for the annual aggregations of fish who migrate to the area to spawn, attracting whale sharks around the time of the full moons of April-June. As a result, the area has become a popular site for both commercial fishermen and dive operators.

"Gladden Spit lies at the intersection of the 250-meter-deep shelf between the Barrier Reef and Glover's Reef and the ...eastern wall of the Cayman Trench. The Cayman Trench is a tectonic plate boundary that runs from... Guatemala northeast to between Cuba and Jamaica and boasts the deepest point in the Atlantic -- over 7,500 meters.... From the air it is clear that the reef bends 90 on the horizontal axis. The reef wall drops nearly vertically around the promontory, into oceanic depth. The spawning area rests at the confluence of both the horizontal and vertical inflection points -- just at the point" (Heyman, 2001).

"Surface water temperatures at Gladden Spit vary from 27C to 31C, and surface water salinities remain high (36-37p.p.t.) during the entire year, but at the end of the wet season they may drop to 32 p.p.t. Long-term current measurements along the shelf edge just north of Gladden Spit

indicate a persistent reef-parallel 0.1-0.2 m per second flow towards the south with intermittent flow variability introduced by the cyclonic eddies."(Heyman and Kjerve 2001)

The central region of the Barrier Reef is continuous and well developed; it runs NW to SE and ends at Gladden Spit. According to Burke (1982), this section has a particular barrier form: back reef, reef crest, inner fore reef with extensive spur and groove formation, and an outer fore reef with a sand trough and coral ridge of Carrie Bow Cay about 15 km up the Reef. Moving southward and approaching Point-of-Reef, the outer fore reef and the inner reef spur-and-groove gradually disappear.

Burke (1982) claims that these structures can only develop in areas protected from long-period, storm waves generated by prolonged and severe winter storms. Belize's three atolls create a wave shadow that protects the central region, but Gladden Spit is not protected. "Where open ocean waves have full access to the Barrier Reef, durable and slow-growing communities dominate, and shallow water reefs are narrow and discontinuous" (Burke, 1982). South of Gladden Entrance, the reef shelf continues but the reef body is broken up with several cuts. The area around the Entrance is peppered with patch reefs.

In their study of the 1998 bleaching and Hurricane Mitch, Kramer and Kramer (2000) evaluated each of the sites that they visited. The deep sites at Gladden Spit (S18) and at Central Gladden (S20) were ranked "Low" disturbance (recent mortality < 10% and mild impact). On the other hand, the shallow reefs -- Swab Patch (S7) and Gladden Spit (S19) -- had "Severe" damage (recent mortality >20% and high impact).

In September 2001, WWF launched its Meso-American Reef Program. Coral data were gathered at 36 sites across the entire reef, most in Belize. The following table (Table 5.1) compares Gladden Spit corals to those at other nearby sites:

Table 5.1 Comparison of coral health at selected areas in Belize

Site	Rate of Disease	%Affected by Bleaching	Stoney Coral (# of Species)	Recent Mortality (% Area)
Gladden Spit	1.1%	22.5%	29	0.88%
Pompion Cay	1.2%	10.5%	30	0.77%
Laughing Bird Cay	4.0%	47.6%	24	2.66%
South Water Cay	4.1%	14.9%	28	2.55%
Tobacco Cay	1.2%	22.9%	27	1.36%
Average: All Belize Sites	2.7%		28.1(18-33)	1.71%

Immediately after Hurricane Iris, a team from CZMAI surveyed reef corals for impacts of the storm. Data were collected at two of the sites that McField (2001) had looked at one month earlier, Laughing Bird Caye fore reef and Gladden Spit. They found a significant increase in recent mortality at Laughing Bird. Except for an increase in bleaching, Gladden Spit showed no significant effects from the hurricane and was ranked "minimally impacted by Hurricane Iris" (Bood 2001).

Three small cays lie south of Gladden Entrance just inside Queen Cay. These are called Silk Cayes. In a study examining species-area relationships with floristic data from Belize's sand cays, Stoddard and Fosberg (1982) listed a number of plant species for the Silk Cays including a mix of tree shrub and herb species. Unfortunately, natural forces, such as hurricanes, have taken their toll on Silk Cayes and a number of these plant species have disappeared from the area. A colony of terns is nesting on North Silk Caye. The Silk Cayes are vulnerable to oil spills.

Inside the Barrier Reef northwest of the Spit, the lagoon has a relatively flat grassy bed sloping slowly inland away from the reef. This area has traditionally been a fishing ground for conch, but all reports are that the population has now collapsed. In 1996, CFRAMP surveyed the entire Belize Barrier Reef for Conch. Three sites in Gladden Spit were examined by counting and measuring every animal in 4 metre-wide transects ranging from 700 to 1800 m. One transect ran through this grass bed and found a density of only 3 legal-size conch per hectare. A transect through Gladden Entrance yielded only 34 conch per hectare.

Gladden Spit is a very important place for over 25 species of reef fish that come together at specific times of the year, usually right around the full moon, to reproduce. Several species of snappers (dog, mutton, cubera, yellowtail) and groupers (Nassau, black, red hind, yellow wing) form spawning aggregations in this area. Most spawning activity is between December and June.

Many large and commercially important reef fishes (especially families Serranidae and Lutjanidae) gather together at recognizable sites -- often reef promontories with steep drop-offs -- to spawn. These aggregations also take place at predictable times -- within 10 days of the full moon in certain months of the year. One of the best known of these sites lies just outside of Gladden's Point-of-reef. Groupers (Nassau grouper, Black grouper, Yellowfin Grouper, Red Hind) spawn around full moon from December to April; snappers (Yellowtail, mutton, Cubera, and Dog) have their peak spawning times in March to June. Fish seem to congregate for spawning more commonly after the full moon each month for 5-10 days (Heyman et al., 2000). At Gladden Spit, the maximum numbers of fish observed to aggregate on one day are as follows: 10,000 mutton snapper, 8,000 dog snapper, 5,000 Cubera Snapper, 20,000 yellowtail snapper, 107 Nassau grouper, 40 black grouper, and 40 yellowfin grouper. These species spawn for up to about seven days after full moon (Heyman, 2001). Within these spawning aggregation sites, spawning actually occurs at species-specific sub-sites. Fishermen describe three more spawning sites within the boundaries of GSMR located about 5 km up the reef and just at the edge of the shelf.

Ever since Belizean fishermen can remember, spring heralds not only the aggregation of spawning snappers, but also the arrival the world's largest fish, the whale shark (*Rhincodon typus*) at Gladden Spit. These whale sharks, known locally as Sapodilla Tom, feed on the spawn of the aggregating snappers. Only nine places in the world, all located in tropical waters, are known so far to have predictable whale shark visits.

Whale sharks (*Rhincodon typus*) are ancient creatures and the largest fish in the sea; estimates reach up to 20 m in length. They feed on plankton -- microscopic organisms floating in the sea. Graham, in a series of studies (2001a to d), notes that the total population of whale sharks visiting Gladden may be less than 100 individuals. Of those identified, 77% were juvenile males corroborated by the rather small average size of the sharks at Gladden -- about 6m. "Whale sharks show a great deal of site fidelity to Gladden as evinced by the re-sighting of marker tags and satellite pop-off locations at the promontory from one spawning moon to the next and in between spawning moons during the spring. When the fish are spawning, whale sharks remain

in the upper 200m of the water column. Following cessation of spawning noted through visual observations, the shark spent anywhere from 32% to 62% of its time in the upper 50m after which it began a series of deep dives, to at least 700m. Deep dives are readily accomplished next to the Gladden promontory where the bathymetry drops to 2,000m. As whale sharks are known to feed on zooplankton, it is highly probable that they are feeding on a deep scattering layer while waiting for the snapper to re-group" (Graham 2001c). When not staying close to Gladden, whale sharks are moving along the entire Barrier Reef. Sharks tagged at Gladden have been sighted as far north as Cancun and as far southeast as Utila (Graham 2001c).

The whale sharks at Gladden Spit are the subject of a research project being carried out by the UK Darwin Initiative and the Natural Environmental Research Council. The aim is better understand the biology of these species, in particular where they go when they are not at Gladden Spit and whether the same individuals return year after year. This research involves getting to know the sharks so that individuals can be identified, tagging them with acoustic tags, and keeping track of size and sex of individuals in the aggregation each year.

Gladden Spit is one of the most seasonally and geographically predictable aggregations of whale sharks in the world. This has resulted in the recent growth of a dive tourism industry, based primarily in Placencia, which began in 1994. Whale sharks are present in April and May and the best times for whale shark interaction trips are a few days before and after the full moons. Thus the industry is very intensive at these times. About 500 visitors took whale shark watching trips in 2001.

5.3.4 Placencia Lagoon

Placencia lagoon is a narrow, 24 km long estuary lying on the coast of southern Belize. The lagoon lies on the southern most part of the Stann Creek District of Belize. A 19 km peninsula ranging in width from five to forty meters surrounds the lagoon. The peninsula has sandy beaches on the eastern side. The peninsula is composed of sediment carried from the Mayan mountains by South Stann Creek River and the Sittee River. The lagoon ranges from one to three miles in width and is mainly shallow, 1-2 m in depth, with a few deeper holes and channels. Its width and area are somewhat variable because of enormous marshy wetlands that blanket most of the inland coast. The eastern coast is made up of the only long sandbar in Belize. The spit of the peninsula is narrow, and its southern tip – where the tourism village of Placencia is located – is laying down sediment very slowly.

The mainland plays a large role in the making of the lagoon. Rivulets and streams beginning in the mountains carry sediments, soil and other material into four major creeks that cross the Central Coastal Plain finally reaching the lagoon. The four major fresh water creeks are Big Creek, Mango Creek, Jenkins Creek and Silver Creek; plus many small streams that are unnamed. Stann Creek District receives the second highest average rainfall in Belize. This is due to the crossing of air currents from the Maya mountains and the ocean. During the wet season of June to January, an average of 80 to 100 inches per year (Sussman 1994).

Numerous water birds live along the shores of the lagoon including white ibis and Jabiru stork. The lagoon is well known for its high density of West Indian manatee that feed on the abundant seagrass beds that carpet much of the bottom. Two types of seagrass predominate in the lagoon – *Syringodum filimore* and *Thalassia testudinum*. Morelet's crocodile maintain a significant population here, also. Snook, tarpon, and jack and other sport fish feed on baitfish funneled into channels by tidal flow. Much of the coast is lined with red mangroves whose roots are encrusted with a rich variety of sessile life – shellfish, sponges, anemones, and algae – and

provide shelter for juveniles of many commercial species. Black, white and buttonwood mangroves grow behind the red mangroves (Sussman 1994).

The vegetation in the area includes pine ridge, savannah, low-broad leaf forests and mangrove. Areas on the mainland side near Mango Creek are characterized as savannah or pine ridge. Areas close to Silver Creek and Jenkins Creek have vegetation of low-broad leaf forest. Areas on the coast have canopies of broken ridge and mangrove.

Three villages border the lagoon. Seine Bight is located in the eastern section of the lagoon, the central part of the peninsula. Fishing and agriculture are the primary economic activities in Seine Bight. Placencia village is located in the southern most part of the peninsula. The major economic activities are tourism and fishing. Mango Creek/Independence is a village in the mainland side of the lagoon. Agriculture and fishing are the major economic activities of the residents of Mango Creek. Five large shrimp farms are now located on the mainland side of the lagoon. The five shrimp farms own a total land area of 22,100 acres with 1,471 acres in production in 2003. There are plans to expand the operations in coming years. The primary species produced is Pacific White Shrimp (*Penaeus vannamei*). It is estimated that full-time employment is around 200 persons with more hired during harvesting and processing. While there is concern about shrimp farms releasing nutrient rich waste into waterways and spreading from the shrimp farm to resident shrimp populations, there is no evidence to date that the shrimp farms are having any impact of LBCNP or GSMR.

A marine port is located in Big Creek in the west of the lagoon and is used primarily for shipping of bananas, although it also is used for import and export of other commodities. The shipping route is through a dredged channel.

The peninsula is developing rapidly for resorts and vacation homes. A single developer has plans to construct 3,000 homes on the peninsula. Mangrove clearing is increasing, with minimal fines and poor regulation and enforcement by the Forestry Department failing to act as an effective deterrent to such activities. Effluent discharges into the lagoon are also increasing. The Department of Environment estimates that by 2010, the shrimp farms could be discharging as much as 250 metric ton of elemental nitrogen into the Lagoon each year. There are reports of algal blooms and fish kills near the outflow from the shrimp ponds. Speeding boats are a danger to the manatees. Fungicides used on the banana plantations surrounding the Lagoon flow in the Lagoon. Solid waste in terms of plastic, crates, etc. are becoming a problem in the Lagoon. Sediment is carried into the Lagoon from the Stann Creek River and Sittie River.

5.3.5 Fisheries

The fishing industry in the area is mainly artisanal or small-scale, characterized by relatively small motorized vessels (approximately 23 feet in length) that fish primarily on a day-trip basis. Some fishermen may camp on the cayes during the fishing season. Fishermen often travel up to 50 km away from their homes to fish and market their fish. The majority of fishermen are members of one of two Fishermen's cooperatives – Placencia Producers Cooperative and Northern Fishermen's Cooperative with a buying station in Mango Creek. More will be said about this in section 6.

A range of different species is exploited according to the season and geography of different fish stocks. Fishermen take a multi-species, multi-gear approach to fishing to target different fish species during different seasons and to ensure a greater possibility for income. Fishing gears include gill nets, beach seine nets, cast nets, hook and line, rod and reel, lobster traps, fish

traps, longline, and diving. The hand line is the most popular fishing gear in the area. Gillnets are reported to have been introduced from Guatemala in the 1960s. Lobster fishermen use traps and tangle nets – gill nets baited with cowhide that entangle lobster. Free divers use hook sticks to catch lobster, spear for scale fish, and gather conch in shallow seagrass beds and back reef areas (Heyman and Graham 2000; Perez 2000). The use of hook sticks kills the lobster diminishing its market value. The beach seine is used seasonally to target ‘sheepshead’ fish.

The inshore artisanal fishery, operating in reef and estuarine waters, operate handlines, gillnets, spears, traps and weirs for finfish and crabs. Target species include smaller snappers and groupers, grunt, porgy, hogfish, barracudas, kingfish, mackerels and jacks. These species are sold in local markets. Stone crab (*Minnepe sp.*), blue crab (*Callinectes sapidus*), eel and oyster support a small fishery. Larger snappers and groupers are caught on the deep slope and bank by both artisanal and commercial fishermen. They use handlines and snapper reels. The fishermen target annual spawning aggregations and are the main composition of the seasonal finfish exports from Belize. Sharks are targeted for their skin, fins, oil, and meat. The fishery is seasonal during the Lenten season and peaks before Easter. A small marine aquarium fishery for export operates in designated areas (Perez 2000).

Heyman and Graham (2000) report that the majority of fishermen interviewed in their study reported that lobster nets and gill nets damage marine habitats. They further report that Belizean fish buyers hesitate to buy fish caught in gill nets since they are generally in poor condition by the time they reach the market. In one community in Southern Belize a petition was generated which favored a national ban on gill nets.

There are two shrimp trawlers operated by the Northern Fishermen Cooperative. These trawlers operate off the coast of Dangriga and False Caye to the Victoria Channel at night. There have been reports of conflict with artisanal fishers in the area. Artisanal fishermen report that the shrimp trawlers damage marine habitats (Heyman and Graham 2000). There are also very high levels of by-catch.

The main fishing methods used in Hopkins are cast net, hook and line, hook stick and free diving. The main fishing gears in Seine Bight are hook and line, cast net, gillnet and longline. In Placencia, the main gears are hook stick, hook and line, free dive, cast net, Hawaiian sling, lobster trap and fish trap. In Monkey River, the main fishing gears are lobster trap, hook stick, hook and line, cast net and Hawaiian sling.

The fishing fleet from Placencia and Monkey River is comprised primarily of fibreglass skiffs (although wooden skiffs are still used) of 12 to 28 feet in length powered by a single outboard engine. A 25 foot skiff will usually have a 60 horsepower engine. A boat and engine may cost US\$9,000 – 10,000. The fishermen from Hopkins and Seine Bight tend to use dories. The boats are usually owner-operated. Boat size has increased in recent years as fishermen venture farther from home and shore to target various fishing grounds.

Fishing is undertaken primarily in the shallow waters of the Barrier Reef. The shallow lagoons provide ideal habitats for the development of extensive seagrass beds which provide breeding or feeding areas for numerous species.

Heyman and Graham (2000) report that lobster and conch fisheries are the most lucrative for fishermen in the area. Adult lobster and conch are found commonly along the Belize Barrier Reef and in some areas of Port Honduras. The fishermen also indicate that important juvenile

areas for conch are found within the Sapodilla Cayes Marine Reserve and the Gladden Spit Marine Reserve. Lobster's bearing eggs are often captured within the northern part of the Port Honduras Marine Reserve.

Heyman and Graham (2000) report that finfish captures (both quantity and species) vary with season and fishermen have learned these patterns after generation of fishing. This indicates a relatively high degree of indigenous knowledge among the fishermen. The outer barrier reef slope harbors mutton snapper, yellow-tail snapper, grouper, and jimmy hinds at various times of the year. Many of these species spawn in aggregations outside the outer reef, particularly at sharp bends in the reef such as Gladden Spit and at a few spots within the Sapodilla Cayes. Fishermen from Honduras harvest snapper and groupers off the reef during the night. These fishers have bigger boats and have better equipment, including GPS, to locate ideal fishing locations particularly around the spawning aggregations. Deepwater silk snappers are caught in waters over 200 feet outside of the steep barrier reef dropoff. Mackerel, silk snappers, jewfish and snook are found close to the coast.

In November of 2002, the Government of Belize created legislation in support of a closed season for the Nassau grouper corresponding with its spawning season in Belize, which runs from December 1st – March 31st. In addition, closed areas were declared corresponding to 11 spawning sites, many of which are also spawning areas for other reef fish species. This legislation was the result of many years of hard work by a coalition of NGOs (Belize Audubon Society, Friends of Nature, Green Reef, TIDE, The Nature Conservancy, Wildlife Conservation Society and World Wildlife Fund).

Jacobs (1999) reports that of 75 fishermen interviewed in Southern Belize, all fished for snapper and jacks, 97% fished for barracuda and jewfish, 96% for groupers other than jewfish, 93% for grunts, 91% for conch, and 87% for lobster. He also reports that a small percentage of fishermen still fish for manatee and a larger percentage for turtle. Turtles are caught at Punta Ycacos, Punta Negra, West Snake Caye, Pompion Caye and Sapodilla Caye. Some fishermen own cayes or use cayes as a base of operation during the fishing season, particularly around the Gladden Spit/Silk Cayes area.

There appears to be a high degree of indigenous knowledge among fishermen about fishery resources and the local area. Palacio (2002) states that, "It is knowledge handed down from one generation to the next showing centuries of co-existence between mankind and marine ecosystems." Palacio (2001) further states, "The folk knowledge that they accumulate about the biology of fish, oceanography, and meteorology are widespread and impressive."

While fishermen have secret fishing spots, Palacio (2001) states that, "There are no community territorial prerogatives that exist in the sea." There does not appear to be any regulated customary tenure practices among fishermen, although there is a general agreement among fishermen about certain areas which are felt to be reserved for them, most particularly for lobster and conch fishing, for which many fishers report having 'secret' spots which they will share only with regular fishing partners. Palcaio (2001) states, "While they openly accept Belizean fishers, they view Northern and Central Belizeans with some jealousy. They do not like that they are coming in large numbers and with sophisticated equipment." Palacio (2002) further reports that, "the use of these localized ranges has arisen more from familiarity and elimination due to overfishing and not from a sense of propriety rights. There is no sense of exclusive territoriality among fishers even against those coming across the border from Honduras and Guatemala."

Fishermen have few informal rules for resource use and management. One informal rule is not to pull someone else's trap. Fishermen feel that catch should be cleaned away from where it was caught so that it doesn't drive other fish away from the area. Fishermen feel that certain size fish should be released when out fishing. Fishermen feel that it is difficult enough to catch fish and they do not want more rules and regulations. There are also informal rules regarding where, when and how gillnets should be used.

Conflicts between southern Belize fishermen and northern Belize fishermen and Honduran and Guatemalan fishermen are increasing. There is a high level of pacificity over foreign fishermen entering into Belize waters. Conflicts and encroachment have the potential to lead to violence. Due to a lack of funds, infrastructure and personnel, there is limited enforcement. FON is being asked to reduce and arbitrate conflicts.

Recreational fishing or sportfishing is becoming more popular in the area, especially for tourism. Snook, permit, bonefish and tarpon are found along the coast near rivers and in the Placencia Lagoon. Snook and juvenile tarpon are found in the lagoons and creeks, bonefish and permit on the seagrass flats, and grouper on the outer reefs. Monkey River is renowned for snook and juvenile tarpon in the winter months. Black grouper (gag) are caught in the November to March period. Other species in the Placencia area include strawberry groupers, occasionally Nassau grouper and big yellowtail snapper in January and February.

Figures on catch and value for individual fisheries and villages are difficult to come by as statistics are generally aggregated at a regional level. One particular trend in the region is depletion of commercial species such as conch, lobster, shark, snook, jewfish and turtles. Fishermen have also noted a distinct decline in the landings of snapper and grouper, though there are various opinions on the cause, ranging from the effects of foreign and northern fishers to shifts in fish behavior – many local fishers are reluctant to attribute such changes to local overfishing.

Perez (2000) reports that for lobster “there are now indications that the resource is fully exploited and is characterized by catch rates fairly stable despite increases in effort and catch fluctuates according to recruitment and environmental conditions”. Perez notes that for conch, data “indicate that this fishery is being exploited close to its MSY”. Perez states that for snapper and groupers, “Reports are that several spawning grounds have collapsed as a result of fishing pressure”.

Heyman and Graham (2000) queried a sample of fishermen in the area about their perceptions of the state of fisheries resources. According to surveyed fishermen, landed fish are getting smaller in size (67% of fisher responses) and have also been drastically reduced in numbers (70% of respondents). Fishermen are landing smaller and smaller fish, some of which are juveniles. There was wide agreement among fishermen in the survey that a majority of commercially harvested species are in some state of decline. Of particular concern are lobster, conch, yellow-tail snapper, silk snapper and crevalle jack. In addition, fishermen felt that snook, spanish mackerel, jewfish and turtles has declined. Fishermen felt that the reasons for the decline included overfishing of juveniles and females with roe, disruption of fish life cycles, smuggling to and cross-border fishing by Guatemala and Honduras, and the use of destructive gear such as gill nets. Enforcement is considered to be insufficient to protect fisheries resources.

Jacobs (1999) in his survey of 75 fishermen in Southern Belize reported that all fishers perceived a reduction in queen conch production. Landings of lobster, sharks, barracuda,

hogfish and jewfish were also perceived by most fishers to have declined. Almost half of the respondents reported that turtle catches were the same or increasing, contradicting other reports.

Jacobs (1999) reported that 67% of respondents believe that the size of 12 different species have declined over the last ten years. Sixty-four percent of respondents felt that the kinds of fish caught over the last ten years have changed. The respondents felt that a change was either a decrease in the number of species caught or a displacement of a primary species by one which was classified as secondary ten years ago. Thirty-five percent of respondents reported increasing fishing effort on grunts, jacks, hogfish and yellow-tail snapper to compensate for reductions in the catch of silk snapper, red snapper and grouper. Ninety-three percent of respondents said that they could identify where fish was abundant 15 years ago and have now become scarce. In Jacobs (1999) survey, fishermen suggested several approaches for improving fish catch including marine reserves (60%), banning gillnets (36%), closed seasons (15%), and more patrols (30%). Palacio (2001) reports, "Even as the fish supply is decreasing they are aware that it is occurring when economic benefits from fishing have never been better, resulting in improved opportunities for themselves and their families."

Overfishing may be the primary cause of the decline in fish species. Many local fishermen blame the decline on the constant illegal fishing by fishermen from Guatemala and Honduras, especially at night. A compounding factor is that there is a market for both undersized and closed season marine products in Guatemala and Honduras. There is also concern about the impacts of nutrients from the shrimp farms on the poorly flushed Placencia Lagoon and the deleterious impacts this may have on the waters around and south of Placencia. The fishery for lobster and conch seems to be overcapitalized.

Placencia fishermen, through the Placencia Cooperative, have reportedly asked government for zoning of the area to manage their own resources and to keep others out (personal correspondence with Mr. Jack Young 2002). The matter is now before the Fisheries Advisory Board. Mr. Young states that the cooperative may not have all the resources to manage the fisheries but that fishermen can keep an eye out for intruders.

5.3.6 Other Concerns and Issues

Key informants in Placencia reported concern over garbage disposal, the need for zoning/building controls due to overdevelopment, land reclamation, and the need for land for expansion. There are Village Council by-laws for restricting building size and for building setbacks from the shore, but these need to be better enforced. In Seine Bight there is concern over water supply and beach erosion.

6 Socioeconomic attributes

This section presents the socioeconomic attributes of stakeholders, fishers and communities in the FON area.

6.1 Stakeholders

The indigenous Maya, the first residents of the area (300 BC to 1000 AD), used the cayes as fishing stations, ceremonial centres and burial sites and utilized a range of fisheries, including conch, finfish, turtle eggs and manatees. The first Europeans arrived in the late 1500s to harvest logwood and then mahogany, with some subsequently shifting to piracy. Garifuna also

arrived from Roatan (Honduras) in the 17th century to fish and harvest timber. Belize, formerly known as British Honduras, became a British colony in 1862 and gained independence in 1981.

The British colonial experience has made Belize more of a Caribbean country culturally, and in terms of its political traditions, its demographics, and other cultural factors such as religion, language, and social organization (ie: gender relations), as compared to its immediate neighbours.

Belize is a classic plural society in that there are important cultural differences among the groups. The population of the Placencia area is composed of Creole, of African and European descent; Garifuna, a mix of African and Carib ancestry; Mestizo, a mix of Amerindian and European peoples; and Ketchi and Mopan Maya. The strong ethnic/color and gender divides which exist in Belize society still persist but are changing. There has been immigration to many communities by outsiders and the population now lives in relatively heterogeneous ethnic communities. The dominant ethnic group in Placencia, Independence and Monkey River is Creole and in Seine Bight and Hopkins is Garifuna. The Creole and Garifuna sections of the population has a larger representation of female headed households than other ethnic groups. The Mestizo and Maya populations display a greater male dominance in the headship of households.

There are several church groups in the villages, as well as women's and youth groups in the villages of Seine Bight and Hopkins. Roman Catholicism is the dominant religious affiliation of people in the region. In more recent years, some of the Protestant religions have made great headway in the population. Besides Anglicans, which was the religion of the British power, there are congregations of Pentecostals, Methodists, Adventists, Mennonites, Nazarenes, and others. The Garifuna have a belief system originating from daily events while at sea. The Garifuna pay homage to the sea (*barana*) and earth (*mua*) as primary givers of life.

While there has been growth in the population of the area from 1980, the most growth has occurred between 1990 and 2000. Many people taking up residence in the area are new arrivals attracted to the area for its natural beauty and for jobs in the tourism sector.

Table 6.1 Populations of coastal villages

Village	1980	1991	2000
Placencia	334	361	501
Hopkins	749	808	1027
Mango Creek/ Independence	1474	1890	2929
Seine Bight	465	504	871

The most significant factor in demographic growth in recent years is the balance between emigration and immigration. Large numbers of the Creole population, and to a large extent the Garifuna population, have been migrating to the United States. There has been a large immigration of people from Guatemala and Honduras. The effects of these movements on the local communities is still unfolding, though it is clearly having an effect, as evidenced in gradual shifts in the pattern of social gatherings, popular foods, and gender relations. The area can no longer be considered as culturally homogeneous.

Placencia is a maritime and fishing community. Fishing has historically been a full time occupation and fish were salted and bartered for other commodities. Turtles were harvested and

their shells were exported. It started growing in the 1950s as a result of a large and diversified supply of seafood and good prices. With the decline in fish catch, an increase in tourism has allowed the community to survive. Since the 1980s, tourism has increased as a major economic sector in the village. So far people have been able to balance off both activities. As the lobster season wanes, the tourist season of November to April picks up. Fishermen transform themselves into tour guides and their wives into tourist service industry. The inhabitants are mainly Creole, with some Garifuna, Mestizo and Guatemalan and Honduran immigrants on the rise, although there has been extensive intermarriage. This gives the community a close knit character. However, there are differences in traditional spirituality, especially among the Garifuna (Palacio 2001).

The population of Belize places a modest pressure on the coastal zone, with the principal uses being artisanal fishery, aquaculture, tourism, small-scale shipping and oil exploration. Independence from the UK in 1981 has increased the need to attain economic viability, including expanding pressure on the country's natural resources in order to produce foreign exchange. Some of the major threats to the country's reefs are fishing, sedimentation, tourism, agro-chemicals, sewage, solid wastes and dredging. Tourism and its associated demands, such as dredging and waste disposal, can exacerbate other detrimental factors. There are different spatial scales of threats superimposed upon each other. However, more attention is now being focused in the country on larger scale issues such as land use planning, pollution, watershed management and regional fisheries management.

Local stakeholders that use the resources or can influence negatively or positively the natural resource of LBCNP and GPMR are Placencia tour operators, Placencia hotel owners, Monkey River tour operators, Placencia Producers Cooperative, shrimp farmers, Placencia-Belize Tourism Industry Association, fishers of Monkey River, Hopkins and Placencia, tourists, the general population of the Placencia peninsula area, citrus and banana plantations around Mango Creek/Independence, and Seine Bight fishers. Fishing and tourism are the dominant cay-based economic activities in the area.

6.2 Fishing

Out of 2100 licensed fishermen in Belize in 2000, there were approximately 300 in the FON area (Perez 2000) (Table 6.2). Perez (2000) reported that the number of licensed fishermen in the FON area included 183 in Placencia/Seine Bight, 51 in Monkey River, 80 in Mango Creek/Independence, and 53 in Hopkins. There are no figures, except membership of part-time fishermen in the Placencia Producers Cooperative, of the total number of part-time fishermen in the area. All of the main types of fisheries in Belize are carried out in the area including lobster, conch, finfish, and shrimp.

Table 6.2 Numbers of registered fishers and vessels in FON communities

Town	Registered fishers	Registered vessels
Placencia Village/ Seine Bight	136	88
Independence	51	?
Hopkins	80	12
Monkey River	33	13
Total	300	113
% of national total	11	14

(Source: CZMAI 2001b)

Everybody in Placencia fishes at some time or the other. In the late afternoon, women and children go to the foot of the piers or the beach to catch one or two snappers to fry for dinner. Night fishing off of local area docks is also quite popular among men, young boys, and some women. Moreover, weekend or afternoon recreational fishing trips in skiffs among family members also occur with regularity. Full- and part-time employment in the fisheries sector includes fishermen, processors, boat service, and administration staff. Fishermen come from Placencia, Hopkins, Monkey River, Seine Bight and Mango Creek.

Fishermen are almost all males. Most fishermen in Placencia are between 31 to 40 years of age, while the majority in Seine Bight are over 50 years. Most fishermen have a primary school education. Most fishermen have between 11 to 20 years of experience. This indicates that the fishery is very dynamic, recruiting young people into it and putting more pressure on the fishery. Although many fishermen report having secondary occupations in the tourist industry as tour guides or working in construction (Heyman and Graham 2000). Indeed, in discussions with fishers in Placencia and other villages, most will admit that there are only a dozen or so focused commercial fishers, in terms of those who only fish for a living and do not partake in the tourism industry in the off season. Due to the relatively small number of fishermen in the South of the country, many fishermen from the North (largely from the Sarteneja/Copper Bank/Chunox area) migrate down to these waters to fish.

6.3 Tourism

Tourism in the area is primarily nature-based. The attractions are the sea/cayes, Monkey River for sightseeing of riverine flora and fauna, the Jaguar reserve about one hour away, and archeological sites farther south. Placencia is still a relatively new destination. Tourism became a major economic activity in the mid-1990s. It is currently considered the fourth largest tourist destination in Belize, after San Pedro, Caye Caulker, and San Ignacio in the Cayo district.

Within the tourism sector, employment includes tour guides, tour operators, dive masters, boat operators, guesthouse owner, gift shop owner, restaurant or fast food outlet, hotel and resort staff, construction, and boat charter. Many of these people may also be employed as fishermen though the division of labor reflects itself in women primarily being the hotel/guesthouse, gift shop and restaurant owners. Tourism activities on the cayes in the region are related to the resort/tourism based in Placencia and Seine Bight. Hopkins is now in the process of organizing itself and tour guides visit the area on scheduled daily tours and trips. Individuals from Monkey River also visit the region on scheduled daily tours and trips, although to a lesser degree. Tourism activities include SCUBA diving, snorkeling, kayaking, whale shark viewing, and sport fishing (Tables 6.3 and 6.4).

Table 6.3 Number of tour guides

Area	1999/2000	00/01	01/02
Stann Creek	88	113	119
Placencia	58	83	86

Source: Belize Travel and Tourism Statistics 2001

Table 6.4 Number of tour operators

Area	1999/2000	00/01	01/02
Stann Creek	4	8	10
Placencia	8	22	21

Source: Belize Travel and Tourism Statistics 2001

The number of hotels in the Placencia/Stann Creek District area have steadily grown in number though the 1990s. Occupancy rates rarely exceed 40 percent. Employment in hotels has also increased through the 1990s. There is concern that the new larger hotel and resort development will drive out the smaller guesthouses in the area (Tables 6.5 to 6.8).

Table 6.5 Number of hotels

Area	88	89	90	91	92	93	94	95	96	97	98	99	00	01
Stann Creek	14	16	10	10	14	25	35	38	37	36	37	37	42	41
Placencia	10	11	15	18	20	22	25	31	31	38	49	49	47	57

Source: Belize Travel and Tourism Statistics 2001

Table 6.6 Number of rooms

Area	88	89	90	91	92	93	94	95	96	97	98	99	00	01
Stann Creek	105	131	88	100	133	233	284	318	300	293	314	302	345	342
Placencia	58	66	80	92	101	129	151	185	185	231	287	289	298	396

Source: Belize Travel and Tourism Statistics 2001

Table 6.7 Number of hotel employees

Area	94	95	96	97	98	99	00	01
Stann Creek	137	142	144	165	177	183	197	246
Placencia	72	87	110	124	147	246	262	282

Source: Belize Travel and Tourism Statistics 2001

Table 6.8 Occupancy rates (%)

Area	97	98	99	00	01
Stann Creek	22	22	29	36	39
Placencia	25	26	31	43	40

Source: Belize Travel and Tourism Statistics 2001

It is estimated that 75 percent of all visitors to the area visit Laughing Bird Caye National Park and the caye can be subject to up to 100 visitors in a day during the peak of the season. Two international sailboat charter companies, The Moorings and TMM, have opened operation in the last couple of years and provide boats for cruising in the cayes. The deep water of the Victoria Channel allows small cruise ships access into the heart of the area, and several use Laughing Bird Caye as a destination. Local residents and operators fear the popularity of the northern destinations may lead to larger cruise ship entering the LBC area, and are strongly opposed to this. There are reports that entrepreneurs are looking closely at this nearshore cruise ship access with a view to developing as yet undefined docking and transport facilities.

It is still premature to determine any real impacts of tourism on the marine resources of the area, but some anecdotal issues have arisen. While the industry generates much needed economic development, on both local and national levels, it has been identified as also leading to reef damage, water quality, illegal camping and litter. It is also noticeable that it has had the effect of generating speculative, though not always well informed development. As the region becomes more of an internationally known tourism destination, relative land values have risen. The cayes, as well as the mainland, are becoming increasingly subject to spiraling 'hope values' that may not reflect their true market value yet often lead to damaging 'improvements', such as indiscriminate clearance, intended to push their supposed value higher (CZMAI 2001a).

Housing development for tourism, vacation homes and retirement is also increasing along the peninsula. There is a large residential development occurring near Seine Bight. In the growing village of Placencia, recent government initiatives to provide space for housing have led to filling of lagoon areas. This development is providing construction jobs and other service employment.

With a decided shift toward tourism in the villages, there will be an accompanying shift in more women and youth engaging in new domestic and service economic activities. This will have an impact of gender roles in the overall community social structure.

There is reportedly some concern that some foreign-owned larger resorts are bypassing the local tour operators in organizing their own tours to satisfy their clients. Questions arise as to how much of this may occur resulting in squeezing out local persons from the business.

6.4 Seaweed Production

Producing, processing and marketing of seamoss occurs in Placencia. Seaweed has both a local and an export market. There seems to be potential for expansion and replication of this activity. Very little information is available on seamoss production in the area except anecdotal information.

6.5 Shipping

The privately owned Big Creek Port is located to the immediate west of the region. Dealing mostly in bananas, it also is used for import and export of a number of other forms of cargo such as orange concentrate, fertilizer, pine feed, break bulk, and stamp. Fifty-three ships visited the port in 2000. With upgrading of the Southern Highway, there is potential for the port to become a major economic generator for the region, such as through the development of a commercial free zone.

6.6 Oil Prospecting

In the early 1960s there was exploratory drilling at Palmetto Caye. No commercial quantities were found. In 1996 an exploratory drill in Block No. 342 in the Gladden Spit area was established. No sufficient quantities were found, however it is expected that the search for oil in the area will continue. The oil prospecting served as an impetus for the establishment of Friends of Laughing Bird Caye. Legislation regarding oil exploration in marine protected areas is vague and there are no guarantees

6.7 Other Economic Activities

Palacio (2001) reports that the significance of drugs and other illegal trade is increasing the cash flow among the communities, adding to inflation in its value. The cayes are used for contraband trading including drugs, guns and illegal aliens. There are also reports of drug abuse increasing in the area as a result of increasing availability, most particularly involving crack cocaine.

6.8 Public Services and Infrastructure

There is a doctor and nurse located in the health center in Placencia. Placencia receives its potable water from the mainland through a pipe from the Independence area which goes under the lagoon. There is electricity. There is no sewage system and individual septic systems are used. There is telephone and internet access. There are satellite dishes to receive television broadcasts and a local cable system. There is one partly paved road which runs down the peninsula. There is a primary school in Placencia, but students must go to Independence for secondary school. There is a bank, a gas station, an ice maker and a main pier in Placencia. Water supply and garbage (solid waste) disposal are concerns.

Hopkins has electricity, telephone, primary school, and a health center. Seine Bight has potable water, electricity, telephone, primary school, and a health center.

6.9 Fish Market Characteristics

Lobsters are primarily exported to the United States via Belize's two main fisheries cooperatives (Heyman and Graham 2000). Conch is exported to the United States and other markets. Some snapper is exported to the United States, although most is sold locally. Grouper used to be exported but a decline in catch has reduced supplies available for export. The majority of finfish exports go to Jamaica. Other species are generally sold at dockside. The cooperatives in Placencia and Mango Creek supply ice.

Commercialization of fishing in Placencia began in the 1950s with the demand for shark meat in the Guatemalan town of Puerto Barrios. The demand for shark meat brought a need to improve the kinds of boats used to bring product to market. Bigger boats were built. The onset of ice allowed lobster and conch to be marketed outside of the community for national and export markets.

Currently, most fish in Seine Bight and Hopkins is sold fresh in the community, although some fishermen sell to the fishing cooperatives. About half of the fishermen in Hopkins are members of the cooperative, while about 10 percent in Seine Bight are cooperative members.

The most successful arm of the cooperative movement in Belize is the fisheries component. Two of the largest cooperatives are the Northern Fishermen's Cooperative and the National Fishermen's Cooperative. The cooperatives are largely marketing cooperatives, engaged in the purchase of the fish of their members for marketing to other locations, including abroad. Northern has been able to introduce a disability fund, an education fund, and a reserve fund from which members finance the acquisition of new facilities and deal with major illnesses. An umbrella organization, the Belize Fishermen's Cooperative Association, was formed with the fishing cooperatives – National, Caribena, and Placencia. The Association engages in lobbying and short training workshops for its members.

There are two fishermen cooperatives operating in the area. Placencia has a well-organized fishermen's cooperative and markets its fish through the National Fishermen Cooperative. The Placencia Cooperative was started in 1962. The Coop provides organizational support to community members going back for forty years. Lobster and conch are the main seafood products marketed. There are two other fishery products that are no longer being bought in large quantities by the Coop for export. They are shrimp and scale fish (both whole and fillet). Scale fish are now sold locally for the hotels. The reason for this decline in both products was limited storage capacity. The coop at first had enough seafood to process rather than take it to Belize City for processing. A decline in supply has resulted in the Placencia coop closing its processing operations. It is a bulk assembly point for the fishermen in the area, and the lobster and conch were frozen/chilled and sent by truck for processing to Northern Fishermen's Cooperative. Their members switched to National Fishermen's Cooperative for the same marketing arrangements. In 2000, the Placencia Producers Cooperative, due to competition for price with the Northern Fishermen's Cooperative in Mango Creek, entered into a joint processing and marketing agreement with Northern. In Seine Bight and Monkey River, some fishermen sell to the Placencia cooperative and others sell their catch locally.

The Placencia Cooperative owned three shrimp trawlers at one time but due to age and mechanical problems they were sold or discarded. The coop had four shrimp boats later through

a joint venture and was able to make a profit for a while. The coop currently has one license to harvest shrimp but they do not use it as the catch is in decline.

Receiving a 'second payment', a return on profit of the cooperative, is one reason why Placencia Cooperative members and non-members sell to the Coop. The Coop also provides members with a sense of collective confidence and membership in a group of peers. Another is the participation of the Coop as a corporate villager in the welfare of the community (Palacio 2001).

Palacio (2001) reports that, "The Placencia Cooperative is experiencing some strain under the overall limitations of community-based organizations to respond expeditiously to market forces. One is to rethink their current position on not purchasing scale fish in larger quantities. It is plain, however, that the Cooperative members are having difficulties in straddling successfully both its fishery together with the pull from the tourist industry." He further states that, "Even as the cooperatives have specialized in marketing, our informants added that they should have taken rigorous steps to manage the fishery product."

As just mentioned, in 2000 the Northern Fishermen's Cooperative established a buying station in Mango Creek. Due to the aggregated nature of the membership and production data reported by the Northern Fishermen's Cooperative, it is not possible to separate this data out for the Mango Creek buying station, but statistics are shown for the Placencia cooperative (Table 6.9).

Table 6.9 Placencia Producers Cooperative 1988-2002 membership and production (lbs.)

	Full Members	Part-Time and Non-producing Members	Lobster tails	Conch	Fish Fillets	Whole fish	Lobster head meat
2002	23	32	24871	7644	2982	4983	1305
2001							
2000	39	71	40284	14322	2881	1960	1154
1999	37	69	28753	15480	3182	2021	723
1998	20	91	29737	22868	3270	4592	592
1997	12	93	8928	11579			
1996	17	88	16378	19636	732		231
1995	22	83	13877	17739			
1994		83	7666	17551	5220	73615	586
1993	22	83	11379	22352	4255	65338	511
1992			13156	16973	5121	75523	
1989	46	74	18339	47764	14186	261411	
1988			22898	48359	15096	262348	
1987			23437	49058	24811	260106	
1986			29943	44315	36750	115842	
1985			31412	71606	27423	121800	
1984			32609	60986	30243	90872	
1983			41084	73854	10399	176747	
1982			38782	75544	17664	187597	
1981			39228	61277	6085	167005	
1980			31551	46464	15465	117968	

Source: Annual Meeting Reports of Placencia Producers Cooperative

Marketing of undersized and closed season marine products is an offence in Belize. Yet it occurs. In part this is because it is demand driven and partly due to the lack of effective enforcement. Policy level interventions are required to address these issues.

6.10 Perceptions

There is a general perception that the declaration of 'so many' MPAs is the result of a conspiracy between the decision makers and some wealthy Belizeans and their foreign 'conservationist' cohorts to destroy the livelihood of small scale fishermen. It is felt that the gains of the MPAs will go to these 'conspirators'. This perception seems to be due to lack of a process of consultation between government, NGOs and local stakeholders (Brown 2000). There is also a perception that the local NGOs which are implementing the MPAs do not represent the interests of local stakeholders. A public education and awareness program is needed to educate the public about marine resource management. Fishermen state that the MPAs are shrinking the ocean area and they question the conservation bias of the scientists.

Palacio (2001) reports that the topic of MPAs was highly controversial not in primarily tourist destinations but in communities where fishing brought in a substantial part of the household income. A primary concern was that fishers were not consulted before the MPAs were declared. The second was that they were the victims of discriminatory practices in some MPAs, especially by the rangers.

Palacio (2001) reported that in Placencia, where tourism has taken over from fishing as a primary livelihood, residents felt that tourism was a preferred way of livelihood. It is perceived as an alternative occupation that makes more cash for the amount of work done. He further reports that in Placencia alternative forms of livelihood will be a major prerogative with controlling and protecting resources that people are already exploiting. In addition, improvements in law enforcement are needed to put teeth into many laws that are already on the books for protecting marine resources and education is needed to alert the citizenry about the value of marine resources and the reef. Education can be done by integrating it into the school curriculum. Awareness can also be raised through articles in local newspapers, postings in villages, and community meetings and activities sponsored by FON.

Palacio (2001) also reports that in Placencia there were two primary concerns – to make sure that fishing continues as a viable income earner and that tourism opportunities increase. (A key concern is that fishing remain a viable 'recreational' and subsistence activity for local residents – ie, that it not be licenced in such a manner as to exclude these informal users.) Respondents felt that overfishing needed to stop and that the services they provide to tourists have to be improved. It was felt that the activities in demand by tourists are increasing but that the providers of these services were scarce or not properly trained. Tour guides, for example, were felt to have a poor attitude to not being able to explain themselves adequately to their clients. More training was needed. Recommended projects included a aquarium for tourists and villagers, training in fly fishing, farming seaweed, moorings at dive sites, women to open catering services to supply boats that take tourists out, and traps for fishermen. Focus groups in Placencia did mention FON as having co-management responsibility for the marine reserve. Though people generally do not know what the concept of co-management means, or have not heard of it at all. In general there is a poor understanding of FON and its role by both fishers and guides, as well as residents at large.

Several key informants report some concern, among people in the five communities, that FON represents that they do not really feel a part of the co-management process of FON, that they do not feel true ownership over the process, that FON really owns the process, and that more consultations and more effective participation are needed. Key to this is better communication with the communities in order to augment confidence in the operations of FON. Local users who are meant to be represented by FON often cite a lack of transparency as a major problem.

Heyman and Graham (2000) report that about 75% of fishermen interviewed are familiar with the fishing laws of Belize. However, only half of the fishermen accurately reported the legal size for lobster and dates of the closed season. Sixty-two percent of the surveyed fishermen support a ban on shrimp trawlers in Belizean waters. Over 80% of surveyed fishermen support a revision in the issuance of fishing licenses. More than half of the fishers surveyed believe that cooperation with the fishing authorities will benefit them directly. Fishers felt that if everyone shares the responsibility they can reap the benefits of good fisheries management.

6.11 Alternative livelihoods for fishermen and other residents

Alternative economic activities for fishermen are in tourism and sport fishing. These activities are consistent with the fishermen's culture and knowledge base. Alternative livelihoods have been introduced to fishermen in the area. Most are tourism related. One effort encourages fishermen to become sports fishing guides (fly fishing, spin casting, trolling, droplining). Some of the fastest emerging business openings are the areas of sports fishing, tour guides, kayak guide, SCUBA divemasters, and whale shark tourism guide. NGOs, such as TIDE in Punta Gorda, are training fishermen in these occupations. FON has also trained dive masters and is hoping to begin fly-fishing training in the near future. Fishermen are also supplying fresh fish directly to hotels, resorts and restaurants. Another potentially lucrative economic alternative is in the production of processed fish such as smoked fish. Another potential is the promotion of windsurfing and sailing guides for the growing boat charter industry. One of the difficulties with introducing alternative livelihood activities is that the skills and confidence required for the organization of the activities need to be compatible with the independent minded nature of fishermen.

Educational interventions are essential. The provision of training opportunities in the use of sustainable fishing techniques and encouraging fishermen to care for the resources. This includes training in the appropriate use of traps, use of fish aggregating devices, promotion of the closed season and minimum size of catch, and certification of specific fisheries. There is also a need to educate youths and children of sustainable use of marine resources.

With increasing tourism activities in Placencia, there is potential for local women to start catering services to supply dive boats and other tour groups.

6.12 Poverty profile

A 1995-1996 national poverty assessment undertaken through the Caribbean Development Bank (CDB) (Kairi Consultants 1996) still provides the most comprehensive information on the topic. Some of the key findings were:

- ◆ 25.3% of households or 33% of the total population fell below a national poverty line of Bz\$1,287.48 for an adult; this was highest in the Toledo (southern) district
- ◆ 9.6% of households or 13.4% of the population were indigent or extremely poor, with resources valued at less than Bz\$751.32 per annum; this was highest in the Toledo (southern) district
- ◆ 23.6% of male household heads and 30.5% of female household heads were poor
- ◆ 20.6% of the urban population and 42.5% of the rural population were poor
- ◆ Poor dominated the agriculture and fishing sector with 49.4% in the lowest quintile, and their participation in this sector was highest in the Toledo and Stann Creek districts
- ◆ Poverty gap was highest in the Toledo district (21.8%) and lowest in Stann Creek (4.9%)
- ◆ 76.3% of heads of households had achieved no higher than primary education

- ◆ There was a general problem of solid waste management throughout Belize
- ◆ Poverty among the Maya was about twice the national average
- ◆ Poverty among youth was 31.6%, and 27.6% among the elderly

There is no known research specifically on poverty in coastal communities, although the issue arises in several of the studies undertaken by government, international agencies and NGOs.

The poverty assessment identifies five main causes of poverty in Belize:

- ◆ Historical underdevelopment, especially of the south that maintains a traditional culture and subsistence economy
- ◆ Substantial influx of poor and uneducated immigrants, many of them refugees, to the south
- ◆ Negative impacts on foreign exchange earning sectors from the international economy through trade liberalisation and advances in technology eroding the advantage of low wages
- ◆ Deficiency in human resource development, education and training, limits growth and economic transformation
- ◆ Difficulty in resolving macro-economic problems reduces expenditure in vital infrastructure and services while maintaining higher than desirable unemployment and underemployment

The report also lists underlying or maintaining factors such as:

- ◆ Poor income and employment generation in key productive sectors
- ◆ Rapid population growth
- ◆ Limitations of the existing safety net due to resource inadequacies
- ◆ Limitations in physical infrastructure
- ◆ Weaknesses in social infrastructure
- ◆ Gaps in the institutional infrastructure
- ◆ Poor community organisation

The government has articulated a National Poverty Elimination Strategy and Action Plan 1998-2003, prepared by a multi-stakeholder National Human Development Advisory Committee (NHDAC) chaired by the Ministry of Economic Development. The NHDAC identifies a three-pronged strategy to combat poverty in Belize:

- ◆ Poverty alleviation e.g. short term social assistance
- ◆ Poverty reduction e.g. medium to long-term infrastructural activities
- ◆ Poverty elimination e.g. long-term infrastructure plus social and economic planning

The government sees a clear link between poverty and the environment, with poor and marginalised people being most impacted by development initiatives that harm and degrade the environment. Consequently, the involvement of communities in environmental management is critical in creating equitable balances between economic, social and physical development. Six broad themes were identified, through district and national consultations, to be part of the national strategy:

- ◆ Economic growth for employment and livelihoods
- ◆ Investment in human capital through education and training
- ◆ Investment in health services and health care delivery
- ◆ Housing shelter and human settlement
- ◆ Social vulnerability and safety nets
- ◆ Protection and conservation of the environment

Community level environmental management initiatives are supposed to be funded via the international Global Environmental Fund (GEF) and the national Protected Areas Conservation Trust (PACT). For coastal resources, the negative impacts of protected area use, tourism and land based sources of pollution are the main concerns (NHDAC 1998).

Although the bigger picture must be taken into account, this section relates mainly to coastal resources. Kairi Consultants (1996) note that the Fisheries Department has provided coherence to the sector, mainly through fishing cooperatives, but lacks the personnel and equipment to be fully effective. They suggest that the principle of co-management is well established in Belize through the Fisheries Advisory Board (FAB), which could be a mechanism for ensuring equity of fishing licence distribution among the districts and coastal villages. While fishing is a major contributor to income and employment, especially in the south, it is unlikely to significantly reduce poverty on its own due to spectre of overfishing. The greatest threat in this regard may not come from legal residents.

Local government poverty alleviation, reduction and elimination interventions in areas of high indigenous populations (especially in Toledo) need to take traditional authority structures into account. Indigenous populations are concerned that government promotion of village councils will undermine and replace traditional authority such as the alcalde system. However, lack of good local leadership also plagues many small communities, according to the poverty report.

The report also describes inadequate institutional coordination among and between government, NGO and CBO interveners as being wasteful of scarce human and financial resources. Better institutionalisation of social partnerships is a recommendation of the poverty assessment. More multi-stakeholder decision-making, rather than just consultation and implementation, is required (NHDAC 2000). This includes the government representatives on collaborative bodies being given more decision-making authority than at present.

Despite poor coordination, Belize's very active NGO community is an asset to poverty strategies since they reach at least as far as government into remote communities. Much technical assistance and credit to improve quality of life has come through NGOs. Working through the NGO umbrella organisations may improve efficiency. Some of the NGOs are politically active, and this may have consequences for their engagement by successive governments. Advocacy and assistance to empower and educate rural women is also prominent. The NHDAC (2000) recommends that government focus on its planning and facilitation functions while delegating more implementation to NGOs, CBOs and private sector organisations.

The National Human Development Report for 1999 notes that devolution and decentralisation of power and authority by government has been manifested mainly in village and town council legislation (NHDAC 2000). However, it notes that many Belizeans are not convinced of real gains in democratic governance, and that more local level initiatives are needed to build the capacity for effective decentralisation.

7 Community-level Institutional and Organizational Arrangements

This section describes MPA and marine resource management and decision-making arrangements and organizations at the community level in the FON area.

7.1 Management of the Laughing Bird Caye National Park

Laughing Bird Caye National Park (LBCNP) was originally designated as a national park under the National Park System Act in 1991 (SI 167/1991) and covered only the caye. In 1996 the park was extended to cover the faro which includes 4,077 ha of marine area (SI 94/1996). It covers 4,096 ha (10,119 acres) of almost exclusively marine environment. It was designated a World Heritage Site in 1998.

It is reported that the Forestry Department held a number of meetings in the Placencia area before agreeing to co-management of LBCNP. Forestry mediated but did not lead these meetings. Local members of the community also instigated a number of community meetings to organize support for their bid to have LBC declared a national park. In this sense, LBC is one of the only MPAs in Belize that was locally initiated with community support.

A management plan was prepared in 2000. The LBCNP is a complete 'no-take/conservation zone'. However, Laughing Bird Caye itself is divided into three zones. The rules of these zones are designed to allow recreational activity to take place within the Park in a sustainable manner. The recreation zone is located on the southern tip of the caye and is approximately 35,000 sq. ft in size. Located within this zone are a ranger/visitor center, barbeque pits, a palapa and picnic tables. Composting tables are located within the Ranger Station. The buffer zone begins at the Ranger Station and ends at the No-entry sign. The preservation zone is a no-entry zone. It is located at the northern tip of the caye and is approximately 20,000 sq ft in size. No activities are allowed within this part of the caye. There are no guest facilities on this end of the caye.

Regulations for the park include:

- No camping or mooring without a special permit from the Forest Department.
- No open fire, except in designated fire-pits. No fire fuel to be brought from the mainland. All excess material to be taken away.
- No hunting or fishing, except with a special permit from the Fisheries or Forest Department.
- No collecting of any natural feature except with a special permit from the Forest Department.
- No cutting vegetation, except designated park personnel.
- No anchors to be used in the park (mooring buoys will be placed for dive sites).
- No diving and snorkeling unless with a licensed dive master or tour guide.

The park is managed under a co-management agreement between the Forest Department and the Friends of Nature (FON). There is a biologist and three rangers. A visitor center provides compost toilets and solar power. This building has become the temporary Ranger Station. Patrols are carried out daily throughout the Park, and rangers have reportedly had few incidents of noncompliance in the Park. The biologist has obtained baseline readings for most of the routine biological parameters in the Park. Standard measures are being used to ensure comparability with other sites.

An education coordinator has begun to develop environmental education programs. A committee of principals of all the local schools has been formed, and several presentations have been prepared. The education coordinator also sets up displays for manatee, turtle and crocodile week. A fee collection system was established in July 2002. To date, revenues have been low, as tourism has declined in the area since Hurricane Iris in October 2001. A decision was made to exclude cruise ships near LBCNP and require that the cruise ships use their own tenders to land tourists.

The co-management agreement between FON and the Forest Department gives FON responsibility and authority for the daily management of LBCNP but it does not include any indicators of success. This will need to be developed. Moreover, any MPA can be 'undeclared' at any time at the whim of the Minister – this creates a problematic lack of long-term security for NGOs.

7.2 Management of Gladden Spit Marine Reserve

Since the 1920s, fishermen have congregated at Gladden Spit to harvest fish from the spawning aggregations. The fishers come mainly from Placencia Village, Seine Bight, Monkey River, Independence and Hopkins. Many spawning aggregations throughout Belizean waters have been depleted, some to the point of extinction by fishing. Therefore, there is concern regarding the possible depletion of the Gladden Spit aggregations. This concern was heightened by the dependence of the whale shark aggregations on the fish spawn, and the possible loss of the whale shark tourism if the aggregations were lost. This led FON to promote the establishment of marine reserve at Gladden Spit.

The Gladden Spit (Silk Cayes) Marine Reserve (GSMR) was established in 2000 (SI 68/2000) and consists of some 26,003 acres of exclusively marine environment. FON took over management in January 2002. The GSMR has two management zones which include, but are not limited to, the following:

- A general use zone.
- The Silk Cayes Conservation Zone: approximately 0.25 of a mile surrounding the Northern, Middle and South Silk Cayes and including the shallow reefs to the south of Middle Silk Caye.

FON has hired a biologist and three rangers. There is a 28 foot skiff with twin 100 horsepower outboard engines. Because of lack of facilities, rangers have used the visitors centre on Laughing Bird Caye as a temporary ranger station. Patrols are carried out daily throughout the Reserve and rangers have reported few incidents of non-compliance.

A management plan has been drafted based on consultations in the five villages that FON serves. FON has held consultations with stakeholder groups – fishermen, government and tour guides – to develop a compromise for management in this spawning zone. The plan includes designation of zones and features compromises with local stakeholders to allow for multiple use of the Reserve. The approach to management of the Gladden Spit Marine Reserve is proposed by FON to include four zones (FON 2002). The majority of the reserve will be a General Use Zone where fishing will be limited to hand lines and diving. A small Conservation Zone encompasses Silk Cays and some adjacent reefs. Only non-extractive uses will be allowed there and motorized recreational activities will be precluded. A Restoration Zone behind the reef covers a seagrass area in which conch populations are known to have been depleted. Fishing will be restricted here and the area will be used to explore various conch restoration measures. A Special Management Area includes the main spawning aggregation and whale shark area just outside the reef, off the point. Within the Special Management Area, access for fishers, divers and researchers will be limited. It is being discussed whether ten special fishing licenses for the spawning zone in the Reserve will be awarded. Diving will be limited to 60-90 divers at any one time, requiring that dive tour operators coordinate their activities to maximize the numbers that can be accommodated, and researchers will be limited to certain times of day, unless tourism dive slots are unfilled. For the tour guides, FON has arranged a system for special site licensing, as well as a special 'whale shark viewing' fee to be paid by tourists wishing to enter the whale

shark zone. The number of tour boats and divers will be controlled, and guides will check in at a pontoon station moored just under the reef at Tarpon Swash.

The biologist has initiated an extensive monitoring program. Baseline data on corals, conch, lobster and commercial finfish have been obtained. Preliminary monitoring methods have been developed for whale shark behaviour and for spawning aggregations. The biologist has also prepared presentations and brochures for Gladden Spit.

7.3 Friends of Nature

The Friends of Nature (FON) (formerly the Friends of Laughing Bird Caye (FOLBC)), is a non-governmental, membership organization. FON was formed by a small coalition of dive guides, fishermen, tour guides and business people in response to the threat of tourism development in the area. The organization came together to lobby government to declare Laughing Bird Caye, which had been used historically as a fishing camp, as a protected area and to protect biodiversity and promote the sustainability of the natural resources off the coast of Placencia.

In the late 1970s, Rum Point Inn began to take tourists to Laughing Bird Caye (LBC). In the early 1980s, more resorts from the area also began to look at using Laughing Bird Caye for tourism activities. As a result of this increased tourism, fishers in the area began shifting from fishing to tourism as fishing, dive and tourism guides. There was increasing concern from local residents in Placencia about the declining resource conditions at Laughing Bird Caye. In 1990, a survey post was observed on Laughing Bird Caye. An investigation found that the caye was about to be sold to a private developer. At the same time, there was also discussion about an oil storage concession being developed on LBC. A petition was started in the community to develop a protected area at LBC. In 1991, a consultation process was begun in Placencia about the creation of a protected area and a national park at LBC. A small Global Environmental Facility (GEF) grant allowed for the consultation on a management plan for LBC. Friends of Laughing Bird Caye was informally organized to support this consultation process.

In 1992, through the efforts of Friends of Laughing Bird Caye, the government declared the caye a protected area. In 1993-1994, the consultation process continued, with support from the Department of Forestry, on a management plan and buffer zone for LBC. In 1996, Friends of Laughing Bird Caye (FOLBC) advisory committee was formed. FOLBC was registered as a non-governmental organization in Belize that same year. The consultation process on a management plan for LBC ended when, in 1996, the Department of Forestry informed FOLBC that LBC was declared a national park of approximately 10,000 acres with a no-take area. In 1998, the area was declared a World Heritage Site.

FOLBC continued to grow in the face of continued development in the area of both tourism and agricultural industries. FOLBC expanded from being a Placencia village organization to being a regional organization with representation on its advisory committee from the villages of Hopkins, Seine Bight, Independence and Monkey River. In 1992-1993, tourists were beginning to be taken out to Gladden Spit to see the whale sharks. Foreign fishers from Honduras and Guatemala were also operating in the area. By 1995, tourism was increasing to see the whale sharks. The Nature Conservancy and FOLBC began a consultation process on management of Gladden Spit. Research was on-going on fish aggregations in area of Gladden Spit and whale sharks and this became a conservation priority. There was discussion of making the area of Gladden Spit a marine reserve and closing the area to night fishing, especially for dog and cubera snapper.

In 1999, FOLBC began lobbying government for the declaration of the Gladden Spit and Silk Caye Marine Reserve. The area was declared a marine reserve in 2000. FON is currently negotiating to reduce the number of dive boats at Gladden Spit during the spawning/whale shark period. FON is also holding consultations with fishermen concerning the closing of spawning aggregation sites, particularly around Gladden Spit. In 2000, FOLBC signed a Memorandum of Understanding (MOU) with the Forestry Department to co-manage the National Park. It also received assistance in the form of a grant from the GEF. The FOLBC also benefited from funds made available to it through the Coastal Zone Management Authority and Institute.

Under its co-management agreement with the government, FON assumes control of the regulations on zoning and the behavior of users. FON is also authorized to police within the zones. FON appointed an advisory committee for the villages in the area to assist in formulating policy on management. A management plan was formulated that went through stakeholder review.

In 2001, an office manager was hired for FOLBC. Rangers were hired for LBC. In 2002, FOLBC changed its name to Friends of Nature, merging Friends of Laughing Bird Caye and Friends of Placencia Lagoon, and became officially registered as a 206 company under the laws of Belize. That same year, FON signed an MOU with the Fisheries Department to co-manage Gladden Spit marine reserve and merged with Friends of Placencia Lagoon. In 2002, FON hired its first Executive Director and additional staff. FON currently has a staff of 12 including administrative, outreach, biologist and rangers. FON's current Board of Directors has 12 members representing five villages in the area and key stakeholders. FON represents the people of five coastal communities that have traditionally used the area: Placencia, Monkey River, Independence, Seine Bight and Hopkins. It also has representatives from the Placencia Fishermen's Cooperative, the local Belize Tourism Industry Association, the highest institution of learning in the area, the Tour Guide Association and the local churches.

A number of buoys have been installed to the west of Laughing Bird Caye, and signs have been posted to indicate public access and associated regulations. Sixty disease resistant coconut trees have been planted to replace those dying of Lethal Yellow disease. Environmental education informational brochures about the Park have been produced. There is a voluntary no-fishing zone within a one-mile radius around the cayes.

FON also has a vested interest in Placencia Lagoon because, in 2001, it merged with another NGO, Friends of Placencia Lagoon, whose mission was to preserve and protect the Lagoon. There are a large and diverse number of actors and stakeholders involved in FON's MPA co-management. This includes:

- FON staff and Board of Directors
- Five FON communities – Placencia, Seine Bight, Hopkins, Mango Creek/Independence, and Monkey River.
- Residents of the communities – fishermen, tour guides, business owners, women, Garifuna, youth.
- Government – Fisheries, Forestry, CZMAI, Environment.
- FON donors – Oak Foundation, The Nature Conservancy, others.
- Other NGOs – TIDE, Belize Aududon Society, others
- Foreign fishermen of Honduras and Guatemala
- Tourists

7.4 Government Structure

Belize is steeped in democratic traditions with regular elections. Elections are keenly contested between two parties. Political power is concentrated in the central government. Although village councils were recently established as a form of municipal governance, their institutional base is weak and there is little real devolution of power. District councils are being formed and some attention is being given to strengthening this level of government.

The villages in the area are administered through Village Councils. Village councils are established and constituted under the Village Councils Act, Chapter 88, Revised Edition 2000. A village council is composed of seven members elected by the village residents. The Village Council has a Chairperson as its head. The Village Council is empowered to make by-laws for the rule and government of the village and enforce the by-laws. Placencia Village Council is one of the first village councils to develop by-laws. The Village Council Act is not as powerful as it seems as the centralized nature of the Belize government and other government Acts erode its provisions.

8 External to the Community Institutional and Organizational Arrangements including Integrated Coastal Management

Protection of Belize's marine resources is the shared responsibility of several governmental and non-governmental agencies. A number of government Acts also impact upon marine resources including the Fisheries Act, the Wildlife Protection Act, the Forest Act, and the National Parks Systems Act. The government of Belize has been encouraging co-management.

8.1 Coastal Zone Management Authority and Institute

The coastal zone of Belize is a complex system comprised of the barrier reef, the three offshore atolls, hundreds of patch reefs, extensive seagrass beds, mangrove forests, and over 1,000 cayes. This area is home to several endangered species such as the West Indian manatee, American crocodile, marine turtles and several birds. Most of the development pressures in Belize are occurring along the coast and cayes, resulting in degraded coastal resources and loss of critical habitat. Two of the country's major economic sectors, tourism and fishing, are directly dependent on the health of the coastal ecosystem.

Coastal Zone Management (CZM) in Belize dates back to a workshop in San Pedro in 1989 where it was recognized that an integrated, holistic approach to management of Belize coastal resources was necessary. The participants at that meeting recommended that a CZM Unit be established under the Fisheries Department to initiate the required integrated CZM program. By 1990, the small CZM Unit was functioning and the CZM Technical Committee was established. In early 1993, the GEF/UNDP CZM Project was launched, providing significant financing that made integrated CZM in Belize a permanent and well-established national program.

The CZM Act was passed in April 1998, and became operational in May of that year. It provides for the institutional arrangements for CZM in Belize through the establishment of a CZM Authority and its technical arm, the CZM Institute. The Act also establishes an Advisory Council, appointed by the Authority. This Council is comprised of a representation from the government, private sector, NGO community and academia. Its function is to advise the Institute on technical matters pertaining to coastal issues and to facilitate coordination among agencies.

Although no regulatory powers have yet been developed within the CZMA, it serves as the focal point for marine conservation planning, monitoring and research. The CZMA facilitates and earmarks funding for technical and management support in planning, implementing and environmental monitoring activities in the Belize Marine Protected Area System and advises the Ministry of Agriculture and Fisheries, the Department of Environment, the Department of Petroleum and Geology, and other relevant departments in matters related to the management and use of the marine protected areas. These departments regulate coastal resource use through the issuing of development and mining permits in coastal areas. The CZMAI has no provision for raising revenue to carry out its activities. The CZMAI is seen as being conservationist rather than production oriented as are the Fisheries and Forest Departments, which has contributed to a certain level of tension between, most particularly, the Fisheries Department and CZMAI. The CZMAI has no regulatory authority or legal mandate over MPAs as compared to Fisheries and Forestry.

The Act also provides for the preparation of a Coastal Zone Management Plan and for the introduction of fiscal measures to support the work of the Authority and Institute. The CZM Authority was established under the Ministry of Agriculture, Fisheries and Co-operatives. It is comprised of a Board of Directors appointed by the Minister and a Chief Executive Officer appointed by the Board. The Authority is an autonomous public statutory body charged with the responsibility of implementing and monitoring policies that govern the use and development of the coastal zone in Belize.

The major functions of the Authority are:

- Advise the Minister on all matters related to the coastal zone, and on the formation of policies
- Assist in development of programs and projects
- Foster regional and international collaboration
- Commission research and monitoring
- In consultation with stakeholders, assist in preparation of development guidelines and review the CZM Plan prepared in accordance with the Act
- Maintain the national coral reef and coastal water quality monitoring programs

The Board can appoint special committees to examine and report on any other matters arising from its functions. The membership of the Board is as follows:

- Permanent Secretaries from the Ministries of Agriculture, Fisheries and Cooperatives; Natural Resources and the Environment; Tourism; and Economic Development.
- The President of the University College of Belize.
- Representatives from the NGO community and the private sector.
- The CEO and Director of the Institute as ex-officio members.

The UNDP National Program Officer and the Fisheries Administrator also sit on the Board as observers.

Several integrated committees provide broad-based platforms to discuss policy development and the implementation of key programs. The Barrier Reef Committee was established as a national forum for oversight of the World Heritage Sites and World Bank's Conservation and Sustainable Use of the Meso-American Barrier Reef System Project. A Marine Protected Areas Advisory Committee fosters communication and exchanges among protected areas managers and advisory committees. Finally, a National Coral Reef Monitoring Working Group was formed to integrate and coordinate various reef monitoring efforts throughout the country.

The CZM Institute carries out the technical functions of coastal management in coordination with the various agencies involved. Its main functions are to conduct marine research, maintain a data centre, provide information as required by the Authority, organize training courses, support other agencies involved in CZM, maintain coastal monitoring programs, and to assist with preparation of a national CZM plan.

An integral component of CZMAI's work is the assistance provided to Government in the development of policies that will promote the sustainable use of Belize's marine resources. These recommendations are submitted following extensive and ongoing marine monitoring and research.

The CZMAI has a Public Awareness/Education Program that seeks to engage the public in the CZM process and to also develop and disseminate public awareness material on the programs of CZMAI. This is done primarily through the production of video and audiovisual materials, radio talk shows, the organizations quarterly newsletter Coastline, public education campaigns for communities, school visits, workshops/seminars, training, media releases and the provision of library services.

In 2001, the CZMAI established development guidelines for nine coastal regions in Belize. The sub-regional approach is to facilitate more 'bottom-up' decision making and planning for coastal management. Placencia is located in the Placencia/Laughing Bird Caye Coastal Planning Region. The guidelines have been prepared to guide current and future development activities on the cayes in the region. The guidelines are based on provisions set out in the draft National Integrated Coastal Zone Management Strategy. The purpose of the Coastal Advisory Committees is to review these guidelines and modify them to suit local need and interests. The strategy is also guided by the draft Cayes Development Policy of 2001 which is aimed to regulate caye development and coastal activities. The plan identifies development sites and specifies the types of land use, lot size, building density, means of utility supply and other relevant performance standards for each site.

The objectives of the guidelines include:

- The promotion of the social and economic well-being of the communities that rely in the region's resources.
- To establish a balance between the requirements for national economic development and the needs to promote the potential for local economic initiative.
- The protection of the region's fishing resources.
- The protection of customary fishing rights.
- The promotion of low density tourism.
- The prevention of overdevelopment and speculation.
- To compliment and augment other resource management initiatives impacting the region.

A Coastal Advisory Committee (CAC) is established for each region to implement the guidelines. A consultation meeting is held in each region to establish a CAC. Members of the CAC would include representatives of various local organizations in the region. For the Placencia/Laughing Bird Caye Coastal Planning Region, for example, the CAC included village council members, fishing cooperatives, schools, tour guides, FON, CZMAI, Forestry, Fisheries, Geology, and Lands. Members of the CAC are to represent diverse interests in the region (Johnson 2002).

8.2 Department of Environment

The Environmental Protection Act of 1992 provides the framework through which the Department of Environment enforces regulations preventing pollution. Regulations for Environmental Impact Statements and Industrial Effluents offer specific controls for industrial development. Although enforcement manpower is limited, the small scale of Belize's industrial sector aids the identification and control of potential sources of pollution. Belize has adequate environmental legislation but lacks enforcement and monitoring capacity. For example, under the Environmental Impact Assessment (EIA) regulations of 1995, the Department of Environment enforces regulations and screens projects that may require EIAs. Similarly, the Land Utilization Authority is responsible for Special Development Areas, which are forms of strategic planning that provide zoning of land use. A zoning plan for Belize's marine waters will ultimately be developed by the CZMA within an overall Coastal Zone Management Plan.

8.3 Belize Tourist Board

The Belize Tourist Board regulates the tourism industry, including the expanding cruise ship industry, which many view as a growing threat to ecologically sensitive areas. The Tourist Guide Regulations require that all tour guides meet standard levels of professional training and licenses can be revoked for non-compliance with environmental or other regulations. Many experienced dive guides are quite effective at 'self-regulation', although new guides are in need of further conservation training. Dive operators have played a major role in the installation and maintenance of mooring buoys. However, these initiatives may be jeopardized by new pressure within the industry to accommodate the mass-tourism market rather than the traditionally small-scale ecotourism market. There is particularly heavy and increasing pressure from the cruise ship industry, with up to five large ships arriving in Belize City on one day, overwhelming the limited infrastructure available for tourists.

8.4 Fisheries Department

The Fisheries Department, part of the Ministry of Agriculture, Fisheries and Cooperatives, manages the fisheries industry, which includes aquaculture. A Fisheries Advisory Board advises the Fisheries Department on policy. The Fisheries Advisory Board is comprised of the Fisheries Department and representatives of the fishing industry, mainly members of the cooperatives. The Fisheries Advisory Board acts as a vehicle of conveyance which ensures that the interests of all stakeholders are protected when decisions affecting the fisheries sector are being made. The Fisheries Advisory Board is a form of co-management in Belize.

The Fisheries Department regulates the exploitation of finfish, conch and lobster within Belize waters under the amendment to the Fisheries Act of 1983. The Fisheries Department regulates the issuance of fishing and boat licenses. No fishing is allowed with SCUBA and there are other gear restrictions, size limits, and closed seasons. However, government resources are inadequate to patrol the waters of Belize or to fully enforce these regulations. Marine reserves have been established under the Fisheries Act to assist fisheries management by replenishing heavily exploited stocks, while also protecting essential habitats. The enforcement arm of the Fisheries Department lacks enough personnel and equipment, and has poor logistical distribution, to be effective.

8.5 Forestry Department

The Forest Department of the Ministry of Natural Resources is responsible for administering the National Parks Systems Act and Wildlife Protection Act. Under the National Parks Systems Act of 1981, national parks are created "for the protection and preservation of natural values". The

National Parks Systems Act provides for four categories of protected areas: national parks, nature reserves, natural monuments, and wildlife sanctuaries. The Wildlife Protection Act allows for protection on many coastal and marine reptiles, mammals, amphibians, fish and birds.

8.6 Meso-American Barrier-Reef System (MBRS) Project

The MBRS Project is a five-year project encompassing the reef system and its associated marine ecosystems and resources on the Caribbean and Atlantic Coasts of Belize, Mexico, Guatemala, and Honduras (World Bank 2001). Belize's coastline is home to approximately 80% of these marine ecosystems. The goal of the project is to improve the protection of the unique and vulnerable marine ecosystems that make up the Mesoamerican Barrier Reef and to assist the four countries to strengthen and coordinate national policies, laws and institutional efforts aimed at conservation and the sustainable use of this global public treasure.

The four participating countries will monitor the impact of tourism and fishing on these resources and create educational programs that will prove beneficial to the system's long-term survival. A total of \$11.6 million U.S. dollars have been allocated for the implementation of the project. Funding for the preparation phase of the project is being provided by the Global Environment Facility (GEF), the Netherlands/World Bank Environmental Partnership Fund, the Canadian Trust, and the Food and Agriculture Organization. In the implementation stage of the project, funding is expected from GEF with counterpart funding from the governments of the four participating countries. These counterpart contributions are \$1.69 million from Belize, \$0.59 million from Guatemala, \$0.59 million from Honduras and \$0.74 million from Mexico (World Bank 2001). The project will be implemented by the World Bank and Executed by CCAD through a Regional Coordination Unit to be hosted by Belize in conformity with the organizational structure.

8.7 Ministry of Natural Resources

Mangroves are protected under the Forest Act. There is a Mangrove Unit with special responsibilities for conservation of these ecosystems. There is also the Land Information Centre and the Lands and Surveys Department. The first body is a data collection and collation unit. The second is responsible for the land use planning and allocation through implementation of the National Lands Act and Lands Utilization Act. It therefore plays an important role in all issues relating to allocation of lands in Belize.

The Forest Department ensures that FON implements its LBCNP management plan and provides enforcement. In reality, enforcement issues are forwarded by the FON rangers to the local police, Fisheries, or the Belize Defense Force. The Forest Department does not provide training or build capacity. Instead they consult and facilitate other activities with the communities.

8.8 Belize Port Authority

The Belize Port Authority (BPA) maintains lighthouses within several marine protected areas and property holdings related to the lighthouses. Other issues related to BPA are its regulatory function of ship operation and navigation within the Barrier Reef System, and waste management and disposal.

8.9 Marine Protected Areas

The Forest Department of the Ministry of Natural Resources and the Environment, the Fisheries Department of the Ministry of Agriculture, Fisheries and Cooperatives, and the Coastal Zone

Management Authority and Institute are the primary government departments that are responsible for the establishment and management of marine protected areas in Belize.

In 2000, due to signs of overexploitation and in an effort to maintain a sustainable fishery, the Fisheries Department (2000) declared a network of strategic marine reserves. In this network, the marine protected areas of Belize are divided into three zones: North, Central and South Belize (Figure 8.1). This proposal would eliminate individual management and advisory committees for each reserve and instead create one management team/advisory board for each zone. MPA entrance fees encompass all reserves in a zone, so that several attractions can be enjoyed by tourists for one ticket price. The Fisheries Department will specify the relative roles of government and other agencies and the co-management arrangements with the local NGOs. FON is located in Zone 3.

The Protected Areas Conservation Trust (PACT) is a key organization in this initiative. It would receive 20% of the gross revenue from admission fees. The remainder would go into the Marine Protected Areas Trust Fund to be shared by all the nodes based on expenditures needed for infrastructure.

The Archaeology Department can also establish archaeological monuments in the coastal areas and by jurisdiction impose management conditions or limitations on the marine protected areas as long as there are any archaeological features or antiquities in the area.

The Fisheries and Forest Departments have signed co-management agreements for six marine protected areas in Belize. Non-governmental organizations such as Belize Audubon Society, Friends of Nature, TASTE and TIDE have signed co-management agreements. These co-management agreements vest day-to-day management and fund raising responsibilities for the respective marine protected area with the NGO.

The establishment of marine and coastal protected areas has been an essential component of marine conservation in Belize. There are currently thirteen Marine Protected Areas in Belize, including seven World Heritage Sites. This also includes eight designated marine reserves, administered by the Fisheries Department and local NGOs. Additionally, there are two Natural Monuments, one National Park, and one Wildlife Sanctuary with significant marine habitat. In addition, there are seven Crown Reserves, which are essentially bird sanctuaries on small cayes and seven coastal protected areas. The role of NGOs and local community-based management is expanding and more advisory committees are being established.

About 16 percent of Belize's marine territory (based on a three mile limit) lies with MPAs (CZMAI 2001b). It has been suggested that 30 percent of the coastal zone should be closed to fishing to adequately provide ecological benefits. Currently the percent of the marine territory (based on a three mile limit) established as 'no-take' zones is 1.3 percent (CZMAI 2001b).

An evaluation of management effectiveness of MPAs in Belize was conducted in June 2000 (McField 2000). The following results are summarized from this evaluation. Overall, Belize's managed MPA system is evaluated as being 'moderately satisfactory'. This indicates that there are minimal elements necessary for management, but there are also deficiencies that prevent effective management and reduce the probability that conservation objectives will be achieved. There are good policies, laws, knowledge, biogeographic characteristics, and management of legal and illegal uses. There is generally good community support for the MPAs, although a small but vocal group of fishermen have openly stated their opposition to the MPAs. Management programs and planning are essential elements with some deficiencies. There are

serious threats to Belize's MPAs from natural disasters, water pollution, and illegal fishing, among others.

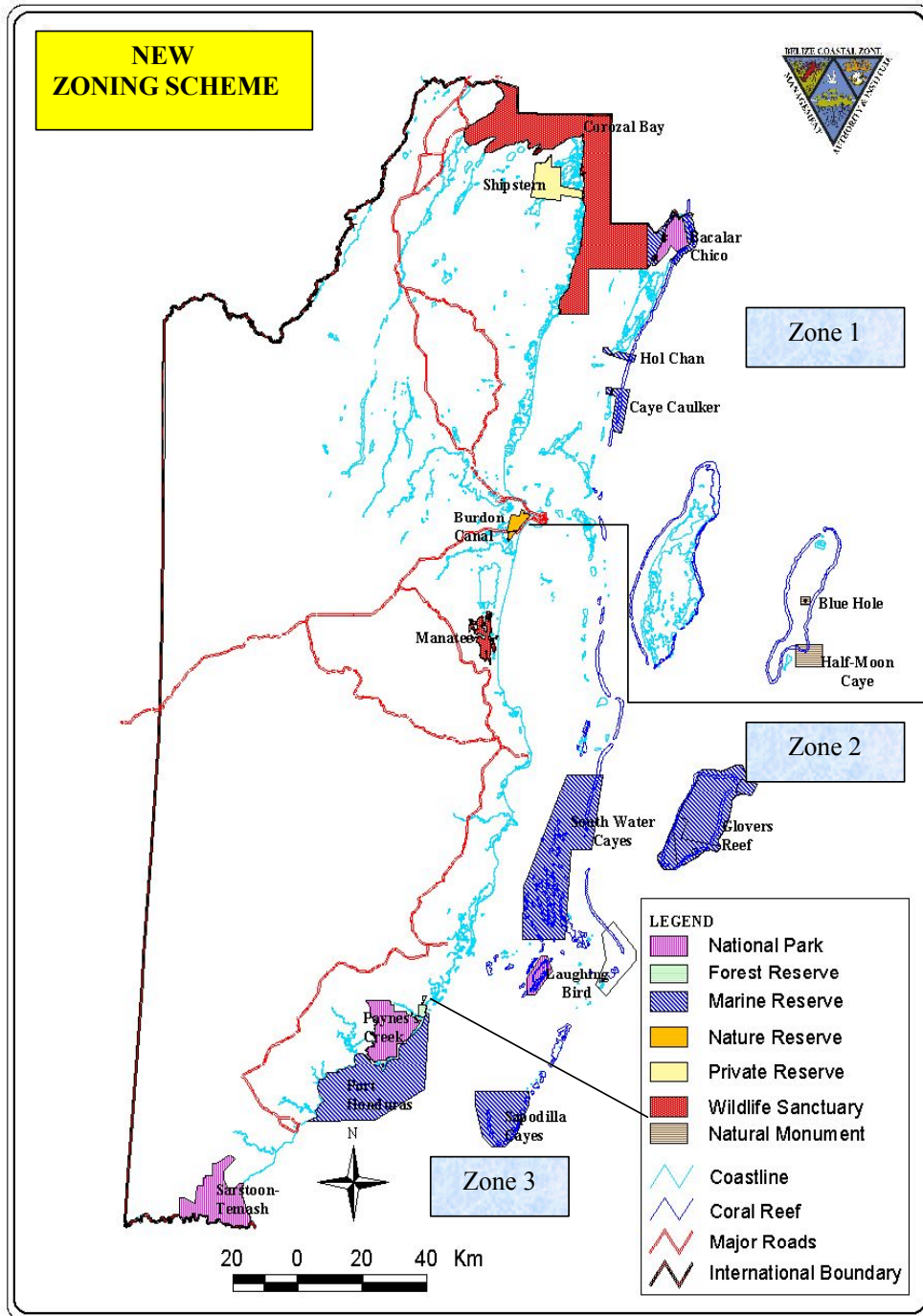


Figure 8.1 The three zones proposed in the MPA Initiative (Source: Fisheries Department 2000)

8.10 Belize Barrier Reef World Heritage Site

The Belize Barrier Reef World Heritage Site (BBRWHS) consists of seven MPAs and was proclaimed in October 1996 under the World Heritage Convention. This cluster of MPAs includes an area of 96,300 ha and represents the range of habitat and the character of the Belize Barrier Reef. The seven MPAs include two national parks, two natural monuments and three marine reserves. The MPAs (and year established) include: Bacalar Chico (1996), Blue Hole (1996), Half Moon Caye (1982), Glover's Reef (1993), South Water Caye (1996), Laughing Bird Caye (1991), and Sapodilla Caye (1996).

8.11 COMPACT

The United Nations Foundation and UNDP-GEF/Small Grants Program joined efforts to demonstrate how community-based initiatives could significantly increase the effectiveness of biodiversity conservation by complementing and adding value to existing conservation programs at six World Heritage Sites/Biosphere Reserves and globally significant reefs. This is being done through a small grant program, Community Management of Protected Areas Conservation Project (COMPACT). The Belize Barrier Reef World Heritage Site is one of these six. A national strategy has been developed with the purpose of preserving the integrity and character of the Belize Barrier Reef Reserve System by developing and supporting a range of conservation and sustainable livelihood activities through partnerships with coastal communities and stakeholders. FOLBC is part of the strategy.

For the Belize portion it was decided that five to fifteen community-based projects would receive a total of up to US \$50,000 each. The projects should concentrate on the following seven World Heritage Sites – Sapodilla Cayes Marine Reserve, the Laughing Bird Caye National Park, South Water Caye Marine Reserve, Glovers Reef Marine Reserve, Half Moon Caye Natural Monument, Blue Hole Natural Monument, and Bacalar Chico National Park and Marine Reserve. The lifetime of COMPACT is from August 2001 to February 2003.

9 Exogenous Events

There are several exogenous events which affect or have the potential to affect Laughing Bird Caye and Gladden Spit. These include natural disasters such as hurricanes (physical damage), global warming (coral bleaching), and sea level rise (coral drowning).

The most serious exogenous event to affect the area was Hurricane Iris on 8 October 2001. Hurricane Iris struck southern Belize, with winds of 140 mph, leaving an estimated 10,000 people without shelter and basic necessities such as food and drinking water. Iris also had considerable impact on the marine and terrestrial environment that supports livelihoods in the area through tourism, fishing and agriculture (Figure 9.1).

The possible long-term conservation consequences arising from the current destruction include:

- The thousands left homeless who will need new homes, putting additional pressure on the forest to provide building materials.
- This clearing of the forests would add more sediment to the five-river watershed in the Maya Mountain Marine Corridor, ultimately damaging the coral reefs off the coast.
- The lack of food means that people may need to return to unsustainable fishing, hunting and poaching.

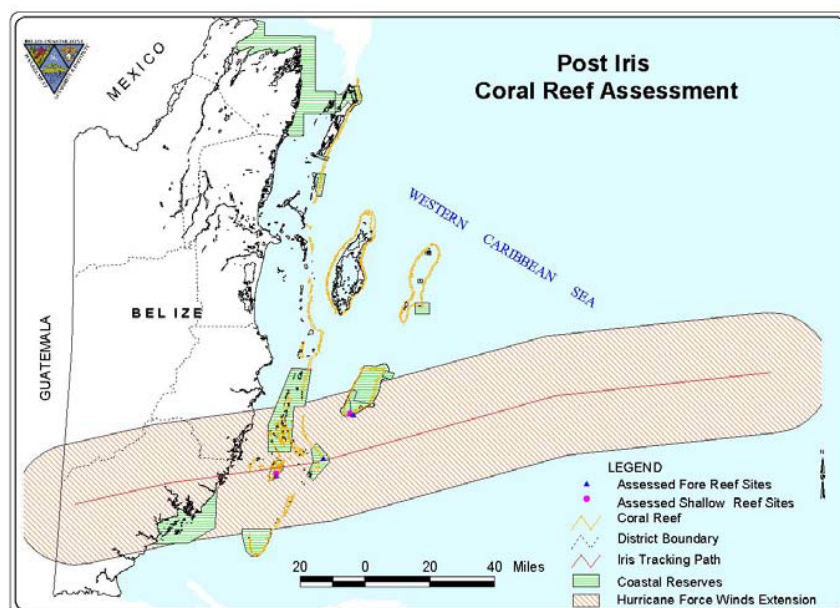


Figure 9.1 Post-Iris coral reef assessment showing hurricane path

Two Nature Conservancy partner conservation organizations, Toledo Institute of Development and the Environment (TIDE) and Friends of Nature (FON), that were working with the communities in Southern Belize to mitigate environmental threats, were also affected by the hurricane. Both organizations lost resources and infrastructure critical to their conservation efforts and FON was particularly decimated. Impacts were:

- Two eco-tourism facilities that were used to bring money into the communities to raise funds for future conservation projects were destroyed.
- TIDE sustained approximately \$100,000 worth of damages including the loss of boats and kayaks used in successful efforts to develop salt water fly-fishing and kayak guiding as alternative sources of income for local fishermen.
- TIDE lost one of its two ranger stations and a great deal of important equipment needed to patrol, and thus protect, the rainforest and the marine reserve.
- In addition to losing the one boat FON uses for patrolling marine reserves, FON's office and all office equipment were destroyed.

This loss of property and the other damage inflicted by the hurricane threatens the long-term success of programs designed to bring an ecologically friendly economy to southern Belize. For example, the combined loss of the eco-lodges and the downturn in the global tourism industry may mean that people who had been retrained as dive, fishing or eco-tourism guides and park rangers will return to over-fishing, slash and burn agriculture, and unsustainable logging to survive.

Laughing Bird Caye was severely damaged by the winds, waves and water surge of Hurricane Iris. There is now a channel separating the north and south end and only approximately 20% of coconut trees were left standing. All mangroves on the north end were washed out and that area is bare of any kind of vegetation. Marine and terrestrial life was also extensively affected.

Over the last few years, natural disasters have contributed to a reduction in agriculture production and exports, as well as short-term increases in food imports. The aggregate impact from Tropical Storm Roxanne (1995) and Hurricane Keith (2000) in Northern Belize together with Tropical Storm Chantal and Hurricane Iris (2001) in Southern Belize resulted in more than US \$200 million in losses/damages to the agriculture sector alone. These natural disasters caused short-term shortages of domestic commodities such as rice, corn and beans and contributed to reduced exports of shrimp, lobster, papayas and bananas in the corresponding years, apart from damages caused to infrastructure. The frequency of hurricane events is expected to increase in response to global climate change.

The long standing infiltration of Honduran and Guatemalan fishermen into Belize waters to harvest fish, even during the closed season in Belize, does not hold well for the future of the fisheries resources in Belize. A harmonized management structure is needed between the three countries to reduce this practice and reduce tensions.

The incidents of September 11, 2001 in the United States have reduced tourism in Belize, although there are signs that it is recovering. Fisheries exports from Belize are impacted by international trade arrangements such as World Trade Organization and North American Free Trade Agreement.

10 Co-management incentives and patterns of interaction

Incentives for stakeholders to cooperate through the actions of FON in the management of marine resources are identified for a number of reasons or threats to the natural resources, economy and livelihoods in the area. These include threats to LBCNP, GSMR and Placencia Lagoon (PFB/BEST/ANDA 2000; Program for Belize 2001). The variety of threats which exist in the area impact upon the two primary economic activities in the area – tourism and fishing. The incentives for stakeholders to cooperate to maintain the health of the natural resources for livelihood and food security have resulted in certain interactions that have influenced the actions of FON (Tables 10.1 and 10.2).

Table 10.1 Unsustainable fishing practices

Threats	Source/type of threat
Destructive fishing practices	Commercial fishers
Undersized catch	Fishers
Closed season fishing	Fishers
Overfishing	Fishers
Disruption of fish life cycles	Fishers

Table 10.2 Tourism industry

Threats	Sources/types of threats
Destruction of live coral	Tour operators and tour guides/tourists
Destruction of other marine resources	Tour operators and tour guides/tourists
Overvisitation of selected sites	Tour operators and tour guides

FON has taken several actions to address unsustainable fishing practices. In both LBCNP and GSMR, restrictions have been put on commercial fishing. Fishermen have reportedly complied with these regulations. There has been a ban on fishing for grouper during the spawning aggregation. FON is holding consultations with fishermen to address concerns over this regulation. Placencia fishermen have asked the government to create an exclusive fishing zone

around their village to control the access of outsiders. Within its strategic plan, FON has a specific strategic objective for addressing: Unsustainable Use of Marine Resources. The purpose of this objective is to mitigate developmental, fishing and tourism practices and activities that impact marine resources and will be sought through responsible management that encourages enforcement of existing and developing new regulations. The prioritized threats that are targeted for mitigation through this strategic objective are:

- Tourism related destruction or damage
- Overuse of resources
- Illegal fishing
- Poor enforcement of regulations

FON has begun to address broader resource management issues than the MPAs. In 2001, FON merged with Friends of Placencia Lagoon to address issues of improper land use and effluents on the Lagoon's environment. Within its strategic plan, FON has a specific strategic objective for: Sustainable Development of Coastal and Lagoon Areas. The purpose of this objective is to work with national and local government and communities to develop best practices and regulatory guidelines for land use and infrastructure development. The prioritized threats that are targeted for mitigation through this strategic objective are:

- poor enforcement of regulations
- unplanned development in agriculture and tourism
- poor enforcement of regulations

See tables 10.3 to 10.5.

Table 10.3 Improper land use

Threats	Source/types of threat
Silting of coral and sea grass beds	Dredging/sand mining
Mangrove destruction	Commercial/residential development
Erosion and silting	Unplanned tourism development
Erosion and silting	Unplanned residential development
Silting due to erosion	Commercial agriculture
Solid Waste	Commercial/residential development

Table 10.4 Effluents

Threats	Source/types of threat
Agricultural effluents	Commercial agriculture
Industrial effluents	Processing industries
Aquaculture effluents	Aquaculture industries
Bilge water/oil spills	Boats and ships
Sewer discharge	Communities along rivers and coast

Table 10.5 Management of MPAs

Threats	Sources/types of threats
Limited implementation of management plans	Resource managers
Limited management capacity	Limited investment in management
Limited monitoring and research	Limited research capacity and resources
Limited community participation	Communities not involved in MPA management

With the recent hiring of new staff, FON has begun to improve its management, monitoring and research capacity. FON has been holding community consultations to increase stakeholder participation in management. Within its strategic plan, FON has a specific strategic objective for: Management of Marine Protected Areas. The purpose of this objective is to protect, conserve and rehabilitate Gladden Spit marine reserve and Laughing Bird Caye National Park through research, monitoring, educating, restoration, and regulating multiple uses. The prioritized threats that are targeted for mitigation through this strategic objective are:

- misuse of reserves
- increased unsupervised use of the park
- lack of baseline data on resources and users
- need for active patrols and monitoring

FON has begun to coordinate more with other NGOs managing MPAs in Belize in order to obtain more support from government and to maintain the MPAs system in the country. FON is beginning to address the issue of funding through the establishment of user fees for using the MPAs. FON's reliance on donors for funding will need to be shifted to a self-financing mechanism to ensure the sustainability of its operations. Enforcement of regulations (Table 10.6) within the MPAs is reportedly functioning well. FON has rangers and boats for patrol. FON has been developing environmental education programs for tour guides and tourists on sustainable use of the marine resources.

Table 10.6 Policy and enforcement

Threats	Sources/types of threats
Lack of political will to protect and finance conservation of marine resources	Parties lobbying to abolish MPAs
Inadequate dedicated resources	Limited revenue generation options
Enforcement	Limited enforcement of existing regulations
Lack of written policy and guidelines to implement MPA management activities	National policy

These threats continue to be serious and beyond the means of FON. Government will need to address these transboundary issues with input from FON and other NGOs. TRIGOH, a regional initiative to address transboundary issues and threats, provides a positive forum for discussion and action (Table 10.7).

Table 10.7 Transboundary

Threats	Sources/types of threats
Deforestation resulting in erosion and silting of rivers and coral	Agricultural interests in Guatemala and Honduras
International poaching of resources	Fishers from Guatemala and Honduras
Solid waste inflow from international waters	Ships

In addition to the threat categories described above, there are a number of specific threats to the marine resources and habitats in the FON area (Tables 10.8 to 10.12).

Table 10.8 Coral

Threat	Source of threat
Removal of algae predators	Overfishing
Physical damage	Trawling, anchors, tourism
Silting	Dredging, agriculture
Disease	Natural phenomena
Bleaching	Global warming
Coral drowning	Accelerated sea level rise
Non-indigenous species	Bilge water, aquaculture

Table 10.9 Mangroves

Threats	Source of threats
Physical damage	Residential and resort development; improper land use
Silting	Dredging; erosion due to agriculture development

Table 10.10 Seagrass beds

Threats	Sources of threats
Physical damage	Trawling; dredging; tourism
Silting	Trawling; dredging; tourism

Table 10.11 Fish population

Threats	Sources of threats
Overfishing	Fishers; market demand
Habitat destruction	Trawling; dredging; fishers

Table 10.12 Water quality

Threats	Sources of threats
Eutrophication	Sewer run-off from coastal areas
Pollution	Agricultural and aquaculture run-off

FON has taken an ecosystem approach to management of the two MPAs and Placencia Lagoon. Within its strategic plan, FON has a specific strategic objective to: Maintain Ecosystem Integrity. The purpose of this objective is to monitor and mitigate impacts on regional ecosystems, biota and key environmental factors to maintain and improve their health and productivity. The prioritized threats that are targeted for mitigation through this strategic objective are:

- illegal fishing
- overuse of resources including destruction of coral reefs
- lack of baseline data on resources and users
- poor enforcement of regulations
- tourism related destruction or damage
- habitat alteration or destruction
- pollution and contamination from land based sources

11 Outcomes and performance of co-management arrangements in Belize and FON

Overall, the idea and implementation of the concept of co-management for MPAs in Belize appears to be fundamentally one of devolving government management responsibilities to local NGOs. In undertaking this devolution, it is felt that the NGOs' will improve the management of coastal resources and that the government will reduce the burden on its already inadequate resources to effectively manage some of the country's most economically valuable natural resources by encouraging NGOs to seek donor funding for resource conservation and management.

In general, the co-management of MPAs in Belize does not inherently involve broad based community participation. Co-management arrangements in Belize have not been designed primarily as community-based systems with the attendant participatory decision-making structures and processes. The dominant understanding of 'community participation' seems to involve appointing a representative from the community, regardless of whether that individual in fact represents the many interests of that community, or indeed, communicates the activities of the managing NGO to its members. As such, communities impacted by the MPA often have very little real determinative impact on the MPA management design and decisions that affect the local resources they depend upon for their personal and economic survival. There is a pressing need to develop mechanisms to more directly and actively involve local communities in the management decision-making of local resources in cooperation with the NGOs that have been granted this responsibility by the government.

There is a general sense among people in the communities that FON serves works with that the Government of Belize doesn't really provide adequate services to its residents. NGOs, such as FON, are often seen in the same way as government; that is, doing the work that the government cannot afford.

Palacio (2001) states, "NGOs do not realize that the South has had many experiences with unsuccessful community-based activities and that it could become both a cause and effect of failures in future ventures, unless the NGOs adopt more sustained and technical ways of working along with the communities, starting with their own indigenous origins. For example, to engage in dialectical interchange with community members on why they need to change their behavior." He further states that, "The government of Belize does not know how to respond to the development needs of coastal community groups. By continuing to deny communities their right to form their own governance systems and to pay for them, the highly centralized governance systems are obstructing the formation of functional community-based structures".

There is a need to devolve decision-making authority to the communities. There needs to be a mechanism established that allows for the community to be brought into the decision-making process with greater effectiveness – regular community information sessions in all villages, a community liaison program/officer, use of participatory techniques for establishing community or user needs and interests, and integrating them more fully and actively into MPA management.

Fishermen tend to be unclear about their role in co-management, as well as being generally unclear about the concept itself. Many fishermen and community members have never heard of the term. There needs to be greater clarity/education and training on the concept of co-management among not only fishermen and community members, but MPA managers and government officials.

At present, co-management takes place in Belize without supporting legislation. The legislation currently applied to allow for co-management is inappropriate, and, on some points, contradictory to existing co-management initiatives (Ravndal 2002). The National Parks Act gives the Minister great discretionary powers to deviate from the Act, and as such provides little guarantee for long-term conservation of biodiversity of protected areas. Numerous licenses to extract resources in protected areas have been granted by applying these discretionary powers. It is also possible to abolish (de-reserve) a protected area and this makes long-term conservation very risky. The Act will need to be revised to reduce the extensive discretionary powers of the Minister. There also seems to be a lack of government commitment to MPAs as illustrated by the small budget allocated to the Protected Areas Program, and this results in a lack of capacity of key government agencies responsible for management and co-management of MPAs.

MPAs are declared under the Fisheries Act but few were explicitly intended for fisheries management as they were sited in very productive areas rather than in areas that were depleted or need rehabilitation. There is inherent tension between the declaration of MPAs for conservation purposes versus as a form of tourist attraction. Very often local peoples/users perceive these areas to be more about attracting tourists and serving the needs of the tourism industry than the needs of traditional long-term fishers be they commercially oriented or merely subsistence-based.

A key problem with co-management for MPAs in Belize is jurisdictional; that is, competition, tension, and personality politics among and between managers and policy-makers in various government departments and ministries. This has resulted in a lack of coordination, cooperation, and commitment among the agencies responsible for MPA management issues. These inconsistencies, at a legislative level, need to be resolved. Two possible routes for resolving these issues include: (1) the creation of an overarching legislation governing and coordinating MPA management activities and co-management; and (2) the creation of national-level policies and related (clear) guidelines concerning MPA creation, management and regulation. The cooperative implementation of these policies and guidelines is also imperative.

FON has a strategic plan, a Board of Directors, an Executive Director and staff. It has an office and equipment. There exists a management plan for both MPAs. Financing has been secured for the immediate future. The MPAs are being managed and the resources are being conserved. However, there are both positive and negative aspects of the co-management arrangement with FON.

12 Conditions for successful co-management at FON

The purpose of this project was to suggest mechanisms for the implementation of integrated pro-poor natural resource (and pollution prevention) management in coastal zones that could be developed and promoted through understanding the requirements for establishing successful co-management institutions for coastal resources under various conditions in the Caribbean. In this chapter we present conclusions based on the research framework that guided the study.

12.1 Type of co-management

The type of co-management that FON is engaged in is that of co-management of public protected areas between government and NGO (FON) with a local advisory committee, composed of community officials and members, contributing to this process. This is one of

several types of co-management being implemented in Belize which also include: 1) co-management of public protected areas between government and NGOs; 2) co-management of private reserves between the landowner (normally an NGO) and government; and 3) co-management between government and communities bordering or nearby a protected area and the community is represented by a community-based organization (Ravndal 2002). This is regarded as a delegated type of co-management where management authority is delegated to local institutions (in this case FON). In return, the government is informed, and reviews and endorses, where it sees fit, decisions made by local institutions.

12.2 Phase of co-management

The establishment of co-management can be seen as having three phases: pre-implementation, implementation, and post-implementation. The pre-implementation phase includes problem recognition, discussion, consensus building, seeking assistance, and project planning. The implementation phase including a variety of activities such as community entry, research, organizing, education, plan and strategy, and plan implementation. Post-implementation includes evaluation, phase-out, and operation of interventions (Berkes et al 2001). The co-management arrangement of FON is currently at the implementation phase.

12.3 Conditions for co-management

Over the last decade, research on co-management around the world has identified a number of conditions that favor the successful implementation and performance of co-management. This final section is based on findings that have been presented and these conditions will be reviewed in the context of FON's co-management activities.

12.3.1 Boundaries

The physical boundaries of LBCNP, GSMR and Placencia Lagoon are distinct and recognizable to FON and stakeholders.

12.3.2 Membership and stakeholders

The co-management process and arrangement that FON is undertaking does not inherently involve a high level of community participation. The concept of co-management at the community level involves FON appointing a representative from the community, regardless of whether that representative truly reflects the interests of all groups in the community or communicates the actions back to the community. Community members are not truly empowered to participate in the co-management of the MPAs. Communities have very little determinative impact on the decisions made about resource management or about the operation of FON.

12.3.3 Resource use problem

There is a high recognition of a number of resource use problems and potential threats to food security and livelihood. This was a central factor for the establishment of FOLBC and all the activities which have followed.

12.3.4 Management objectives

FON has a strategic plan developed in 2002. It provides clear management goals and objectives for both FON and for its management of the MPAs. Both of the MPAs have management plans with well articulated goals and objectives.

12.3.5 Scale of management

The scale of management of LBCNP and GSMR are within the capacity and capability of FON. This said, however, there is still a need to further develop the capacity of the Board of Directors to effectively govern FON and the two MPAs. There is also a need to further develop the capacity of current staff to undertake all the functions of management which have been delegated to them. There is also a need for more rangers and a senior biologist. Additional staff will be needed if FON is to undertake active management in the Placencia Lagoon.

12.3.6 Management adaptation

FON is a relatively young NGO. It has grown to take on a great deal of responsibility and authority for management of the two MPAs. Management has adapted to changing conditions in the area, such as integrating with Friends of Placencia Lagoon to address the needs of managing the Lagoon. They have also adapted to changing conditions as a result of the impacts of Hurricane Iris. As mentioned above, there is still a need to develop greater capacity of the staff and Board to improve management of both FON and the marine resources. There is also a need for better communication between the staff and the Board to adapt to changing managerial needs.

12.3.7 Cooperation

There is a lack of real buy-in by the stakeholders into the MPA management process. This can be attributed in part to the lack of active participation of stakeholders, lack of understanding of co-management, and the need for stronger environmental education activities.

12.3.8 Leadership

Leadership and motivation of the stakeholders is critical. There is a real need to focus on empowerment and on leadership management training for community members and resource users.

12.3.9 Collective action

There is not a strong tradition of collective action for marine resource management in Belize. Collective action could be strengthened through expanded education and awareness programs for the community.

12.3.10 Conflict management

As competition from a more diverse set of resource users of the marine and coastal resources in the area increase, so do conflicts. Traditional means of solving conflict no longer function. Increasingly, FON is being asked to manage conflicts between stakeholders and resource users. This is a task for which FON is not fully prepared and there needs to be training on conflict management.

12.3.11 Effective communication

There is a lack of transparency and accountability between FON and the stakeholders. For example, there is limited reporting on FON finances and activities to community. Lines of communication will need to be improved.

12.3.12 Effective coordination

FON works with five communities – Placencia, Seine Bight, Hopkins, Monkey River and Mango Creek/Independence. The coordination between FON and these communities varies. Relations

with Placencia and Monkey River tend to be more positive than with Hopkins. The historical animosity between Seine Bight and Placencia may affect the current management relations between FON and Seine Bight.

12.3.13 Trust and respect

FON is seen by many as merely an extension of government rather than a true representative of the people and resource users in the community. There is little transparency and accountability of FON, especially concerning funds and decision-making that affects key user groups (fishers and tour guides). There is a lack of real respect by many stakeholders for FON, although this is changing. There needs to be more daily interaction between FON staff and the community.

12.3.14 Organizational capacity

Outside of the two fishing cooperatives and the tour guide association, there are few organizations to represent stakeholders at FON or in the MPA management. Community organizing and stakeholder empowerment will need to be expanded to improve stakeholder participation in MPA management.

12.3.15 Financial resources

FON has adequate financing for the near future. This funding is primarily from international donors and may not continue for the long term. There is a need for FON to develop a self-financing mechanism. FON does have a strategy to develop long term funding of its activities. The lack of effective self-financing mechanisms may detract from the MPAs becoming economically viable and for long-term operation and sustainability of FON and the MPAs.

12.3.16 Net benefit

Positive economic benefits are accruing to stakeholders in the area as a result of MPA management. Tourism is increasing and local people are getting new jobs as tour guides, dive operators, and hotel, restaurant, and shop owners and staff. There do not seem to be many negative economic impacts of the MPA, however, the closing of the fishing areas near the spawning grounds in GSMR will need to be evaluated.

12.3.17 Representation in decision-making

There is concern that FON doesn't really represent the interests of the people in the communities. FON is felt to only communicate with certain people or groups in the community. The FON Board is not felt to be representative of all the stakeholders. Consultations are not well facilitated. There is also a concern that FON is a sort of 'elite' group that favours certain individuals and villages over others. In general, confidence in the representation of stakeholders in FON is quite low.

12.3.18 Enforcement

There is illegal fishing operating in the waters around the MPAs, primarily by fishermen from Guatemala and Honduras. There is a need for better enforcement of existing regulations. There is a need to increase education about fisheries laws and marine ecology to both domestic and foreign fishermen. There is a need for better coordination and harmonization of laws with neighbouring countries.

12.3.19 Property rights

Property rights in the MPAs are clear and well-defined.

12.3.20 Sharing decision-making

In general, creoles have a tendency to not go to meetings, while Garifuna and Mayans are more willing to attend meetings and participate. Generally speaking, meetings are held at a time convenient for FON as opposed to user groups (for example, evening meetings that go on until late at night are not viable for fishers who get up at 4 am to go out on the water). One strategy that has been adopted is for a group of fishers/family to send one 'representative' to a meeting and subsequently inform others about what took place. Also, FON tends to set the format and agenda of these meetings.

12.3.21 Decentralization and delegation

There is a need for more support from government agencies (Forestry, Fisheries) for the co-management activities. There is a need to give real power to the communities and NGOs to manage their own resources. Politicians need to understand the positive and negative consequences of community empowerment.

12.3.22 Social and cultural fit

Fishermen have become a powerful political force in Belize. However, they tend to focus more on their rights than their obligations. Fishermen will need to take more responsibility for resource management and focus less on income generation. Alternative livelihoods have been provided to local stakeholders, such as training on sport fishing, which has fit into the social and economic structure of the community.

12.4 Priority Action

FON as an institution is in a process of growth and maturity. FON has done a very good job of starting from a grassroots organization of local citizens concerned about use of marine resources to an NGO providing a range of functions for MPA management. As an institution, FON has adapted well to the changing needs of the MPA and its stakeholders. The priority action items reflect this maturity of FON as it seeks to improve the functions and services that it provides for marine resource management.

Priority action items to improve the activities of FON as reported by respondents include:

- Improved community involvement,
- Improved representation of stakeholders in FON management,
- Increased empowerment of stakeholders,
- Improved environmental and participatory education programming,
- Improved transparency and accountability for FON management,
- Strengthened self-financing mechanisms, and
- Improved trust and respect between FON and stakeholders.

FON has a strategic plan to address many of these issues and needs to implement these objectives and actions.

13 References

Almerigi, S. R. Mahon, Y. Alleyne, K. Atherley, J. Cumberbatch, and S. Mahon. 1999. Barbados Coastal Conservation Programme (Phase 1), Demonstration Projects. Participatory coastal zone management in Barbados. Coastal Zone Management Unit, 30 pp

Arnstein, S. 1969. A ladder of citizen participation. American Institute of Planners 35:216-224

- Auil, A. A., K. A. Aiken, and J.A. Koslow. 1999. An assessment of the Belize coral reef fishery. Proc. Gulf and Caribbean Fishery Institute. 45: 84-94.
- Azueta, J. 1996. Visual Assessment of Reef Fish Around Laughing Bird Caye, Belize. Fisheries Department, Belize City.
- Baird, I. G. 2000. Integrating community-based fisheries co-management and protected areas management in Laos PDR: Opportunities for advancement and obstacles to implementation. Evaluating Eden Series Discussion Paper No.14. London IIED. 17 pp.
- Belize Central Bank. 2002. Economic statistics for Belize. Government of Belize.
- Belize Tourism Board. 2001. Belize travel and tourism statistics: January-December 2001. Government of Belize.
- Berkes, F., R. Mahon, P. McConney, R. Pollnac and R. Pomeroy. 2001. Managing small-scale fisheries: alternative directions and methods. International Development Research Centre, Canada. 320pp
- Bevier, W. and B. Young. 1999. Draft Laughing Bird Caye National Park Management Plan. Friends of Laughing Bird Caye National Park, Placencia.
- Bood, N. 2001. Ecological status of Belize's southern reef system: impacts of Hurricane Iris. Coastal Zone Management Authority and Institute.
- Brown, D.A.V. 2001. Poverty in the Caribbean. On-line lecture. University of the West Indies, St. Augustine Campus. [<http://www.caribbeanresearch.com/Social%20Development/>]
- Brown, D.N. 2000. Social assessment of the Belize section of the Mesoamerican Barrier Reef System. CARICOM Fisheries Unit, Belize City.
- Brown, D.N. and R.S. Pomeroy. 1999. Co-management of Caribbean Community (CARICOM) fisheries. Marine Policy 23:549-570.
- Burke, R.B. 1982. Reconnaissance study of the geomorphology and benthic communities of the outer barrier reef platform, Belize. In The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, I. Structure and Communities edited by K. Rutzler and I.G. Macintyre; Smithsonian Contributions to the Marine Sciences Number 12, Smithsonian Institution Press, Washington, D.C.
- Caribbean Conservation Association. 2001. Report of the Executive Workshop on Co-management (28 - 29 August 2001) and Executive Workshop on Education and Outreach (30 August 2001), hosted by the Toledo Association for Sustainable Tourism and Empowerment (TASTE) in Punta Gorda, Belize. Coastal and Marine Management Program (CaMMP) of the Caribbean Conservation Association. 42pp.
- Caribbean Natural Resources Institute. 1999. Principals of Participation and Co-management: A Workshop For Professionals. CANARI Technical Report No. 260:24 pp
- Caribbean Natural Resources Institute. 2000. Participatory resource management approaches for managers and decision-makers. Week 1: Building institutions for participatory resource management. CANARI Workshop Report. 3-7 July, 2000, Falmouth, Antigua
- Caribbean Natural Resources Institute. 2001. Participatory resource management approaches for managers and decision-makers. Week 2: Designing participatory institutions for effective management. CANARI Workshop Report. 22-26 January, 2001, Tobago
- Carney, D. ed.1998. Sustainable rural livelihoods: what contribution can we make? DFID, London. 213 pp.

Centre for Development Studies. 2000. DfID Support for Pro-Poor Civil Society Organisations: A Good Practice Guide. Manuscript. Department of Economics and International Development, University of Bath

Central Bank of Belize. 2002. Twentieth annual report and accounts. Government of Belize. 72pp

Central Statistical Office. 2000. Environmental Statistics for Belize. Ministry of Finance, Belmopan.

Central Statistical Office. 2001. Abstract of Statistics: Belize 2001. Ministry of Finance, Belmopan.

Coastal Zone Management Authority and Institute. 2001a. Placencia/Laughing Bird Caye Coastal Planning Region: Development Guidelines (Draft). Belize City.

Coastal Zone Management Authority and Institute. 2001b. State of the Coast Report 2000. Belize City.

Coastal Zone Management Authority and Institute. 2003. The National Integrated Coastal Zone Management Strategy for Belize. Belize City.

Coral Cay Conservation. 1991. Report of Survey Data: Laughing Bird Caye 1991 Expedition. London, England.

DFID-NRSP. 2001. Locating a poverty focus in natural resources systems research. DFID. 12pp.

Dorward, A., S. Anderson, S. Clark, B. Keane and J. Moguel. 2001. Asset Functions and Livelihood Strategies: A Framework for Pro-Poor Analysis, Policy and Practice 1. Contributed Paper to EAAE Seminar on Livelihoods and Rural Poverty, September 2001. [Web doc.]

Friends of Nature. 2002. Draft Gladden Spit Marine Reserve Management Plan. Placencia.

Fisheries Department. 2000. Marine protected areas network initiative (Draft). Government of Belize

Geoghegan, T. and A. Smith. 1998. Conservation and sustainable livelihoods: collaborative management of the Mankòtè Mangrove, St. Lucia. 16 pp.

Geoghegan, T., A. Smith, and K. Thacker. 2001. Characterization of Caribbean marine protected areas: an analysis of ecological, organizational, and socio-economic factors. CANARI Technical Report No. 287.

Gibson, J., M. McField, and S. Wells. 1998. Coral reef management in Belize: an approach through integrated coastal zone management. *Ocean and Coastal Management* 39: 229-244.

Government of Barbados. 1993. Development plan 1993-2000. Government Printing Dept., Bridgetown, Barbados

Government of Belize. 1981. National Parks System Act. Statutory Instrument No. 4 of 1981.

Government of Belize. 1991. National Parks (Laughing Bird Caye) Order. Statutory Instrument No. 167 of 1991.

Government of Belize. 1992. Section 13A of The Fisheries Act, Chapter 174 of the Laws of Belize, Revised Edition 1980-1990.

Government of Belize. 1996. National Parks (Laughing Bird Caye) Order. Statutory Instrument No. 94 of 1996.

Government of Belize. 1996. National Parks (Entry Fees) Regulations. Statutory Instrument No. 128 of 1996.

Government of Belize. 2000. Fisheries (Gladden Spit and Silk Cayes Marine Reserve) Order, 2000. Statutory Instrument No. 68 of 2000.

Graham, R.; 2001a. Pilot survey results on demographics and attitudes of tourists participating in whale shark tours in Belize, UK Darwin Initiative and PADI Project Aware Foundation.

Graham, R.; 2001b. Belize's first whale shark tourism & conservation course, Report to the Gladden Advisory Board, UK Darwin Initiative and PADI Project Aware Foundation.

Graham, R. 2001c. Research and conservation of whale sharks and reef fish spawning aggregations. Report to the Department of Fisheries, UK Darwin Initiative and PADI Project Aware Foundation.

Graham, R. 2001d. Whale shark tourism guidelines for the Belize Barrier Reef, Brochure, UK Darwin Initiative and PADI Project Aware Foundation.

Heyman, W. D. 2001. Spawning aggregations in Belize. Workshop report "Towards a sustainable management of Nassau groupers in Belize," Belize City, 30 July 2001. The Nature Conservancy, Belize.

Heyman, W. and T. Hyatt. 1996. An analysis of commercial and sport fishing in the proposed Port Honduras Marine Reserve. Belize Center for Environmental Studies. 51pp

Heyman, W. and R. Graham (eds.). 2000. The voice of the fishermen of Southern Belize. Toledo Institute for Development and Environment. Punta Gorda.

Heyman, W. D., and B. Kjerfve; 2001. The Gulf of Honduras, In Coastal Marine Ecosystems of Latin America. Ecological Studies, vol. 144, Springer-Verlag.

ICLARM and IFM. 1998. Analysis of Co-Management Arrangements in Fisheries and Related Coastal Resources: A Research Framework. Report Prepared by the Coastal Resources Co-Management Research Project Core Staff at the International Centre for Living Aquatic Resources Management (ICLARM) and Institute for Fisheries Management and Coastal Community Development (IFM): 21pp.

Jacobs, N.D. 1999. Assessment of marine and fisheries resources in the Southern Region of Belize. Environmental and Social Technical Assistance Project (ESTAP-IDB Project No. 999/OC-BL). Belize City.

Jentoft, S. 1989. Fisheries co-management: delegating government responsibility to fishermen's organizations. Marine Policy 13:137-154.

Johnson, M. 2002. Final report: consultancy to strengthen the coastal advisory and marine protected areas advisory committees. Belize City.

Kairi Consultants. 1996. Poverty assessment report — Belize. Final Report, Volumes 1 and 2. Report submitted to the Caribbean Development Bank.

Kairi Consultants. 1999. Poverty assessment report: Grenada. Volumes 1 and 2. Reports to the Caribbean Development Bank.

Kramer, P.A., and P.R. Kramer. 2000. Ecological status of the Meso-American Barrier Reef System: Impacts of Hurricane Mitch and 1998 coral bleaching event. Report to the World Bank.

Kuperan, K and N.M.R. Abdullah. 1994. Small-scale coastal fisheries and co-management. Marine Policy 18:306-313.

- Kurien, J. 1988. The role of fishermen's organizations in fisheries management of developing countries (with particular reference to the Indo-Pacific region). FAO Fish. Tech. Pap. No. 300.
- McConney, P.A. 1998. Using "common science" in co-management. Proceedings of the Gulf and Caribbean Fisheries Institute 50: 1115-1121
- McConney, P.A and R. Mahon 1998. Introducing fishery management planning to Barbados. Ocean and Coastal Management 39: 189-195.
- McConney, P.A., A. Atapattu and D. Leslie. 1998. Organizing fisherfolk in Barbados. Proceedings of the Gulf and Caribbean Fisheries Institute 51: 299-308.
- McField, M. 2000. Evaluation of management effectiveness: Belize marine protected areas system. Coastal Zone Management Authority and Institute. Belize City.
- McField, M.D. 2001. The influence of disturbances and management on coral reef community structure in Belize. Ph D Dissertation, University of South Florida.
- Ministry of Agriculture, Fisheries and Cooperatives. 2002. Statistical report. Belmopan.
- National Human Development Advisory Committee. 1998. National Poverty Elimination Strategy and Action Plan. Belmopan.
- National Human Development Advisory Committee. 2000. Preparing for the new millennium: national human development report 1999. Government of Belize, Belmopan. 91pp.
- Naturalight. 1999. Laughing Bird Caye National Park Web Page <http://www.laughingbird.org>.
- Noble, B. F. 2000. Institutional criteria for co-management. Marine Policy 24: 69-77.
- Normann, A. K., J. Raakjær Nielsen and S. Sverdrup-Jensen (eds.) 1998. Fisheries Co-management in Africa. Proceedings from a regional workshop on fisheries co-management research held 18-20 March 1997 at Boadzulu Lakeshore Resort, Mangochi, Malawi. Fisheries Co-management Research Project, Research Report No. 12.
- Palacio, J.O. 2001. Past and current methods of community base coastal resources management in the Southern coast of Belize. IDRC-CBCRM. Belize City.
- Palacio, J.O. 2002. Community management of protected areas conservation project: community assessment: final draft report. Submitted to Programme for Belize, Belize City.
- Perez, J. 2000. National Report: Belize. CARICOM-CFRAMP, Belize City.
- Pinkerton, E., ed. 1989. Co-operative management of local fisheries: new directions for improving management and community development. University of British Columbia Press, Vancouver.
- Placencia Producers Cooperative Society Ltd. Annual General Meeting reports. Placencia.
- Pomeroy, R.S. 1998. A process for community-based co-management. AFSSRN News. ICLARM Contribution #1448.
- Pomeroy, R.S. 2001. Devolution and Fisheries Co-management. In R. Meinzen-Dick, A. Knox and M. Di Gregorio (eds.) Collective Action, Property Rights and Devolution of Natural Resource Management – Exchange of Knowledge and Implications for Policy. Zentralstelle für Ernährung und Landwirtschaft, Feldafing, Germany.
- Pomeroy, R. and F. Berkes. 1997. Two to tango: the role of government in fisheries co-management. Marine Policy 21: 465-480.

- Pomeroy, R.S. and M.B. Carlos. 1997. Community-Based Coastal Resource Management in the Philippines: A Review and Evaluation of Programs and Projects, 1984-1994. *Marine Policy*. Vol. 21, No. 5: 445-464.
- Pomeroy, R.S., B.M. Katon and I. Harkes. 2001. Conditions affecting the success of fisheries co-management: lessons from Asia. *Marine Policy*. 25: 197-208
- Programme for Belize. 2001. Baseline assessment of the Belize Barrier Reef Reserve System for the COMPACT project. Prepared for United Nations Foundation under the UNDP-GEF/SGP-COMPACT Project. Belize City.
- Programme for Belize, Belize Enterprise for Sustainable Technology and Association of National Development Agencies. 2000. Belize COMPACT Programme Strategy: 2001 to 2003. Belize City.
- Ravndal, V. 2002. Community co-managed park system for Belize. Final Project Evaluation. UNDP/GEF Project.
- Renard, Y. 1991. Institutional challenges for community-based management in the Caribbean. *Nature and Resources* 27(4): 4-9.
- Renard, Y. 2000. Case of the Soufriere Marine Management Area (SMMA), St. Lucia. Prepared for the Seminar Integrating Stakeholders in Participatory Natural Resource Management, Kingston, Jamaica, April 2000. CANARI Technical Report No. 285: 8pp
- Stoddard, D.R. and F. R. Fosberg 1982. Species-area relationships on small islands: floristic data from Belizean sand cays. In *The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, I. Structure and Communities* edited by K. Rutzler and I.G. Macintyre; Smithsonian Contributions to the Marine Sciences, Number 12, Smithsonian Institution Press, Washington, D.C.
- Sussman, S. 1994. Serenity or destruction: a rapid ecological assessment of Placencia Lagoon. CFA-Belize. Belize City.
- Sverdrup-Jensen, S. & J. Nielsen 1999. Co-Management in small-scale fisheries - a synthesis of Sothern and West African experiences. Institute for Fisheries Management and Coastal Community Development (IFM). 23pp.
- Thompson, D. 1999. Final Report. CEDAM International 1999 Belize Expedition to Laughing Bird Caye.
- Toledo Institute for Development and the Environment; 2000. "Laughing Bird Cay National Park Management Plan," Friends of Nature, Placencia, Belize.
- UNDP/UNICEF/NHDAC. 1999. Belize: preparing for the new millennium. National Human Development Report. Belmopan.
- Wantland, K. F. and W. C. Pusey; 1971. A guidebook for the field trip to the southern shelf of British Honduras, New Orleans Geological Society.
- World Bank. 2001. Central America, the conservation and sustainable use of the MesoAmerican Barrier Reef System (MBRS). Report No. 21786 LAC: 341 pp.

14 Appendix

14.1 Appendix 1: Project case study summaries

14.1.1 Barbados

Sea egg fishery — A food fishery for white sea urchins (*Tripneustes ventricosus* locally called “sea eggs”) has declined on several occasions. After several closures to facilitate recovery, the government recently initiated co-management. Stakeholder groups include the Fisheries Division and Coastal Zone Management Unit (CZMU) of the government; and the Barbados National Union of Fisherfolk Organisations (BARNUFO).

Fisheries Advisory Committee — Under its 1993 Fisheries Act the government of Barbados activated a multi-stakeholder Fisheries Advisory Committee in 1995. The FAC has struggled to define and meet its co-management mandate. Stakeholder groups include the Fisheries Division of the government; individual and organisational members of the FAC.

14.1.2 Belize

Laughing Bird Caye National Park and Gladden Spit Marine Reserve MPAs — These MPAs in Belize’s barrier reef are co-managed by an NGO under co-management agreements with the Forestry and Fisheries Departments. Government stakeholders include the Fisheries and Forestry Departments, Coastal Zone Management Authority and Institute. Friends of Nature, Belize Tourism Industry Association and Belize Fisherman’s Cooperative Association are some of the NGOs.

Fisheries Advisory Board — Belize has a Fisheries Advisory Board (FAB) that has been a powerful force in fisheries for over 30 years. However, it has not been well documented as an example of co-management. Stakeholder groups include government Fisheries and Cooperatives Departments, Belize Fisherman’s Cooperative Association, members of the FAB.

14.1.3 Grenada

Lobster fishery (focus on Sauteurs location) — At the rural town of Sauteurs government recently started a co-management project to encourage use of more responsible fishing gear for lobster harvest, and the fishing co-operative in the area is presently being revived. Stakeholder groups include government Fisheries and Cooperatives Divisions, the Agency for Rural Transformation, St. Patrick’s Fishermen’s Co-op.

Seine net fishery (focus on Gouyave location) — The seine net fishery in Grenada is a case of an attempt by government to systematically document traditional fishing rules and customs in order to incorporate them into fisheries management plans and legislation. Stakeholder groups include the Fisheries Division of government, Agency for Rural Transformation, Grenada Community Development Agency, Gouyave Improvement Committee and St. John’s Fishermen’s Association.