# Managing small-scale fisheries in the Caribbean: the surface longline fishery in Gouyave, Grenada

by

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Submitted to the Faculty of Graduate Studies of The University of Manitoba
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**Managing small-scale fisheries in the Caribbean: the surface longline fishery in Gouyave, Grenada**

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Sandra Grant

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirement of the degree

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This dissertation is dedicated to the fishers and community members in Gouyave. My task here is to translate the concerns of the community into the technical language of practitioners, so they can make the much needed changes to fisheries management. Changes that will support fishing communities not make them more vulnerable.

# Abstract

This dissertation explores alternatives to managing small-scale fisheries in the Caribbean. Specifically, it demonstrates the importance of livelihoods, fisher knowledge, resilience, and institutions in fisheries management and planning; and develops a draft fishery management plan using the Management Objective Driven (MOD) fishery planning process. The case study is the longline fishery for large pelagic species in Gouyave, Grenada. Four analytical approaches are important to this study: (1) sustainable livelihoods framework, with an emphasis on individual, household, and community livelihood strategies; (2) fisher knowledge, with an emphasis on technological and ecological knowledge; (3) a resilience analysis, with an emphasis on adapting to disturbances and changes; and (4) a common property analysis, with an emphasis on sustainable institutions and cross-scale linkages.

Qualitative, quantitative, and participatory tools were used for data collection and analysis. Qualitative methods included semi-structured interviews with fishers, community members, and the government. Quantitative methods included a livelihood survey with 169 households. Other techniques included two focus group meetings with staff at the Fisheries Division, and three small group meetings with fishers. Field work was conducted between November 2002 and March 2004.

Regarding livelihoods, Gouyave fishers and community members are able to secure a living for their households by using diversification strategies, taking advantage of fishing and non-fishing seasonal cycles, and participating in social exchanges. The income they earn from fishing activities is spent locally to economically sustain the community, creating a viable fishing community. However, the community is vulnerable to disturbances (e.g., hurricanes and storm surges) which can change the livelihood systems (economic opportunities) overnight. Therefore, policies and management strategies should support livelihood systems in the community, as it not only benefits fishers but also the community.

The study shows that fisher knowledge is a valuable source of qualitative data, and should be included in management and planning. Fishers have expert knowledge of longline technology and ecological knowledge of the marine environment. This

knowledge can provide contextual information useful in interpreting historical fish landings, and it is consistent with published biological data. Combining fisher and scientific knowledge can increase the amount of information available for management. Also, in the absence of scientific data, fisher knowledge can be a reliable data source. Integrating fisher knowledge in management has its challenges, namely poor communication and lack of trust between fishers and the government.

Resilience is a measure of flexibility of the fishery system to changing circumstances and hence a worthwhile objective in fisheries management and planning. In analyzing resilience through cycles of change and reorganization, the study highlights the importance of enhancing resilience by: supporting the reorganization potential of the fishery; improving communication, problem-solving, and participation in decision-making; encouraging grounded response to critical change; and taking a multi-scale response to dealing with change. A resilient system would help support diversity (livelihoods, knowledge), build management based on flexibility and learning, and build capacity to manage and anticipate change.

The study shows that local institutions managing migratory marine commons are faced with two sets of challenges. The first is the sustainability and success of local institutions, and their participation in managing the commons. According to the study, the focus is on the participation of formal institutions in management; however, informal institutions with flexible rule structures essential to adaptive management should be encouraged to participate. Second, management of migratory fish stocks must involve cross-scale linkages between local (community and their institutions), national (the Fisheries Division), and regional/international levels. Such multiple-level management can benefit from institutional interplay. However, there are issues of compatibility and the task of connecting levels.

The research findings in this dissertation concludes by stating that management strategies and the planning process which considers livelihoods issues, fisher knowledge, resilience building, and the participation of local institutions in cross-scale management is likely to lead to improvements in fisheries management.

# Acknowledgements

This study would not have been possible without the assistance of the following individuals and organizations. Thank you to my committee members Fikret Berkes (Natural Resources Institute, advisor), John Sinclair (Natural Resources Institute), and John Brierley (Environment and Geography) for their continuous support during the PhD process. Special thanks to Fikret who was always there to give advice and show me different ways to achieve my research goal. Thanks also to Robin Mahon (University of the West Indies, CERMES) for his initial encouragement and continuous support, and to the Caribbean Regional Fisheries Mechanism (CRFM), in particular Milton Haughton, for technical and logistical support.

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Last, but not least, I thank my family: my mother, Etheline Richards, for giving me life, for educating me, and for unconditional support and encouragement to pursue my interests. My cousin, Odean Reynolds (you are like a sister), for listening to my frustrations and believing in me.

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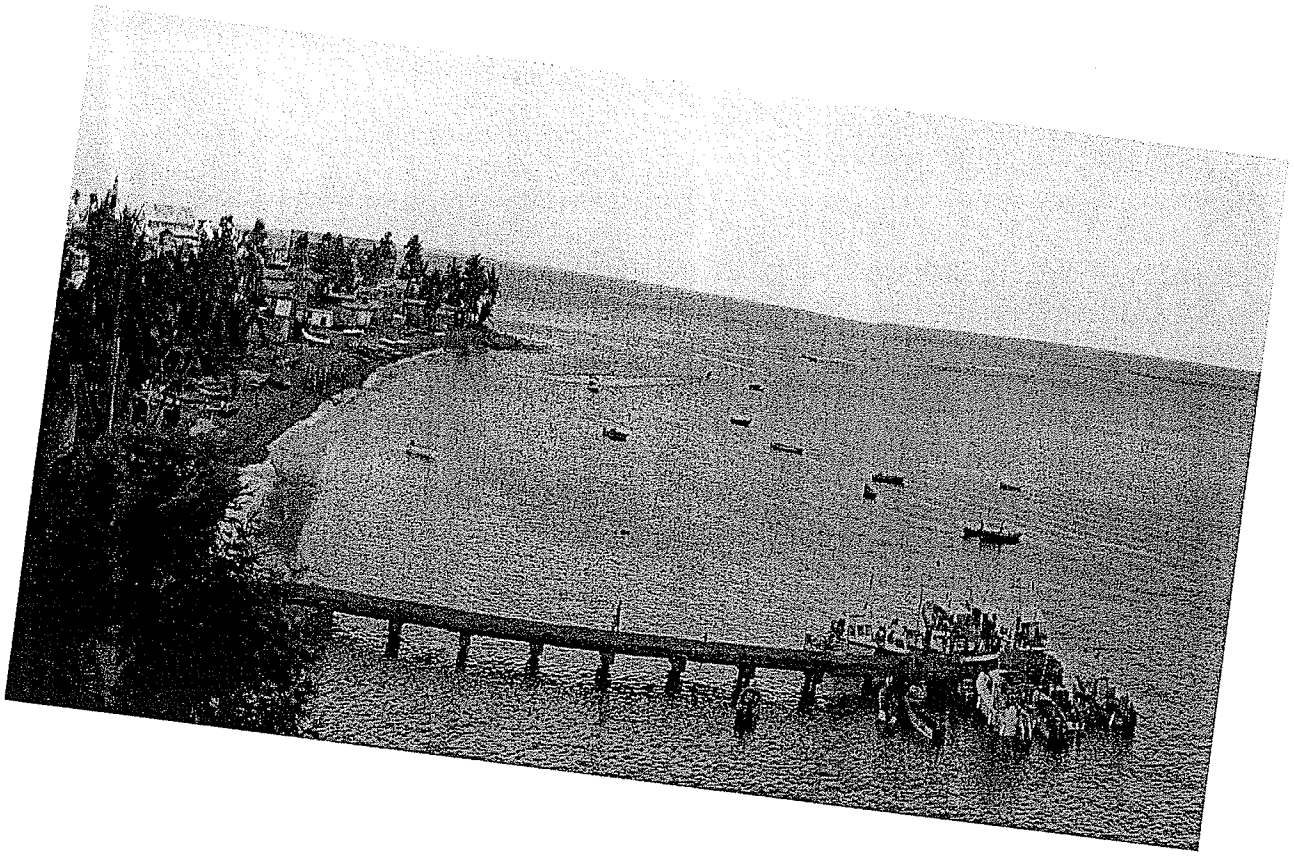
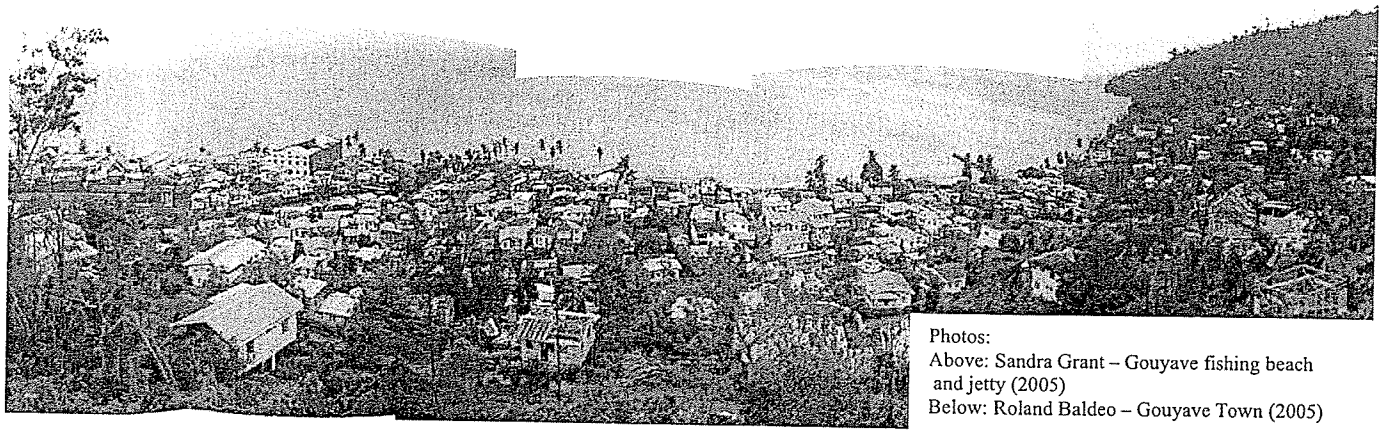
# List of acronyms

| | |
|---|---|
| AFDP | Artisanal Fisheries Development Programme |
| BO | Boat owner |
| BO/Captain | Boat owner and captain (owner/operator) |
| CaMMP | Coastal and Marine Management Program |
| CARICOM | Caribbean Community |
| CCA | Caribbean Conservation Association |
| CDB | Caribbean Development Bank |
| CFDP | Coastal Fisheries Development Project |
| CFRAMP | CARICOM Fisheries Resources Assessment and Management Program |
| CFU | CARICOM Fisheries Unit |
| CIDA | Canadian International Development Agency |
| CPUE | Catch per unit effort |
| CRFM | Caribbean Regional Fisheries Management |
| EC | Eastern Caribbean |
| FAO | Food and Agriculture Organization |
| FD | Fisheries Division |
| GCFL | Grenada Commercial Fisheries Limited |
| GCNA | Grenada Cooperative Nutmeg Association |
| GIC | Gouyave Improvement Committee |
| ICCAT | International Commission for the Conservation of Atlantic Tuna |
| IDRC | International Development Research Centre of Canada |
| IFAD | International Fund for Agricultural Development |
| LJFL | Lower Jaw Fork Length |
| MALFF | Ministry of Agriculture, Lands, Forestry, and Fisheries |
| MOD | Management Objective Driven |
| MPA | Marine Protected Area |
| MSY | Maximum Sustainable Yield |
| MT | Metric tonne |
| NFA | National Fishermen Association |
| NGO | Non-Government Organization |
| NIS | National Insurance Scheme |
| OECS | Organization for Eastern Caribbean States |
| PRA | Participatory Rural Appraisal |
| RRA | Rapid Rural Appraisal |
| SJFA | St. John's Fishermen Association |
| SJFC | St. John's Fishermen Cooperative Society |
| SPSS | Statistical Package for Social Science software |
| UN | United Nations |
| UNCLOS | The United Nations Conservation on the Law of the Sea |
| UNFSA | United Nations Fish Stock Agreement |
| WECAFC | Western Central Atlantic Fisheries Commission |

# CHAPTER 1:

## Introduction





Photos:
Above: Sandra Grant – Gouyave fishing beach and jetty (2005)
Below: Roland Baldeo – Gouyave Town (2005)

# CHAPTER 1: Introduction

Almost 10 years ago a fisherman walked into my office at the Jamaica Fisheries Division to complain about the status of the coastal pelagic fishery. "You should not be concerned," I said, "According to my data [scientific assessment] the fishery is doing well". I proudly whipped out my graph to prove the point. "You young university graduates who think you know more about fishing than a fisherman" he commented, "Come to the fishing beach and I will teach you more about fishing than you will ever learn in a book." I accepted his offer, and learnt and understood fisheries from his perspective. At the office, the more I followed the rules of management based on fisheries science, the more I became frustrated with this approach, because I wanted to incorporate the fishers' perspective in my analysis.

After six years interacting with fishers and implementing data collection activities to generate data to conduct fish stock assessment, I became more and more interested in linking my two sets of knowledge: the social system (fishers) and the ecosystem (marine environment). Then I read the book '*Managing small-scale fisheries: alternative directions and methods*' (Berkes et al., 2001) in which the authors argue that interdisciplinary social-ecological management of fisheries is a necessity when dealing with a complex system such as the marine ecosystem. Therefore, conventional fisheries management and fisheries science are not adequate when dealing with complex social-ecological systems. Instead, new tools and methods from different disciplines should be applied to small-scale fisheries management. I knew then that I had to continue fisheries management research in applying alternative techniques – Sandra Grant.

## 1.1 Fisheries management

The sustainable management of small-scale fisheries[1] is critical to the survival of fishing communities which depend on fish to provide food, income, and livelihoods for households. Yet most small-scale fisheries have not been well managed. One problem is the use of conventional fisheries management method, which was developed to manage large-scale (industrial) fishery, but it does not fit small-scale fisheries (Mahon, 1997; Berkes et al., 2001). To understand the problems of conventional fisheries management this approach will be discussed.

[1] Small-scale fisheries, especially in the Caribbean, are characterized as large numbers of small-scale vessels and fishers often based in small coastal communities that depend on local resources using multi-fleet to harvest multi-species (Berkes et al., 2001).

Conventional fisheries management and fisheries science rely on outcomes of stock assessment to formulate management strategies. Stock assessment involves those activities used by fishery scientists to describe conditions or status of a harvested or managed unit of fish (stock). Such assessments include understanding the history of fish landings and the effort needed to catch the stock (Catch per Unit Effort or CPUE), age, growth, death of fish, and the use of mathematical models to predict present and future yields and biomass. Mathematical models, which determine the maximum possible exploitation of fish stocks while ensuring sustainable yields over the long-term, have guided fisheries management. Maximum Sustainable Yield (MSY) is the largest average catch that can be taken continuously from a stock. Maximum Economic Yield (MEY) is the overall yield from a fishery that provides the maximum economic returns. Finally, Optimum Sustainable Yield (OSY) is the combination and rationalization of all the outputs considered important for the fishery in question (Walters, 1986; Sparre and Venema, 1992; Charles, 1994; Holling et al., 1998). These models can forecast the effects of development and management measures, such as closed season, total allowable catch, and gear regulations (Sparre and Venema, 1992; Hilborn and Walters, 1992).

The problems with conventional approach are predicting future events is impossible, assigning a numerical value to future yields is fruitless, and even well-meaning attempts to exploit the resource responsibly may lead to disaster (Ludwig et al., 1993; Wilson et al., 1994). Conventional fisheries management is a command-and-control (or linear/ reductionist) method to solve fisheries problems. It assumes that resource problems are well bounded, predictable, clearly defined, and generally linear with respect to cause and effects (Holling and Meffe, 1996). This style of management usually results in ecosystem becoming less likely to recover from stress and shocks, with the natural resources becoming more vulnerable to surprise and crisis (Holling, 1978; Holling et al., 1998). In reality, the effects of using the conventional approach to manage fisheries has lead to overexploitation, elimination of sub-stocks, habitat degradation and losses, and top-down decision-making and policies that ignore the complexity and uncertainty of marine resources (Christie, 1993; Ludwig et al., 1993; Charles, 2001; Christensen, 1985).

The Caribbean is not without its problems with conventional management. Proper stock assessment is seldom done or used in management. This is because stock assessment is data-intensive, and most Caribbean countries lack the technical capability and financial resources to carry out such intensive data collection, analysis and interpretation processes. Thus, most of these countries lack the information to manage fisheries using the stock assessment. Furthermore, small fisheries departments lack local expertise to assess, interpret, and apply the results of stock assessment analysis. They have to rely on 'experts' from developed countries with a background in assessing large stocks. Furthermore, they lack the data required to conduct these assessments, and the finances for more data, more equipment, more staff and training to sustain this approach (Mahon, 1997).

Natural resources such as fisheries are complex systems problems (Levin, 1999). Therefore, any sustainable management approach should address the interaction of social with natural systems and deal with uncertainty and complexity (Charles, 2001; Hughes et al., 2005; Wilson, 2006). According to Berkes et al., (2001:23):

> The emerging view of ecosystem emphasizes unpredictability (as opposed to predictability), multiple equilibria (as opposed to single equilibrium), resilience (as opposed to stability), threshold effects (as opposed to smooth changes), non-linear (as opposed to linear) processes, and the multiple scales in which these processes occur. These changes indicate a view of ecosystem that is much more complex than the view on which our conventional management approaches are based. Thus, the shift in the ecosystem paradigm has major implications for fisheries management approaches. For example, once we recognize the limits of predictability of future yields of a given stock, then we also recognize the limits of fishery management systems based on sustainable yields.

To deal with the issue of uncertainty and complexity in fisheries, provisions are made in the precautionary approach to environment and natural resource management made at the UN Conference in Environment and Development (UNED) in Brazil 1992. A key element in the Principle 15 of the Rio Declarations is that uncertainty is unavoidable in sustainable fisheries management; therefore, it is necessary to anticipate or prevent environmental degradation. Fishery management systems "should err on the side of conservation, particularly when there is the chance of irreversible changes that may degrade the equity of future generations", which means shifting the burden of proof

from the conserver having to prove harmful effects, to the user proving it will not cause harm (Berkes at al., 2001:24).

To deal with the unpredictable nature of social and ecological systems a number of promising alternative approaches to managing small-scale fisheries have generated interest. Some of these alternatives are adaptive management, participatory management and the use of fisher knowledge, co-management and community-based management, fisheries management planning, and participatory decision-making (McConney et al., 2000; Berkes et al., 2001; McConney et al., 2003; Pomeroy and Rivera-Guieb, 2006; Breton et al., in press). The alternative approaches may be individually useful; however, it is a combination of approaches that may be more effective, and that is the overall method that will be used in this research.

### 1.1.1 The research project

This research is an exploration to apply and combine new tools, concepts, methods, and management strategies to manage small-scale fisheries in the Caribbean. The case study is the surface longline (or simply longline) fishery for large pelagic species in Gouyave, Grenada.

In the Caribbean exploitation of large pelagic resources is expanding both commercially and recreationally. Large pelagic stocks are fully exploited or over-exploited, and therefore the urgent need to manage this resource. But management has its challenges, the stocks are migratory and as such it must include regional and international inputs. However, little is known of the impact of large pelagic fishing on communities. According to Mahon et al., (2005:217), "There is the need to better document the role of large pelagic fishing in the social and economic structure of rural communities, households, and representative fishing enterprises." It is for this reason that this research takes a community perspective to reveal the social and economic impact of large pelagic fishing on Gouyave, and develop management strategies that take these views into account. There is also the need to link local level management of large pelagic stocks to national, regional and international organizations/institutions.

The island of Grenada was chosen to conduct this research because it had the largest pelagic fishery of the Eastern Caribbean islands (Mahon and McConney, 2004),

yet been subjected to limited research compared to the other islands. The fishing community of Gouyave was chosen because it had the largest small-scale longline fishery in Grenada. Although this research is small and the scope locally applied, it can be an example of how fisheries management and planning can be implemented in the Caribbean region. The regional program, CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) was designed to promote the management and conservation of fishery resources in 12 English-speaking CARICOM countries[2] developed similar fisheries management systems for participating countries (Haughton et al., 2003). As such, applying new tools and methods to one Caribbean country may be applicable in others.

**Research objectives**

The broad objectives of this dissertation are: (1) to demonstrate the importance of livelihoods, fisher knowledge, resilience, and institutions in fisheries management and planning; and (2) to develop a draft fishery management plan for the longline fishery using the Management Objective Driven (MOD) fishery planning process. The following objectives satisfy the research purpose:

1. To determine how livelihoods issues can be analyzed and included in fisheries planning;
2. To determine how the use of fisher knowledge can inform institutions at various levels of management;
3. To evaluate how social and ecological systems related to the longline fishery reorganize around change using a resilience approach;
4. To evaluate community-based institutions related to the longline fishery, with a view for local level participation in regional and international management; and
5. To determine how a Management Objective Driven (MOD) approach may be applied to fisheries management.

[2] The participating countries are Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, and Trinidad and Tobago.

The first four objectives are analyzed through the theoretical lenses of sustainable livelihoods, traditional or fisher knowledge, complex systems theory with emphasis on resilience, and commons institutions, respectively. The final objective relates to a fishery planning process, where the results of the first four objectives are used to implement the MOD approach. This research hopes to demonstrate the feasibility of alternative fisheries management and planning approaches to the region, and provide resource managers in the Caribbean with practical alternative directions and methods for sustainable management of large pelagic resources. Also, to further theory and practice in managing fisheries resource.

## 1.2 The conceptual framework

Fisheries resources are unpredictable complex social-ecological systems. Therefore, no one perspective can analyze the relationship between marine ecosystem and social systems; an interdisciplinary assessment is required. This research is interdisciplinary by design, using skills from fisheries biology, ecology, human geography, development studies, anthropology, sociology, and economics to understand the relationship between the community and the marine environment. Understanding this relationship through consideration of using different disciplines provides a greater awareness of the issues and possible strategies for management. This section briefly outlines the main bodies of theory used in this study. Each concept is further explored in the specific chapters.

**Sustainable livelihoods.** The sustainable livelihoods framework is used as a conceptual tool to help understand fishers livelihood strategies, recognize seasonal and cyclical complexity of livelihood strategies, identify ways of making livelihoods able to cope with shocks and stresses, and understand the linkages between individual and household assets (Sahn, 1989; Davies, 1996; Chamber, 1997; Allison and Ellis, 2001). This dissertation explores two ideas. The first, fishing is part of a broader livelihood system in the community. Therefore, decisions for policy making should not be bounded by biological (MSY) and economic (profits, income) objectives, but should include social (livelihood security) objectives as well. The second, fishing is prone to uncertainty

(hurricanes, storms). Studies have shown that fishers and the community have a wide range of strategies to respond to uncertainty (Berkes and Folke, 1998). Understanding sustainable livelihoods in fishing communities from an individual, household, and community perspective provide insight into how fisheries management can become more sensitive to livelihood issues.

**Fisher knowledge**. Conventional fisheries management relies on scientific knowledge as the basis for assessment. Nevertheless, fisher knowledge can provide useful information to complement scientific knowledge, or it can substitute when scientific knowledge is not available (Johannes, 1998). This research builds on existing literature regarding the use of traditional/local ecological knowledge in resource management (Ruddle, 1994; Johannes, 1998; Berkes, 1999). Since 1992, with financial and technical assistance from the CARICOM Fisheries Unit (CFU) and the Canadian International Development Agency (CIDA), Caribbean countries collected catch, effort and biological data for use in conventional stock assessment (CFRAMP, 1993, 1995, 2001). Despite the accumulation of scientific data, countries oftentimes do not have sufficient information from which to manage fish stocks. In fact, fisher knowledge and 'common-sense' have already led to improved management systems (McConney, 1998). Fisher knowledge can help widen the range of information by combining scientific knowledge with fisher knowledge. This information can be used to evaluate the status of a fishery, inform government, and determine future directions. Combining fisher and scientific knowledge incorporates uncertainty and takes a precautionary approach to fisheries management.

**Resilience**. Resilience is an emerging concept in complex system theory. It is the capacity of the social and ecological system to absorb disturbance (Holling et al., 1998; Ludwig et al., 1993). Systems use information, knowledge, and experience to learn from and adapt to perturbation; adaptation provides opportunities for innovation and renewal (Holling and Meffe, 1996; Holling et al., 1998; Gunderson et al., 1995; Gunderson and Holling, 2002; Folke et al., 2005). Conventional fisheries management often blocks out disturbance; but disturbance is endogenous to the cyclic processes of ecosystem renewal. Therefore, managing fisheries for resilience would be a worthwhile objective from a

long-term point of view. When managing for resilience a number of important ingredients should be considered (Chapin et al., 2004):

- The recognition that people and their institutions are integral components of ecological systems;
- Social-ecological systems are always changing;
- Resilience is associated with diversity of species, of human opportunities, economic options that maintain and encourage both adaptation and learning; and
- Management aimed at building resilience depends on adaptive management built on flexibility and learning.

This dissertation explores change and reorganization based on the adaptive renewal cycle and panarchy (Berkes and Folke, 1998; Gunderson and Holling, 2002; Berkes et al., 2003; Chapin et al., 2004). The idea here is the longline fishery is constantly changing and managers need to guide it to evolve, take advantage of "windows of opportunity", and maintain options and flexibility. This dissertation also explores knowledge systems and learning capabilities that allows for adaptive management of local, and regional ecosystems (Folke et al., 2005).

**Commons institutions.** How to engage community-based institutions in participatory fisheries management and planning? In the case of shared resources, how to extend community-based management to regional and hemisphere commons? This dissertation draws on the literature in common property theory, with its emphasis on the self-organization of local institutions and cross-scale linkages (Ostrom, 1990; Ostrom et al., 2002; Young, 2002a; Young, 2002b). Appropriate local institutions involving fishers, community, and government are important in fisheries planning. This research focuses on community-based institutions with regard to their role and potential to facilitate participatory management between fishery managers, fishers, and community members. Building such partnerships has never been easy as it requires fishers who are sufficiently well organized to carry out such a partnership. In the past, formal institutions to manage fisheries have not been successful in the Caribbean (Brown and Pomeroy, 1999), thus the need to bring all forms of local institutions (formal and informal) into the process. Management of shared stocks means involving fishers and communities from different areas within the same country as well as regional and international institutions. Fishery

planning and management of shared stocks must include the interaction of scales both vertically and horizontally at the local, national, regional and international levels.

**A planning process**. This dissertation applies a structured fishery planning process, to prepare a draft fishery management plan for the longline fishery. This fishery planning process (known as the MOD approach) was chosen because of its advantages over conventional stock assessment approach (Mahon, 1997). The approach does not depend entirely on stock assessment to manage the fishery as much could be done with planning and stakeholder participation. The MOD approach is an adaptive process in that it facilitates dealing with change and uncertainty, and yet is consistent with the precautionary approach. This approach implicitly supports participatory management and resilience. This dissertation modifies the approach to be more explicit on livelihood concerns of community members, use of fisher knowledge in assessing the fishery, the participation of local people through local institutions and cross-scale management as part of a flexible management system that takes into account change and uncertainty.

## 1.3 Plan of the dissertation

This dissertation is organized into nine chapters, followed by a list of references, personal communication, and appendices. Chapters 1 - 3 provide context to the overall research, Chapters 4 - 8 deal with fisheries management and planning approaches (with a blend of theoretical concepts, field results, and discussion), and Chapter 9 discusses research findings. The following explains the details of each chapter.

**Chapter 1** states the objectives, conceptual framework for this research, and organization of the dissertation. **Chapter 2** presents the research approach, methods, and data analysis. This chapter details specific research methods including qualitative, quantitative, and participatory tools used during the 16 months of field research. **Chapter 3** describes the case study, the longline fishery in Gouyave, Grenada. This chapter presents the social, cultural, and economic profile of Gouyave, and from primary and secondary data describes the longline fishing industry.

Chapters 4 to 7 attempt to accomplish three things: first, to use practice (the case study) to inform theory; second, to highlight the lessons fishery managers can learn from

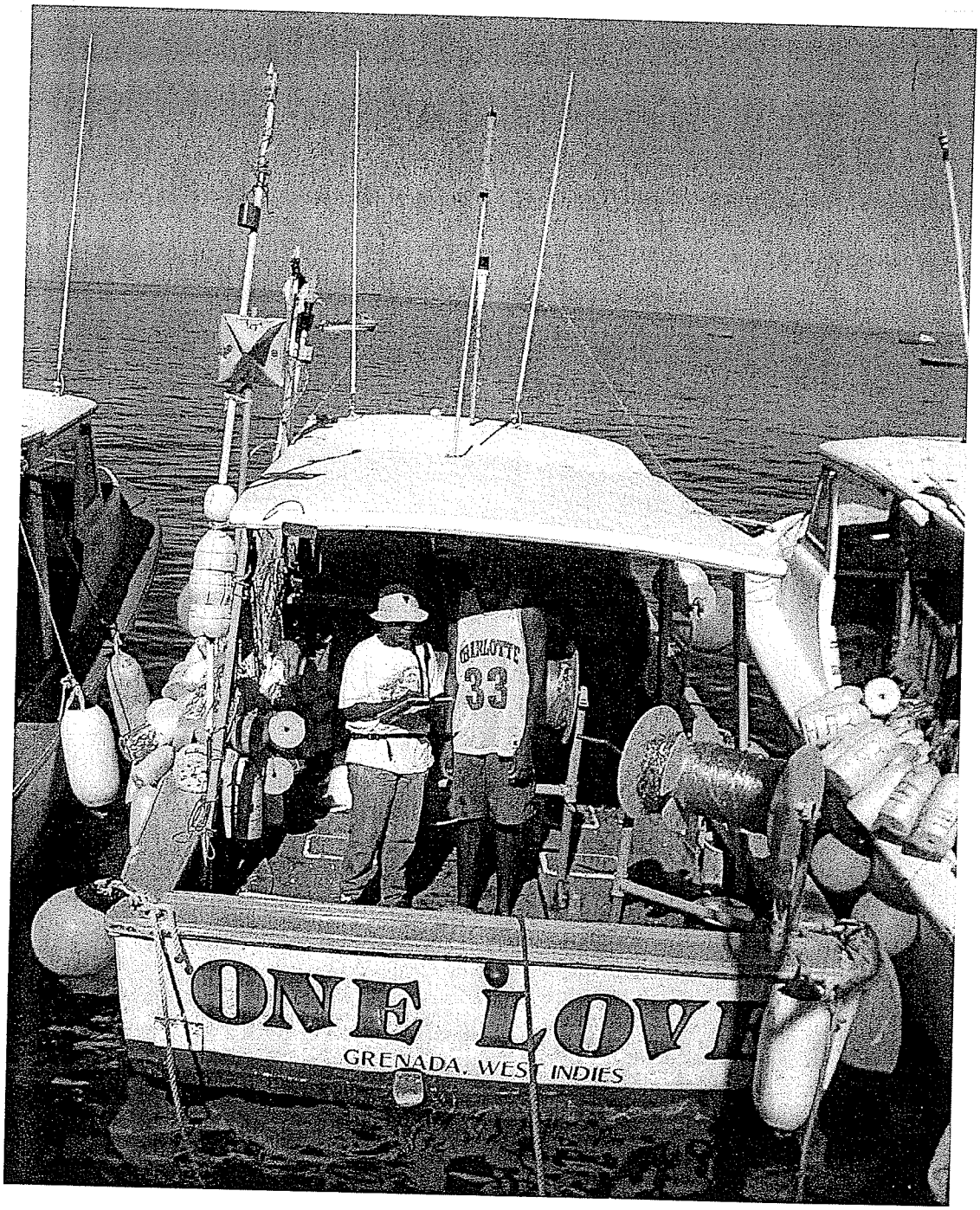
livelihoods, fisher knowledge, resilience, and institutions; and third, how these lessons can inform fisheries management and planning, which is later applied to the MOD approach. **Chapter 4** builds on data in Chapter 3 to analyze livelihoods from the fishers' perspective by applying the necessary academic disciplines. To Gouyave fishers sustainable livelihood is about securing a living for individuals and his/her household, and providing for a community. Thus this chapter discusses sustainable livelihoods from this point of view. It documents livelihood activities and strategies, discusses fishing sustaining the community, and describes changes to Gouyave livelihood systems after a shock. **Chapter 5** documents the development of technological and ecological knowledge of the longline fishery. This chapter contributes to the literature on local knowledge in fishing communities, and the need to use fisher knowledge to complement scientific knowledge. **Chapter 6** analyzes change, reorganization, and renewal in the longline fishery using analytical tools in resilience. This chapter contributes to the understanding the dynamics of disturbance, response to change, and renewal. It documents cycles of change and reorganization, and analyzes how fishers, community members, and the Fisheries Division respond to change. To discuss the fishery response to change, data from Chapters 5 and 6 were combined. How the socio-ecological system responds to change gives some insight into building resilient fishery systems. **Chapter 7**, institutional arrangements for managing marine commons, evaluates institutions and their ability to participate in fisheries management. This chapter challenges common property theory in two ways. First, it analyzes the self-organizing and self-regulating properties of local institutions to determine what factors encourage successful institutions. Second, it questions the management of shared/migratory that crosses many social and political boundaries. The case of the International Commission for the Conservation of Atlantic Tuna (ICCAT) management regulations is used as an example to show the challenges in managing shared migratory marine resource commons.

**Chapter 8** outlines a step-by-step plan of how the MOD approach (with modifications) could be implemented. The application is limited in scope. More needs to be done to discuss findings with the Fisheries Division and the community. Thus far the MOD approach has proven to be a possible fishery management process, and even more useful with the modifications. **Chapter 9**, the concluding chapter, sets out the research

findings and reflects on the research approach. Five research findings are presented based on each objective. The main contribution of this dissertation is in the area of alternative approaches to small-scale fisheries management in the Caribbean.

# CHAPTER 2:

## Research methods



# CHAPTER 2: Research methods

This chapter describes the research approach undertaken to study the longline fishery in Gouyave. It begins with the research philosophy statement, that is, why the research was done in this particular way using a specific bundle of research tools. Second, the research structure is presented - the site selection process, details of the field research, and dissemination. Third, details of research methods used to address the objectives and data analysis techniques are described. Finally, this chapter discusses the validity and reliability of the results.

## 2.1 Research approach

This research approach can be characterized as applied, holistic, and interdisciplinary, valuing the perspectives of a wider cross-section of individuals in the community. The approach is applied because the research techniques chosen in this study culturally fit the community and the situation. It is holistic because the research is founded on the idea that an understanding of the whole system, not just the parts, improves data interpretation. It is interdisciplinary because the research draws on techniques in social sciences and development studies to understand the issues from the perspective of the people. Moreover, the approach is about valuing the perspective of community members and respecting their views. The valuing and respecting were demonstrated in how interviews were conducted informally and in colloquial speech, and allowing the interviewees to speak openly and as long as they wanted in a non-threatening environment.

Also critical to this research approach is community participation. While a few key informant interviews can give the detailed information necessary, the researcher chose to widen the number of participants by varying the conversations from small talks to long interviews with a wide cross-section of people (fishers, housewives, high-school children, street-side vendors). This was an opportunity for the researcher to learn about

the people and the culture, but it was also a way for community members to learn about the research and reflect on the life in the community.

To achieve the research objective, the researcher used techniques that resulted in a comprehensive understanding of the complexities of life in the community and fishing. Such an understanding was important when considering how best to manage a fishery influenced by people and their social considerations. Following a qualitative understanding of community processes and institutions relevant to fisheries, the researcher applied quantitative research approaches that combined survey and visualization techniques. A qualitative research approach is useful to understand the experience of the participants. According to Merriam (2002:3-4):

> The key to understanding qualitative research lies with the idea that meaning is socially constructed by individuals in interaction with their world. The world, or reality, is not the fixed, single, agreed upon, or measurable phenomenon that is assumed to be in positivist, quantitative research. Instead, there are multiple constructions and interpretations of reality that are in flux and that change over time. Qualitative researchers are interested in understanding what those interpretations are at a particular point in time and in a particular context.

By contrast, quantitative research gives numerical measures for a statistical analysis. Also, the researcher used a number of Participatory Rural Appraisal (PRA) tools to understand different aspects of livelihoods using participatory tools and visualization techniques (Chambers, 1997).

Table 2.1 summarizes the different research techniques used. The combination of qualitative, quantitative, and participatory research approaches has its advantages and disadvantages. One advantage is that the researcher gains an understanding of the community members' interaction with the world, the complexity of issues, and provides statistical numbers to support findings. The second advantage is that the researcher's role changes between an insider, facilitator, and investigator. The result is a greater understanding of the community, the researcher's ability to weigh results obtained by each of the different methods used, and an ability to triangulate the results. The main disadvantages are the process are exhaustive and time consuming.

**Table 2. 1: Comparing qualitative, participatory, and quantitative research approaches**

| Features | Qualitative | PRA | Quantitative |
|---|---|---|---|
| Duration | long | short | long |
| Depth | exhaustive | preliminary | exhaustive |
| Scope | wide | wide | limited |
| Structure | flexible, informal | flexible, informal | fixed, formal |
| Participation | medium-high | high | low |
| Methods | basket of tools | basket of tools | standardized |
| Major research tools | semi-structured interviews, participant observation | semi-structured interviews | formal questionnaires |
| Sampling | small sampling | small sampling based on variation; opportunity sampling | random sampling; representative |
| Qualitative descriptions | very important | very important | not as important as 'hard data' |
| Outsider role | insider | facilitator | investigator |
| Best for … | understanding the community's self-perception | learning and understanding rural people's opinions, behaviour, and attitudes | gathering representative quantitative data and statistical analysis |

Source: Theis and Grady, 1991; Chamber, 1997; Merriam, 2002

## 2.2 Research structure

The research process involved three phases. The first phase was site selection, which involved selecting a case study. The second phase was field research, which involved data collection and analysis, research monitoring, and verification. The third phase was dissemination of research findings with the community and a wider audience.

### 2.2.1 Phase 1 - Site selection

The purpose of site selection was to select the most appropriate fishing village and fishery that would provide answers to the research objectives. Potential sites were identified based on the recommendations of colleagues (former CFU and Fisheries Divisions), literature review, and personal experiences of the researcher working in the Caribbean. The next task was to develop a short-list based on the following criteria: countries that already had conducted a number of community-based studies and others in the midst of conducting these types of studies; projects doing similar work to this

research; the ability to build on existing work being done by management authorities; management authorities willing to work with the researcher; and fishers and a community willing to or were already organized. From these criteria seven sites were short-listed to be scoped (Table 2.2). Scoping involved visiting the sites, observing, and talking with fishers and community members. The researcher also discussed the research and its implications with management authorities. Further documents on the specific fisheries were reviewed to become familiar with the fishery.

**Table 2. 2: Short-list of potential study sites**

| Fishery and fishing area | Community and country | Communities exploiting the fishery | Institutions/organizations with which the researcher would work |
|---|---|---|---|
| Snapper aggregation, Gladden Split | Placencia, Belize | Placencia, Monkey River, Punta Gorda, Independence, Hopkins (include Honduras & Guatemala fishers) | Friends of Nature<br>Mesoamerican Barrier Reef project<br>Belize Fisheries Department<br>Coastal Zone Management Institute |
| Reef Fishery, south Belize | Dangriga, Belize | Dangriga | UWI School of Continued Studies IDRC-CBCRM project<br>Buye Juan Lambey Institute (BJLI)<br>Belize Fisheries Department |
| Reef fishery, west coast Jamaica | Negril, Jamaica | Negril, Orange Bay, Broughton, Salmon Point, Bloody Bay, Homers Cove, Green Island, Little Bay | Carl Hanson, Negril Coral Reef Preservation Society<br>Negril Environment Protection Trust<br>Jamaica Fisheries Division<br>Natural Resources Conservation Authority |
| Longline fishery, west coast Grenada | Gouyave, Grenada | Gouyave, Victoria, Waltham (include Trinidad & Barbados fishers) | James Finlay's IDRC-CBCRM project<br>Patrick McConney, CaMMP/DFID Project<br>Robin Mahon, FAO/CFU Project RLA/0070<br>CARICOM Fisheries Unit, Belize<br>Grenada Fisheries Division<br>St. John's Fishermen Association |
| Trolling Fishery east Grenada | Grenville, Grenada | Grenville, Soubise, Marquis | Grenada Fisheries Division<br>Soubise Fishermen Cooperative<br>Grenville Fisherman Association |
| Reef fishery, Grenadines | Bequia, St. Vincent & the Grenadines | Paget Farm | Robin Mahon - CaMMP/CCA Grenadine Island project<br>CERMES UWI, Cave Hill<br>St. Vincent & the Grenadines Fisheries Division |
| Reef fishery, Island shelf | Charlestown, Long Haul, Newcastle | Newcastle, Long Haul, Jessup, Charlestown, Jones Bay, Indian castle, Cotton Ground (include St. Kitts fishers) | Nevis Island Administration – Department of Fisheries<br>St. James Fishermen Association<br>(St. Kitts Island Administration) |

To select the final site a second set of criteria was developed based on the research objectives. The sites were ranked according to the following criteria: availability of fishery information; ease of obtaining livelihood information; active fishermen cooperatives/associations; applicability of resilience theory; and links to organizations or research activities. Sites were visited between September and October 2002. Based on a review of the scoping outcome, the site selected as the case study for this research was the longline fishery in Gouyave, Grenada (Grant, 2002 unpublished report).

### 2.2.2 Phase 2 - Field research

This section discusses the field research phase (Fig. 2.1). The field research was structured into four parts: preparatory activities, planning, field data collection, and final data analysis (Bunce et al., 2000; Bunce and Pomeroy, 2003). Although the research was structured into four parts, some activities were done simultaneously, and the research process modified continuously, e.g., initial interview questions tested and re-tested to ensure the intent was captured.

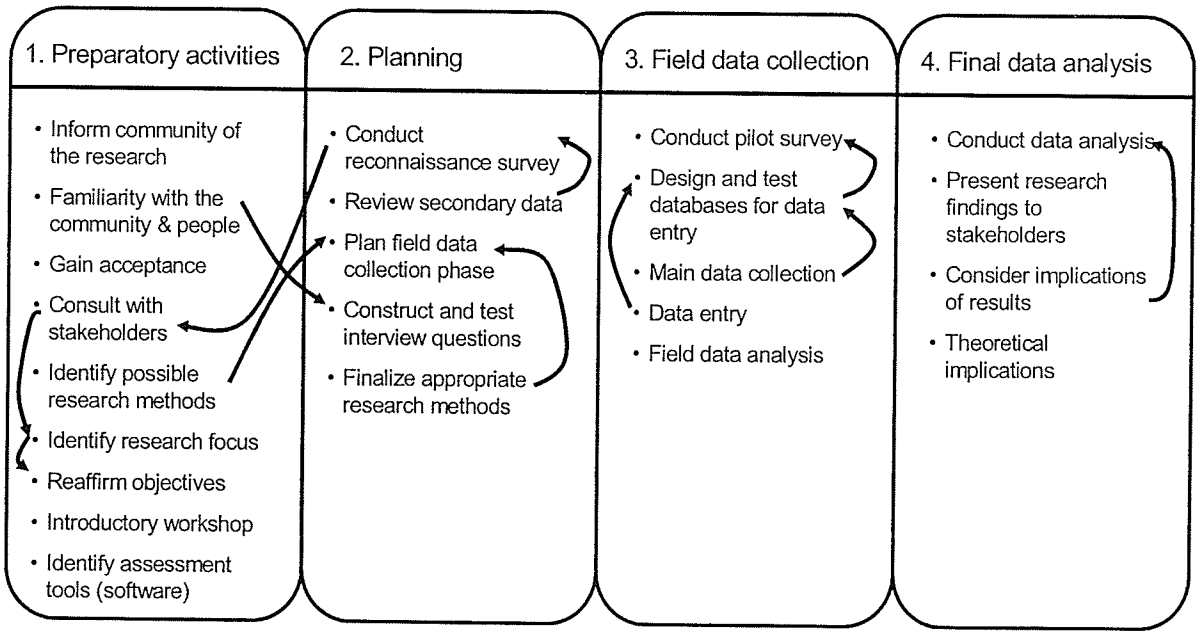



**Fig. 2. 1: Structure of the field research activities. Arrows showing a few cases of how the process was continuously modified (Source: framework adapted from Bunce et al., 2000).**

**Preparatory activities**

The aim of the preparatory activities was to exchange ideas with stakeholders about the research focus, and to consider the best strategies by which to achieve the objectives. It was also a time to engage stakeholders and the Fisheries Division to participate in the research. To achieve this goal, the researcher journeyed to Grenada in late November 2002 to begin the field research. She lived in Gouyave on Upper Depradine Street for 16 months. The researcher was new to the people and their culture; therefore, it was important that the community become familiar with her and the reasons she was living in the community. She spent the first six months in the community interacting with individuals and observing community dynamics so as to gain acceptance and trust from its members. Interacting with the community was an opportunity to introduce the research topics and to meet key members in the community. Fisheries Division staff also introduced the researcher to key individuals in the community and they suggested she met with other individuals. Talking freely with individuals gave them an opportunity to speak openly about the surface longline fishery, relate issues that were important to them, and specify research areas that the researcher should consider. Also, community walks were frequently undertaken to increase visibility and become familiar with the town and surrounding villages.

On January 16, 2003, the researcher organized an introductory meeting with 14 individuals including staff of the Fisheries Division and the former Chief Fisheries Officer to discuss the purpose, objectives, and activities of the research. This meeting gave participants an opportunity to make comments and suggestions regarding the research and its implementation strategy. The researcher also worked at the Fisheries Division for two months. During this period the she spent most of the time reviewing documents on the longline fishery from the Division's files and the library. Other activities included learning the protocol for data management, licensing and registration, and concessions. It was also an opportunity to observe organizational behaviour and practices. Talking with fishers, community members, staff at the Fisheries Division about the proposed research was beneficial to all involved. The researcher was able to further focus the study and gain acceptance from the community to conduct the research.

**Planning**

At the end of preparatory activities the researcher reviewed the initial research plan along with comments and suggestions from the Fisheries Division and community. The initial plan was revised and made to reflect, as far as possible, the needs of the community, Fisheries Division, and the researcher. The revised plan investigated livelihood and gender issues, fisher technological and ecological knowledge, community's response to changes in the fishery, and the ability of formal and informal institution to participate in management. Although, data on these different areas were collected during the life of the project, there were times when data collection activities focused on specific issues.

Preliminary research instruments were also revised. What could have been long questionnaires were divided into shorter ones dealing with specific issues (Appendices A-1 to A-12); because it was easier to engage fishers to talk at length about a specific issue than to complicate the questionnaire with many different issues. Likewise, questions were changed to include local vernacular, and much time was spent constructing and testing interview questions. Also important was the logistics of conducting the field data collection, deciding who to target, where to conduct the interviews and the sample size.

**Field data collection**

Each research instrument was pre-tested and fine-tuned before the final draft was accepted. Databases were designed in SPSS, NVivo, dbase, and Excel, and tested with results from the pilot survey. Preliminary analyses of the pre-tests were reviewed to ensure the consistency of questions, data entry, and analysis. Once everything worked, the main data collection commenced. During the initial stages of the main data collection the questions, database structure, and data analysis techniques were tested and modified. At the end of each questionnaire results were compiled and verified with key individuals and fishers.

**Final data analysis**

A final detailed data analysis was conducted, including frequency and cross-tabulations (Section 2.3). Results were discussed with key individuals and consideration given to the theoretical implications of the results. It was also an opportunity to reflect on the data collection process and findings. Part of the reflection involved searching for missing information, and planning a verification trip to obtain the data.

A verification trip was planned for October 2004; however, in September 2004 Hurricane Ivan hit the island, destroying most of the island's infrastructure. Plans for verification were delayed until April 2005. Despite the damage, fishing activities resumed shortly after Hurricane Ivan and operations did not change significantly, although there were changes to other livelihood activities. During this verification visit, the researcher visited with community members, listened to their stories, and provided support. It was also an opportunity to collect missing research data, to distribute technical reports to the Fisheries Division and community members, and to verify research findings.

### 2.2.3 Phase 3 - Dissemination

Dissemination activities included the production of reports, conference presentations, and local meetings. Reports included a site selection report and four technical reports on knowledge and learning, institutional interplay, sustainable livelihoods and a final research project report. The reports were distributed to community members, the Fisheries Division, and funding agency. The researcher attended six conferences over the lifetime of the project, including the Gulf and Caribbean meetings. Local meetings were held mainly with the Fisheries Division to present preliminary research findings, and discuss management techniques. This dissertation is also part of the dissemination activities.

## 2.3 Research methods

The methods utilized in this research are summarized in Table 2.3. This study focused on five objectives: livelihood issues, fisher knowledge, resilience, institutions,

and fisheries planning. Each objective draws on different research techniques and instruments. Details of the research methods are later described in details.

**Table 2. 3: An outline of research techniques by objectives used to collect data for this study.**

| Objectives | Activities/analysis | Methods | Appendices |
|---|---|---|---|
| Background information | Social and economic characteristics | SS, Obs | |
| | The fishing industry | SS, Ssi, Obs | A-4 |
| | History of the community | SS, Ssi, Ora | A-1 |
| Livelihood | Community livelihoods | Ssi, Sur, Tim, Gen | A-10, A-12 |
| | Household livelihoods | Ssi, Sur, Map, Gen | A-10, A-12 |
| | Individual livelihoods | Sur | A-12 |
| | Gender issues around livelihoods | Ssi, Obs, Gen | A-10 |
| | Kinship and social relations | Obs | |
| | Household characteristics | Ssi, Sur, Gen | A-10, A-12 |
| | Livelihood strategies | Ssi, Sur, Gen | A-10, A-12 |
| | Seasonal livelihood patterns | Ssi, Scl | A-10 |
| | The economics of livelihoods | Ssi | A-6, A-11 |
| | Effects of Hurricane Ivan | Ssi | verification |
| Fisher knowledge | Description of the longline fishery | Ssi | A-4 |
| | Folk taxonomy | Ssi | A-5 |
| | Ecological knowledge | Ssi | A-5 |
| | Technological knowledge | Ssi, Ora, Tim | A-3, A-4 |
| | History of fishing | Ssi | A-2 |
| Resilience | History of longline fishing | SS, Ssi, Tim, Ora | A-3 |
| | History of marketing | Ssi, Ora | A-2 |
| | History of the Fisheries Division | Ssi | A-7 |
| | Political history of Grenada | SS | |
| | History of development projects | SS | |
| | Impact of disturbances (hurricanes) | Ssi | A-3 |
| Institutions | Fisher groups and organizations | SS, Ssi | A-8 |
| | Use and property rights | Ssi | A-4 |
| | Rule-in-use | Ssi, Obs | A-4 |
| | Fishers' response to ICCAT | Ssi, Foc | A-9 |
| | Management options | Ssi, Foc | A-4 |
| Fisheries management approach | Stakeholders | Obs, St | |
| | Components of the fishery | Obs | |
| | Objective driven approach | SS | |
| Source: Bunce et al., 2000 | | | |

Key: Foc – focus group; Gen – gender analysis; Map – community map; Obs – observation; Ora – oral history; Scl – seasonal calendar; Ssi – semi-structured interview; SS – secondary sources; St – stakeholder analysis; Sur – Survey; Tim – timeline.

### 2.3.1 Qualitative techniques

***Participant observation.*** The main method used for the first six months of the research was participant observation (See Jorgensen, 1989). Observing, listening, and writing field notes became the key to understanding how the community functioned. The researcher took part in community activities, such as group meetings, concerts, parties, carnivals, cinema, and funerals, with the intent to gain an appreciation of social relationships in the community. Once friendships and knowledge of the fishers were established, the researcher joined competent captains on longline, seche, beachseine, and trolling (Appendix B) vessels during regular fishing trips. In order to observe and understand women's role in the community, the researcher worked with fish vendors and also visited with them. Information on local and national institutions was obtained by working at the Fisheries Division and the Gouyave Fish Market, attending fishermen cooperative meetings, observing informal group and community activities, and observing the process involved in starting the St. John's Fishermen Cooperative.

***Observations.*** The researcher lived across from the Gouyave Fish Market, which was the centre of fishing activity in the community. It was also an ideal site to sit and observe activities in the community, the landing of fish, interaction between/amongst fishers and vendors, movement of fish from the boats to processing plants. Conflicts between fishers were also observed. Issues of why the conflict got started and how it was resolved were of interest to the researcher, as they gave insight into the customary justice system in the community. Observation of who was doing what, where, and when was also important to the researcher, and was a way of determining individual's role in the community. Also, observations of the community's infrastructure and housing conditions were recorded by journaling and field notes.

***Documents.*** Published literature and documents provided background information to help reconstruct the history of fishing, and to gain insight into the different organizations and institutions. The researcher reviewed reports, letters, government correspondence, books, published literature, newspaper articles, posters, and boat/gear models on longline fishing in Grenada. To obtain these documents, the researcher visited the following libraries in Grenada: the Fisheries Division, the Documentation Centre (University of the West Indies), Gouyave community library, the Statistical Unit at the

Ministry of Finance, the Agency for Rural Transformation, and the National Library. Other libraries outside Grenada included the Caribbean Natural Resources Institute (CANARI) in Trinidad, University of the West Indies at the campuses in Jamaica, Barbados, and Trinidad, University of Manitoba, and the personal libraries of friends in the region. Osmond Small (former President of the St. John's Fishermen Association) provided his scrapbook with newspaper clippings from the 1980s on fishing-related articles, which in turn encouraged the researcher to start a scrapbook of fishing issues that occurred during the field research.

***Interviews.*** In this research the main data source was semi-structured interviews (See Mukherjee, 1993; Pido et al., 1996; Chamber, 1997). These interviews were conducted on the beach, in private homes of respondents, and in the office of the Extension Officer at the Gouyave Fish Market. Questions were open-ended, which allowed the researcher to further investigate interesting points in the interview. Of the 12 research instruments developed, 10 were semi-structured interviews. What follows is a brief description of the semi-structured interviews that were used throughout this study:

- *History of Gouyave* (Appendix A-1): this interview documented life in Gouyave from the 1950s to present, from a non-fishing perspective. It was developed to provide historical social and economic background information on the community. Three knowledgeable mature individuals were interviewed.

- *History of fishing* (Appendix A-2): this interview documented the history of fishing from the 1950s to present. It was developed to provide information on fishing activities before Hurricane Janet (1955), after Hurricane Janet, during the revolution (1979-83), and present (2003). Six retired and older fishers were interviewed.

- *History of longline fishing technology* (Appendix A-3): this interview was developed to provide detailed information on the history of technological development of longline fishing specific to Gouyave (1979-2003). Fishers who were actively involved in fishing longline when the technology was introduced were sought to be interviewed. Two Fisheries Officers (Roland Baldeo and Moran Mitchell) who were directly involved in training fishers in longline technology, and five knowledgeable fishers were interviewed.

- *Longline fishing technique* (Appendix A-4): this interview documented present longline construction, practices, and status of the fishery. It was developed to provide detailed information on the present variations in the technology amongst fishers. Also, to appreciate problems in the industry and the role of government in management. Twenty-one active longline fishers were interviewed.

- *Fisher ecological knowledge* (Appendix A-5): this interview was developed to provide detailed information on how fishers use ecological clues to catch large pelagic species using longline. It was clear from pilot interviews that some fishers were specialists in certain aspects of ecological knowledge. Therefore, a large sample of knowledgeable fishers was used to capture information on a wide knowledge base. Hence, 40 retired and knowledgeable active fishers were interviewed.

- *Boat expenses* (Appendix A-6): this interview was developed to provide detailed information on fishing expenses (operational, maintenance, initial investment, and loan costs) by vessel type. Total fish landings (from the Fisheries Division's daily landing form) and boat expenses were tracked for 17 vessels. These vessels included 13 canoes, 4 pirogues, and 4 semi-industrial vessels.

- *The Fisheries Division - history, data collection, and management* (Appendix A-7): this interview was developed to provide information on the history of the Division, institutional memory, data collection activities, and management of large pelagic stocks. Two retired and four current staff members were interviewed.

- *Fishers' groups and organizations* (Appendix A-8): this interview was developed to understand both formal and informal fishers' group structure and activities, and their role in fisheries planning. The target group was present and past fishers' group members willing to talk about their experiences, 14 individuals were interviewed.

- *Fishers' response to the International Commission for the Conservation of Atlantic Tuna (ICCAT) management measures* (Appendix A-9): regarding the issue of ICCAT's management measures, fishers were asked to comment on the new regulations. In many instances fishers had not heard of the regulations. Hence, this study was an opportunity to pass information to fishers and to document their response. Over 45 fishers were interviewed; three focus groups (totaling 23 fishers) and 22 one-on-one discussions.

- *Qualitative livelihood questions* (Appendix A-10): this detailed interview on livelihoods was initially developed to explore livelihoods activities and strategies in Gouyave. Questions were asked on all livelihood aspects observed in the community, including fishing, agriculture, livestock, kinship support, and personal achievements of the household. The outcome of this interview was the basis for a focused quantitative livelihood survey (Appendix A-12). Twenty individuals, from diverse livelihood backgrounds, were interviewed.

- *Verification interview*: final data analysis revealed a few gaps in the data. Community members and fishers, staff of the Fisheries Division, and Grenada Community Development Agency (GRENCODA) in Gouyave were interviewed to provide the missing data. Community members were also asked to comment briefly on the impact of Hurricane Ivan, to complete the dataset on the history of Gouyave.

*Focus groups*. The researcher tried on many occasions to carry out focus group discussions with fishers and community members. Initially, some meetings ended in near brawl, as it was very difficult to have a meeting with a heterogeneous group of individuals. On reflection, these groups had comprised of individuals of different age, gear type use, and social groups. The researcher learnt that a focus group could work, but it was important to have the right mix of individuals. Thus, meetings were held with already established social groups on specific issues. In total, five focus group meetings were carried out: three with fishers on ICCAT management regulations, and two with the Fisheries Division on the longline fishing industry.

*Oral histories*. This study relied on life stories of community members to give rich narratives about their life experiences in Gouyave. Extracted from the narratives were the development of fishing, the history of the community, gender roles in the community, and cultural values of the community. Five knowledgeable older individuals (two of them since deceased) were asked to talk about their life and fishing in the community. Participants included Mr. R. 'Tizan' Munroe, born 1930, fisherman; Mr. Joseph McDan, born 1929 and died January 6, 2004, Fisher; Mr. Osmond 'Chicken' Small, born 1937, repaired inboard engines; Mr. Carlyle Gleen, educator; and Margaret, retired fish vendor.

### 2.3.2 Quantitative approach

*Gouyave boat census*. The Fisheries Division did not have a reliable list of fishers and boats in Gouyave. Although, longline fishing vessels are required by law to register and have a license, the law is not enforced. To obtain an accurate number of boats, the researcher conducted a boat census on a day when most vessels were ashore. The researcher, accompanied by a data collector from the Gouyave Fish Market, walked the length of the fishing beach, stopping at each boat to document the vessel name, owners' name, and main fishing activity (Appendix A-11). Vessels anchored at sea were also recorded. The information was later verified during interviews with owners and captains, and cross-referenced with the Fisheries Division's boat registry.

*Livelihood survey*. The livelihood survey (Appendix A-12) questionnaire design went through numerous drafts so as to ensure it captured the livelihood system of

individuals and households, and it was tested for clarity and its use of local vernacular. The researcher also ensured that maximum information was captured through a minimum of 35 questions. There were leading and reliability questions incorporated into the questionnaire. It was pre-tested with five respondents who were asked specifically to comment on how well the survey reflected their livelihood activities. After the pre-test a few changes were made to the questionnaire to accommodate respondents' comments.

To ensure a sample population representative of the livelihood structure in the community, a stratified list of livelihood groups (fishing, support services, and non-fishing activities) was developed (Table 2.4). To estimate the number of fishers and boats, the researcher compared data from the boat census, the 1995 agricultural census, the Fisheries Division licensing and registration database, and key informants. To estimate non-fishing community members, information was obtained from the Statistical Unit's population census of 2001 and key informants. The total number of individuals (N) within each sub-stratum was estimated, and the number of interviews conducted or sample population (n) was recorded by males (M) and females (F). In many instances, particularly non-fishing livelihoods, the total population was unknown (DK); however, interviews were conducted. A stratified sampling approach was undertaken and individuals invited to participate in the survey because households which were apart of the fishing community were scattered in Gouyave and surrounding villages (Chapter 3).

The survey started in December 2003 with the researcher conducting the interviews. A female research assistant, who lived in the community, was trained to assist in administering the questionnaire. Initially, questionnaires completed by the assistant were verified by the researcher to ensure questions were asked with the same intent; she completed 54% of the questionnaires. A total of 169 questionnaires were completed; in addition, three were rejected due to incomplete forms. An interview took on average 10-45 minutes to administer.

Completed questionnaires were checked, verified, and assigned a number. Following the pre-test a coding system was set up, with additional codes to provide a greater variety of responses. The database structure was set up in the Statistical Package for the Social Sciences (SPSS). This software provided the means for data access and

export to other software. The accuracy of the data entry was tested by randomly choosing an interview and checking the information entered.

**Table 2. 4: Livelihood stratification by gender from which respondents were chosen to participate in the livelihood survey. N represents total population (estimated) and n sample numbers.**

| 1. FISHING LIVELIHOODS | | | | |
|---|---|---|---|---|
| | M(N) | M(n) | F(N) | F(n) |
| BO/Investor | 55 | 9 | 7 | 1 |
| BO/Captain | 49 | 23 | 0 | 0 |
| Captain | 42 | 17 | 0 | 0 |
| Crew | 190 | 27 | 2 | 1 |
| | | | | |
| **2. FISHING SUPPORT SERVICES** | | | | |
| | M(N) | M(n) | F(N) | F(n) |
| Marketing | 32 | 14 | 14 | 6 |
| Other support services | 57+ | 12 | 0 | 0 |
| | | | | |
| **3. NON-FISHING LIVELIHOOD ACTIVITIES** | | | | |
| | M(N) | M(n) | F(N) | F(n) |
| Non-fishing activities | DK | 18 | DK | 41 |
| | | | | |
| **OVERALL TOTAL** | | **120** | | **49** |

M(N) male total population, M(n) male sample population,
F(N) female total population, F(n) female sample population,
BO Boat Owner, DK information not available

### 2.3.3 Participatory tools

***Seasonal calendar.*** Rural livelihoods are connected to seasonality, as each season has different livelihoods strategies. Thus, seasonal calendars can lead to comparisons of livelihoods such as seasonal variations and their linkages with food, employment, and workload (Chambers, 1997; IIRR, 1998). Seasonal calendars were developed with community members to provide pictures of the production of fish and agricultural commodities throughout the year.

***Timelines/historical matrix.*** Community members were asked to use rocks to show how livelihood activities changed in the 1940s, 2003 (the year of the research and pre-Hurricane Ivan), and 2005 (post-Hurricane Ivan). This activity gave participants a chance to discuss the impact of the hurricane on the community. In another exercise,

fishers discussed longline fishing technological changes using a historical matrix. Timelines were used to verify information obtained in the semi-structured interview.

***Community mapping***. Geographically referenced mapping was used to document important features of Gouyave. In this case the community was geographically large, and the technology was available to map the community using aerial photographs and GIS technology with assistance from the Land Use Division, Ministry of Agriculture, Lands, Forestry, and Fisheries (MALFF). Key features of the town were geo-referenced and incorporated in the national GIS database. The GIS maps proved valuable in understanding the differences between fishing and non-fishing households.

***Gender analysis***. A gender analysis was done to understand the division of labour and social, cultural and economic roles in the community. Gender refers to the roles, activities, responsibilities, constraints, and opportunities of men and women in communities. Gender roles in communities depend on society's expectations rather than on biological differences. These roles and expectations differ from place to place and change over time. Because gender is specific to culture and time, a gender analysis is necessary for community projects (March et al., 1999). Throughout this research gender implications were considered at all times but are only reported if results were important. Males and females were interviewed on the cultural role of gender and the division of labour in the fishing industry.

***Stakeholder analysis***. A stakeholder analysis was used in this research to determine who should be involved in fisheries planning. The purpose of stakeholder analysis was to identify individuals involved in the longline fishery, to explore possible conflicts among individuals/groups, and to provide insight into the dynamics and relationships of different groups (Grimble and Wellard, 1997; IIRR, 1998; Wahab, 2001).

***Other techniques***. One useful technique was to ask fishers Joshua Welsh and Michael Page to build models of the different longline designs using the same material (as much as possible) as in the past. During interviews with other fishers, model longlines were presented to ensure the interviewee and the researcher were discussing the same gear adaptation. It also helped fishers recall how the gear was used and construction techniques, since there were many versions of the gear. Fishers were also asked to identify large pelagic fish using local names that were landed at the Gouyave

Fish Market. Seabird identification was done using pictures (Raffaele et al., 2003), and fishers related the association of seabirds with large pelagic species. Later the researcher added common and scientific names for fish species and seabirds.

## 2.4 Data analysis

Quantitative survey data were coded, entered, and analyzed using SPSS, Access, and/or Excel, whichever was most applicable. Data analysis in SPSS included simple descriptive statistics, frequency, cross-tabulation, and basic statistical analysis. SPSS tables were exported to Excel for graphical representations such as histograms and pie charts.

Qualitative data were first written in descriptive form. In many instances information was converted from the spoken format to formal English. Categories were identified and aggregated manually or with the aid of the qualitative software package NVivo. Other qualitative data analysis included summaries and synthesis. Fishers' response to ICCAT's management regulation was analyzed using NVivo. Themes from the interviews identified (e.g., enforcement, effects on livelihoods) were used to create free nodes. Each interview was coded by the interviewee's role in the fishery, and type of interview, whether focus group or individual interviews. The software generated frequency tables by nodes.

Community maps were generated using the GIS software ArcView. The process of building maps involved: obtaining aerial photographs of Gouyave town (scales 1:3,700 and 1:4,300 m); scanning and geo-referencing the photograph of Grenada using shape files; producing spatial data using heads-up digitization; building databases of roads, rivers, and plot information (commercial/residential activity, type of commercial activity); geo-processing in ArcView; and performing spatial drawing using a plot information database. All this was done with assistance from the Land Use Division, MALFF.

**Economic analysis**

To understand the flow of income from fishing (used in Chapter 4) the circular flow of national income and the Lowry model in economics is applied. The circular flow of national income is applicable because, like a national economy, the longline fishery in Gouyave is an open economy, as it takes part in international trade, i.e., the sale and purchase of goods (fishing equipment) and services overseas (freight charges). To represent the macro economy of Gouyave longline fishing industry, the national product equation for an open economy (Equation 1) is used.

**Equation 1:** national product equation

$$Y = C + I + G + (X - M)$$

Where:

Income (Y) - money received by the household (fishers).

Consumption (C) - money spent by the household.

Investment (I) - any addition to real stock (any new purchases to existing capital equipment).

The government has influence on the circular flow, taxes are withdrawn and government expenditure (G) is injected.

Exports (X) - injections, as people overseas create income for local households.

Imports (M) - money paid that leaves the local economy, and includes money paid out overseas to purchase goods and services (Beardshaw, 1992).

Equation 1 is modified by the researcher to include two variables called $Y_2$ and $W_1$ (Equation 2) to represent the economy in Gouyave. The fishery has an additional injection ($Y_2$) which represents goods and services received by the fisher but not purchased. This injection helped to support the fisher; if these goods and services are not given they would be purchased. Conversely there is withdrawal ($W_1$) where part of the fisher income is not passed to the circular flow; goods and services are given but not sold.

**Equation 2** - modified national product equation

$$Y + Y_2 = C + I + G + W_1 + (X - M)$$

To demonstrate the multiplier effect of increased employment opportunities stemming from development in the longline fishing in Gouyave, the Lowry model is applied (Fig. 2.2). This model shows how an increase in employment in the basic sector, i.e., fishers involved with fish destined for sale outside the community, has a ripple effect upon the growth of the household sector which, in turn, increases demand from the service sector and so on, thereby creating a multiplier effect (Hagget, 2001). It is the generation of new monies from outside the community that ultimately filters through the local economy to promote economic growth, both with respect to the household and service sectors. Thus, for example, if there is an increase of 100 new jobs in the basic sector and assuming the average family size to be four, then household sector grows by 400 persons. These people will require services from an additional 40 people in service sector 1 (as the service multiplier in Fig. 2.2 is considered to be 1/10). As workers in the service jobs will have families there is created a second, smaller set of households (household sector 2) and thus more service jobs (service sector 2). These diminishing cycles can be repeated several times. Equation 3 is used to estimate the amount of jobs created in service sector 1, based on household multiplier (average household size) of 4 and service multiplier of 1/10. Both household and service multipliers are variable, their values being determined by circumstances existing within that society. In this study the Lowry model is employed to demonstrate the multiplier effect that fishing can have upon Gouyave. The longline fishery has both basic and non-basic components with fish being sold outside and within the community. The focus here is upon the basic sector because it has become important as a source of new money for the town.

**Equation 3 - multiplier effect**

$$\text{Total population} = \text{fishing jobs } (*h)/1-(s*h)$$

**Where h-household multiplier, s-service multiplier (1/10)**

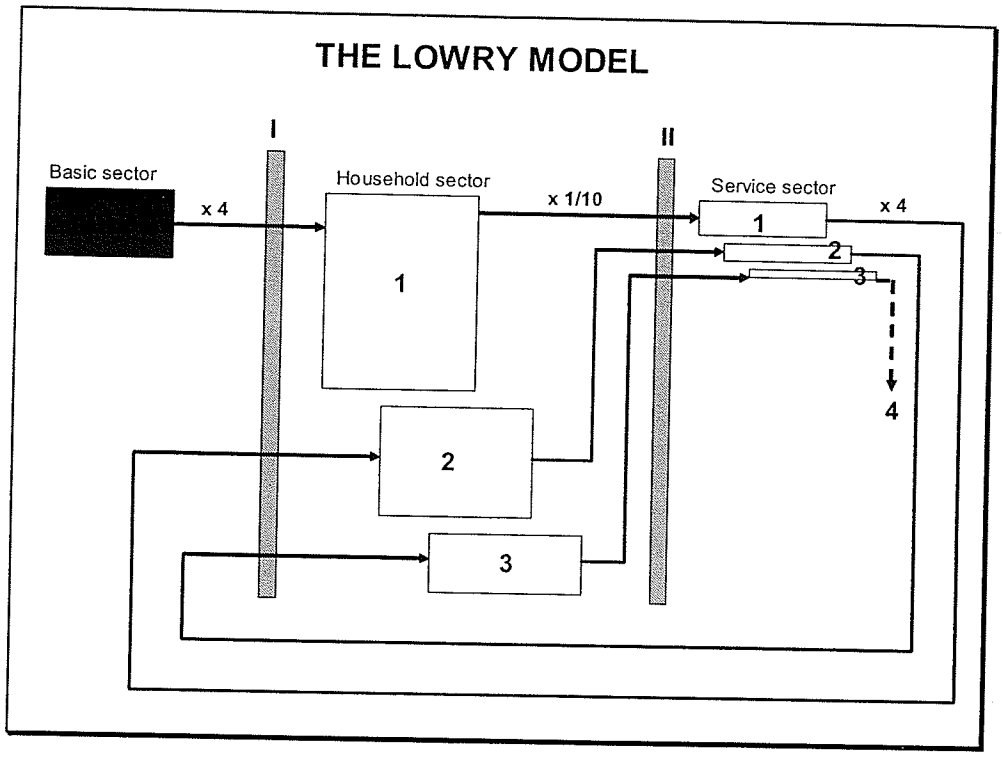



**Fig. 2. 2: The Lowry model showing the multiplier effect of how an increase in the basic sector can lead to increases in household and service sectors.**

## 2.5 Confidence and reliability

A variety of data collection methods were selected to capture a realistic representation of the community and the longline fishing industry. To cross-check the accuracy and reliability of data and information and minimize the occurrence of bias, triangulation, members' checks and data saturation validity techniques were used (Merriam, 2002; Jackson, 2003).

Triangulation is using multiple sources to confirm emerging findings. For example, to collect information on livelihoods various data collection methods were used (Table 2.3). The process involved observing people at work, interviewing key informants so as to understand livelihood activities, reviewing documents related to livelihoods, discussing gendered livelihoods with both males and females to obtain different perspectives, interviewing farmers and fishers on detailed seasonal livelihood patterns,

listening to older community members talk about the old days, and constructing questions to be explored in the qualitative and quantitative surveys.

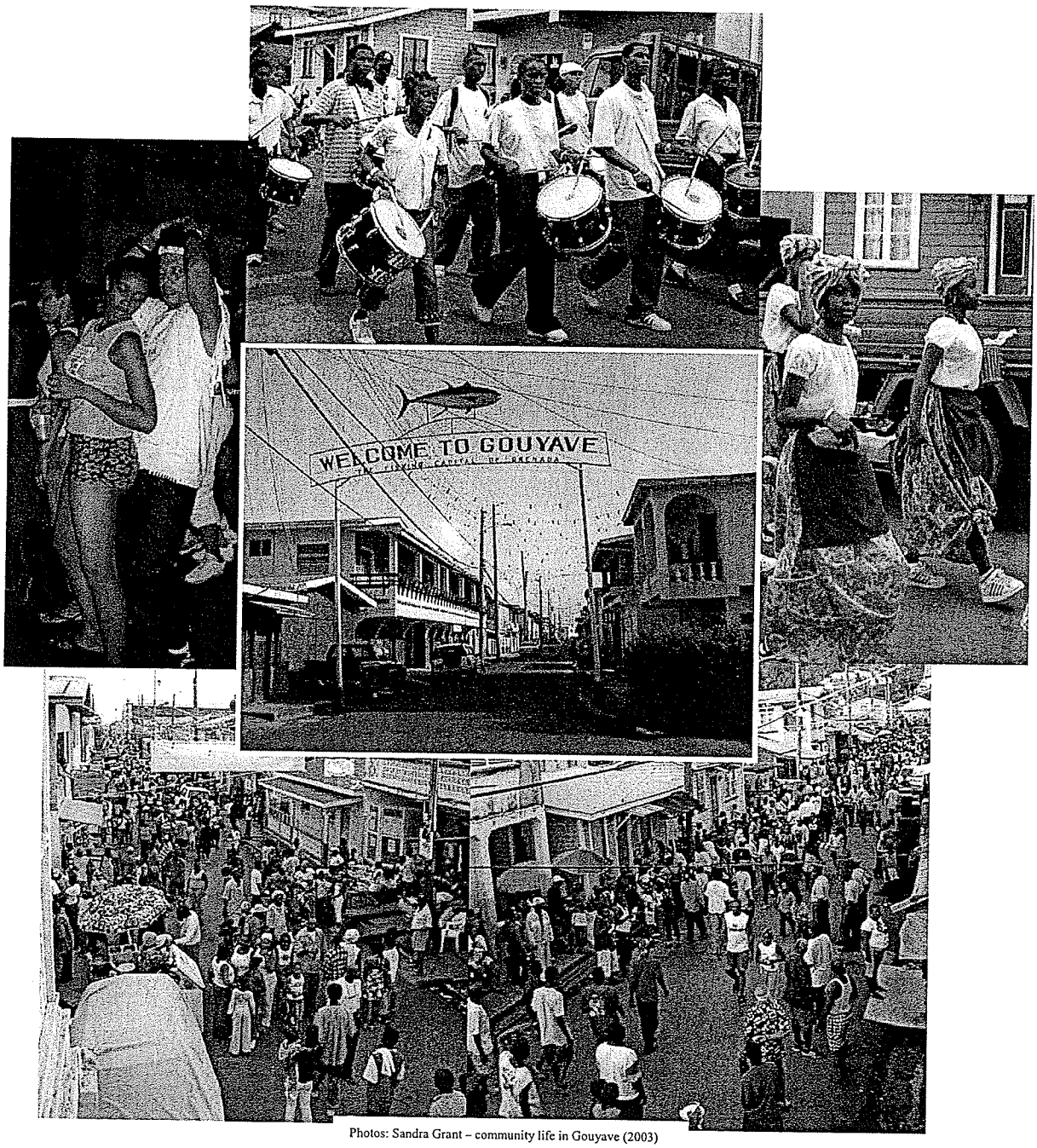
Members' check is taking the data and interpretation back to the source for verification. It was rare to find an individual who was informed on a topic. The researcher had to rely on a number of individuals to talk about what they knew, then weave the information together to build the story. The information was documented, then taken back to a few key informants for review. For example, chronological changes in longline technology since 1979 were reviewed and verified by Fisheries Officers and fishers.

Adequate engagement in data collection is ending data collection when there was no new information (or data saturation). This technique was used as a general principle in this research. After a few interviews any new information would be reviewed to determine its relevance. If it was relevant then further interviews were conducted. When there appeared to be no significant new information, data collection was terminated.

The cross-check process for data collection was rigorous to ensure the accuracy of information. This reliability method was taken because the study relied on individual memory of events that took place as far back as the 1950s. By cross-checking information from key informants against other informants and available documents, the outcome was more reliable.

# CHAPTER 3:

## The study area, the community, and the fishery




Photos: Sandra Grant – community life in Gouyave (2003)

# CHAPTER 3: The study area, the community, and the fishery

This chapter introduces the case study - the surface longline fishery in Gouyave - in an effort to understand the components of this fishery, the interactions, and the scope of the study. The longline fishery system is comprised of the fishing community and the longline fishing industry. The first part of the chapter deals with the socio-economic environment in the context of who fishes, and where and how they live. The second part of the chapter is about the longline fishing industry along with a description of supporting activities. The chapter concludes with a diagrammatic representation of the longline fishery, showing the scope of this research. This chapter includes some primary data from the study, in addition to secondary data as background.

## 3.1 The fishing community

This section provides a brief insight into the human/social side of the fishery by describing the geography of Grenada, Gouyave infrastructure, the socio-economic environment, and the social and cultural characteristics of the community. The section answers the question: How is the community similar to or different from the rest of Grenada? The socio-economic environment is compared to the rest of Grenada, and social and cultural features of the fishing community are compared to the rest of Gouyave.

### 3.1.1 Geography

Grenada is a tri-island state comprising the islands of Grenada, Carriacou and Petit Martinique, with several inhabited and uninhabited islets off the northeast and southeast coasts (Fig. 3.1). It is the most southerly of the Windward Islands, located 138 km southwest of St. Vincent and 145 km north of Trinidad and Tobago. The island is situated between 11°00` and 12°30` north latitude, and between meridians 61°35` and 61°48` west longitude. The total area of the tri-island state is 344 $km^2$; mainland Grenada is 19 km at its greatest width, with an area of 311 $km^2$.

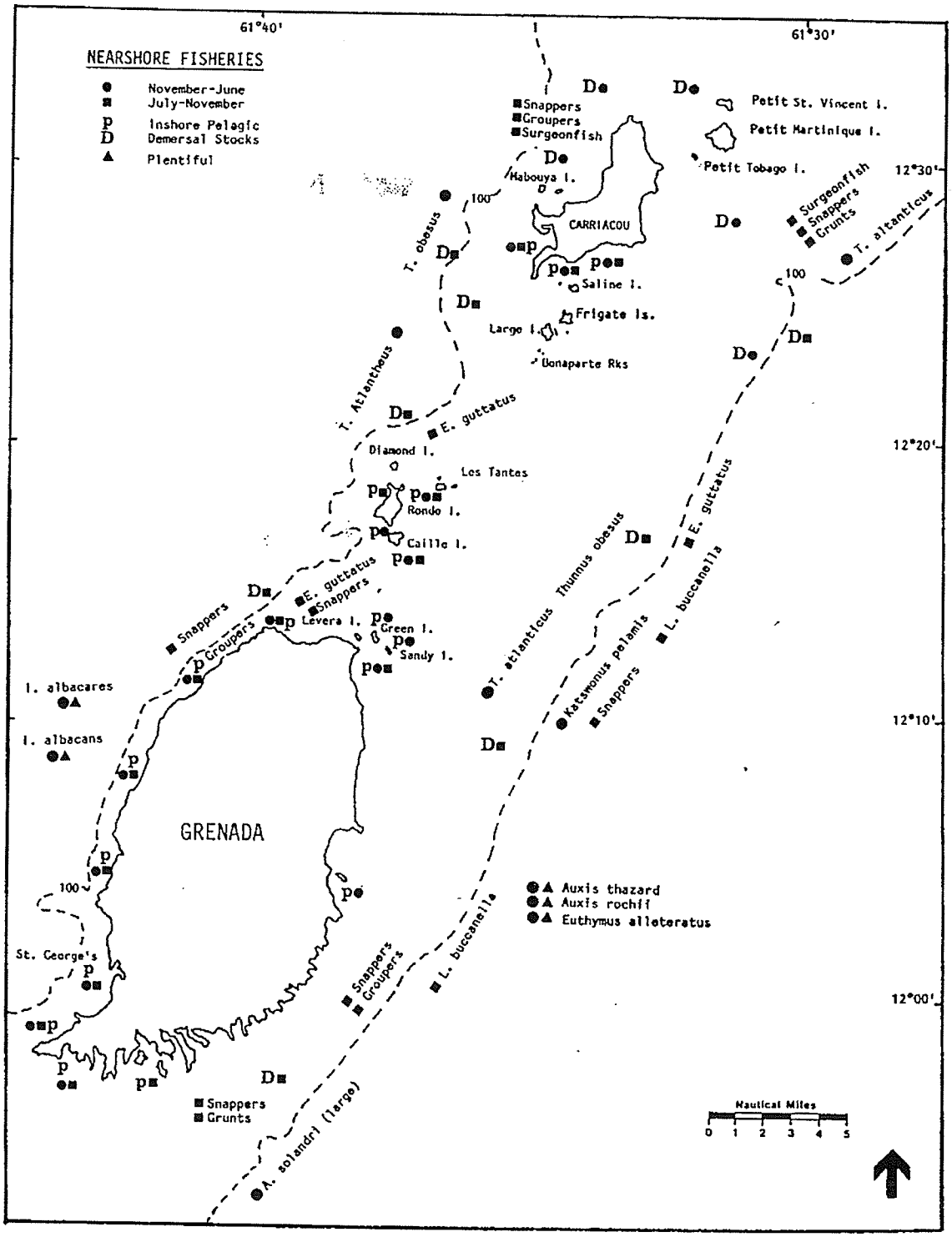



Fig. 3. 1: Map of the tri-island state of Grenada showing the insular shelf, 100 fm (91m) contour and the type distribution and seasonality of near-shore fisheries (Source: CCA, 1991:120)

The island has terrain with slopes exceeding 20°, with the highest mountain about 900 m. The elevation provides most of the island with generous rainfall, which together with Grenada's latitude of 12°N, gives the island a sub-humid tropical climate. The mountain range in the central part of the island receives more than 4,000 mm of rainfall annually, while the southern peninsula catches less than 125 mm. The year is divided into alternate dry (January to May) and wet seasons (June to December) where during the latter 70-80% of the annual rainfall is received (Brierley, 1974). Grenada's insular shelf area is 3,100 $km^2$, making it the second largest shelf area in the Eastern Caribbean. The shelf is narrow on the west coast 0.8 km, in contrast to the southeast and northwest shelves that range in width from 4-12 km, while the west-southwest from 19-32 km (Fig. 3.1). Depth of water on the shelf varies from 18-36 m, with an average range of 14-18 m. Dominant ocean currents flow from the SES. During the South American rainy season, fresh water discharges drift across to the eastern Caribbean islands from the Orinoco and Amazon Rivers (Ministry of Agriculture, 2004).

### 3.1.2 Profile of Gouyave

The town of Gouyave, formerly known as Charlotte Town, in the parish of St. John's is located on the west coast of the island about 19 km to the north of St. George's town by road. Fishers say Gouyave is the fishing capital of Grenada (some say the fishing capital of the Eastern Caribbean), 'the town that never sleeps'. It is the second largest town in Grenada. In 2001, it had an estimated population of 2,152, about 2% of the nation's population (Central Statistics Office, pers. comm., 2003). The town has many urban characteristics (Fig. 3.2). Results from an appraisal survey of infrastructure in Gouyave conducted by the researcher revealed there were over 441 residential buildings and 112 commercial buildings, with 24 different types of commercial activities. The town is home to 6 schools (1 daycare nursery, 1 pre-primary, 2 primary, and 2 secondary) and 9 churches. Recreational facilities include 32 bars, 2 nightclubs, 1 gym, and a sport complex (track and field, football, and basketball) with spectator pavilion. Social services include a health centre, police station, fire service, post office, court-house, library, and a commercial bank. The town has a well-developed network of roads and private-bus services.

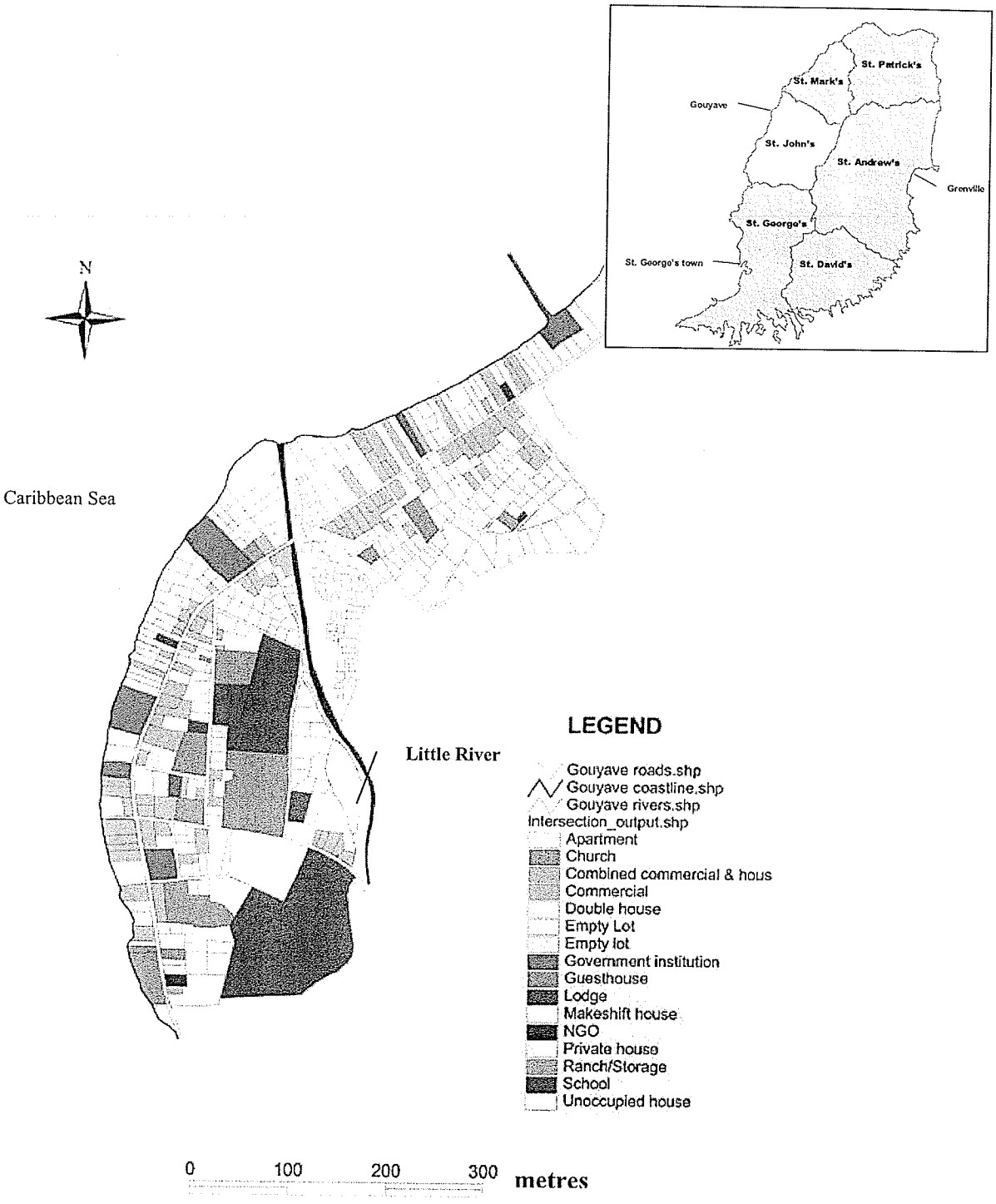



**Fig. 3. 2: Map of Gouyave showing the types of dwelling per lot. Little River divides Upper and Central Depradine. Insert: Map of Grenada showing parishes and the location of Gouyave, Grenville, and St. George's town.**

According to the poverty assessment report, 32% of Grenada's population is poor (CDB, 1999). The annual poverty line for Grenada was estimated at EC$3,262 per adult. "A poverty line based on household consumption expenditure tells of the expenditure necessary to purchase the minimum nutritional and other fundamental requirement for living" (CDB, 1999:76). The poor population in the parish of St. John's, which includes Gouyave, stood at 23.9%, with Gouyave being listed as 1 of the 11 poorest communities in Grenada.

Housing amenities are used here as a proxy for socio-economic environment to compare the differences between Gouyave and the rest of Grenada (Table 3.1). Amenities discussed are tenancy, building material, kitchen, toilet, and bathing facilities, source of water, and electricity. In Grenada 71% of houses are situated on land owned by householder (CDB, 1999). However, in Gouyave 57.5% of houses and lands are owned by householders, and 25.7% of houses are built on land owned by the church, government, or private landowners. The type of building material used in the construction of houses indicates the socio-economic status of the residents, where wooden houses are an indicator of low socio-economic standings (CDB, 1999). Low numbers of wooden houses (34.4%) and high numbers of concrete houses (55.2%) indicates higher socio-economic conditions in Gouyave when compared to the national averages.

Most people have indoor kitchen, toilet, and bathing facilities (Table 3.1). Some 27.9% of houses in Gouyave do not have toilet facilities; they use two public bathroom facilities provided by the government, buckets or the beach. Water is piped into houses or standpipes from the public supply. About 99% of the dwellings have electricity. Public, private, and cellular telephone services are readily available. Newspapers, radio, and cable TV are ways to obtain news and information.

**Table 3. 1: Distribution of housing amenities in Grenada and Gouyave**

| Housing amenities (%) | Grenada (N=4061) | Gouyave | |
|---|---|---|---|
| | | All dwellings (N=529) | Fishers only (N=89) |
| Walls of the house | | | |
| Wood | 49.2 | 34.4 | 44.9 |
| Concrete | 31.8 | 55.2 | 42.7 |
| Wood and concrete | 18.1 | 10.4 | 12.4 |
| Location of kitchen | | | |
| Indoor | 88.9 | 85.4 | 74.5 |
| Outdoor | 8.8 | 3.1 | 8.1 |
| None | 1.5 | 11.5 | 17.4 |
| Toilet facilities | | | |
| Pit-latrine | 55.7 | 0.2 | -- |
| Indoor (water closet) | 41.9 | 66.5 | 43.8 |
| Outdoor (water closet) | -- | 5.4 | 14.6 |
| None | -- | 27.9 | 41.6 |
| Other | 2.0 | | |
| Bathing facilities | | | |
| Outdoor | 49.4 | 11.0 | 34.7 |
| Indoor | 43.5 | 62.7 | -- |
| None | 7.2 | 26.3 | 65.3 |
| Sources | CDB, 1999 | This study | This study |

There are differences in educational attainment between the children from the fishing community and the rest of Gouyave (Fig. 3.3). Although primary education is free and secondary education is subsidized by the government, children from the fishing community, especially males, are behind in educational attainment. The principal of one of the two primary schools described the educational situation as follows:

> Children from the L'Anse [fishing community] are falling behind in school. At the pre-school level they perform the same, but as they get to the higher grades they fall behind, especially the boys. The gap between the L'Anse children and the wider Gouyave society is getting wider. Girls avail themselves of the opportunities presented to them, not the boys. Boys are attracted to the money they can make in fishing. Fishing makes money, lots of money. Although most children pass the Common Entrance Examination [national secondary school entry exam], when they get to secondary school, the boys drop out because they spend a lot of time working in fishing and not enough time doing homework or schoolwork. They soon become overwhelmed and drop out of school. This is particularly true for children on the L'Anse (Oslyn Radix-Thomas, pers. comm., 2003).

There is not a lot of data to compare the fishing community of Gouyave with the rest of Gouyave or Grenada as a whole. Using housing conditions as the proxy to assess the socio-economic environment, Gouyave is similar to Grenada as a whole, but the

housing amenities available to fishers appear to be below the Grenada average (See also section 3.2.1). Along with the observation that children from the fishing community are below the average of Gouyave as a whole in education, it appears safe to conclude that the socio-economic status of Gouyave fishing community is also below the Grenada average. However, such a conclusion hides the rather large income difference between the highest income earning fishers (captains of the larger boats) and the lowest (boat helpers). The next section explores how the community works and how social relations regulate income and spending. Based on primary data, the section explores how the social values of the community become a 'player' in socio-economic status.

### 3.1.3 The fishing community - social and cultural characteristics

Geographically, the town is divided into three sections, Upper Depradine, Central Depradine, and Lower Depradine (Fig. 3.3). The fishing community's main population centre is the northern end of town, Upper Depradine also known as D'Lanse, the L'Anse, or the Lanse. The L'Anse was always considered the poorer end of town. This area accounts for 51.6% of the town's dwellings.

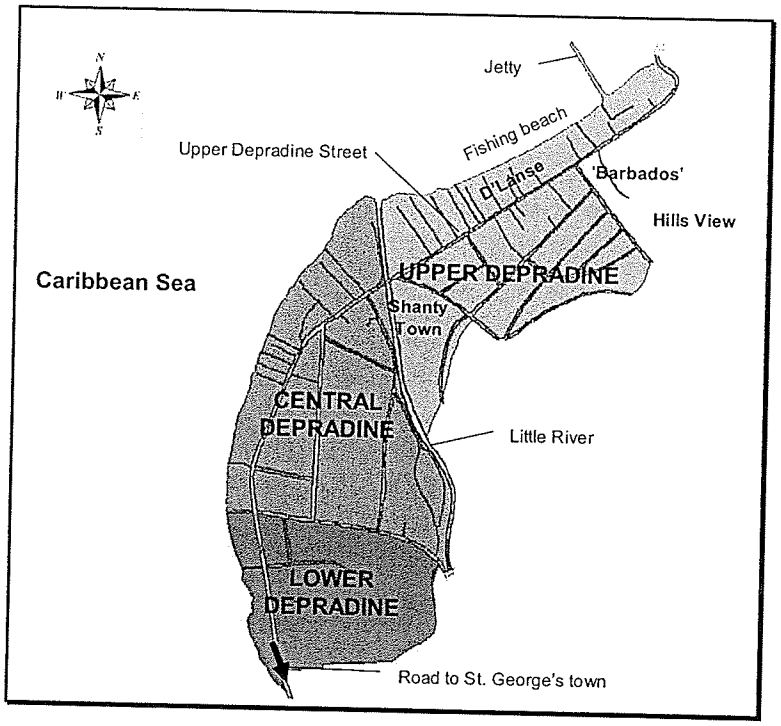
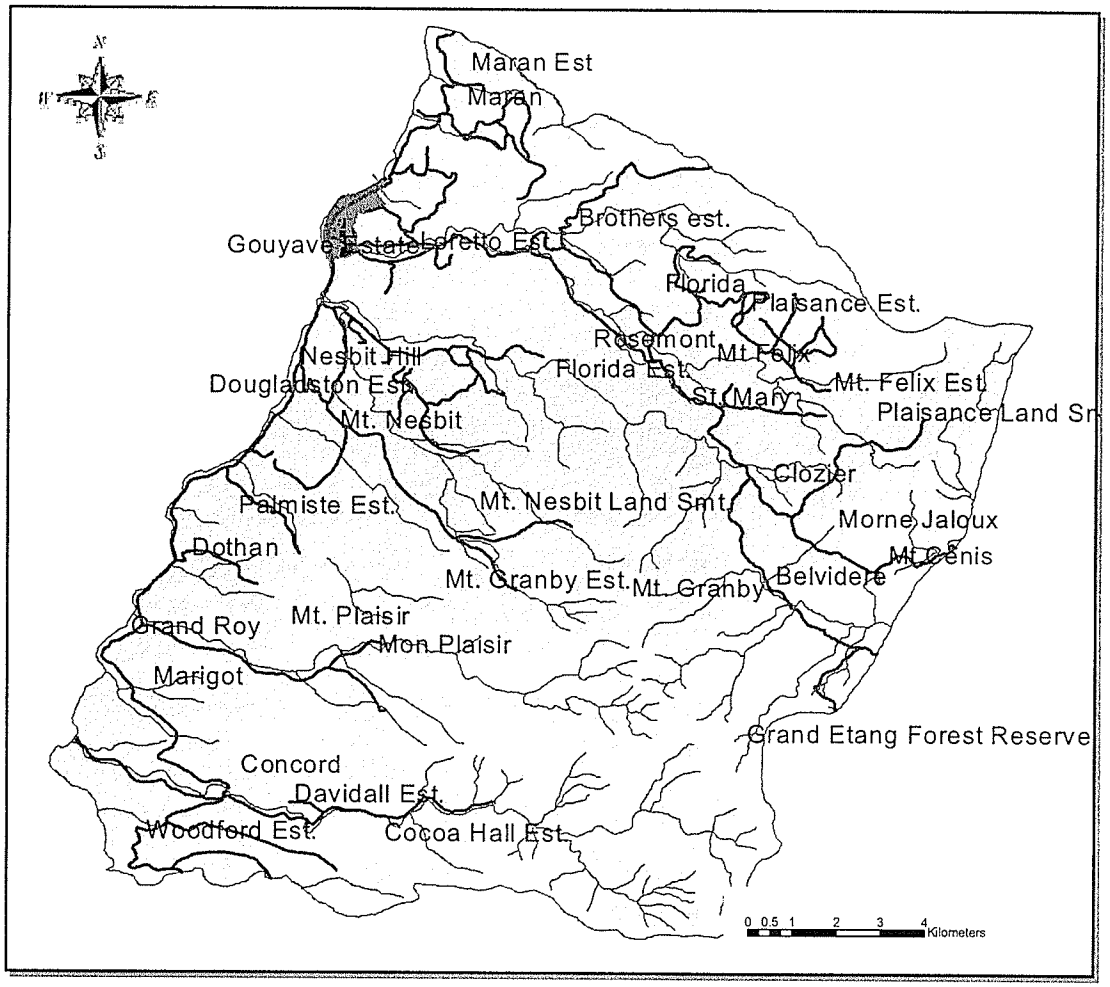



**Fig. 3. 3: Geo-reference map showing sections of Gouyave and fishing household areas**




| Locations | Percent |
|---|---|
| **Gouyave Town** | |
| Upper Depradine block | 32 |
| D'Lanse | 14 |
| Shanty Town | 5 |
| Central Depradine block | 8 |
| Lower Depradine block | 2 |
| **Villages in St. John's** | |
| Central Gouyave Estate | 7 |
| Hills View/Constant Spring | 5 |
| 'Barbados' | 4 |
| Dr. Belle | 4 |
| Douglaston | 3 |
| Mt. Nesbit | 2 |
| Gouyave Estate | 2 |
| Loretto | 2 |
| Marigot | 2 |
| Mongo Road | 1 |
| Maran | 1 |
| Cloizer | 1 |
| Palmiste | 1 |
| Brothers Estate | 1 |
| Grand Roy | 1 |
| **Other parishes** | |
| Waltham, St. Mark's | 1 |
| St. Patrick's | 1 |

**Fig. 3. 4: Map showing villages where fishers lived in the parish of St. John's. Over 60% of fishers lived in Gouyave, the remainder in other villages in St. John's, St. Mark's, and St. Patrick's (Source: MALFF, Land Use Division, 2004).**

Fishers lived traditionally between Upper Depradine Street and the sea coast and Shanty town in the Upper Depradine area (Fig. 3.3). However, after a number of storm surges and tropical storms, the government relocated houses away from the coast. Many fishing households moved to surrounding villages such as Central Gouyave Estate, Loretto, and Douglaston (Fig. 3.4). The relocation of fishing houses caused this once geographically defined community to disperse, although there still remain large clusters of fishing households in Gouyave. As a result of the relocation, many fishers commute (walk or bus) to Gouyave from Waltham (in the parish of St. Mark's) in the north, Cloizer in the east, and Concord in the south (Fig. 3.4). Commuting fishers usually carry a backpack with a change of clothes, travel to the fishing beach, stay by the beach or with family until the end of a working day, and then return home.

The L'Anse is synonymous with the fishing community, a way of life, and a culture. The fishing community is a group of people and their household participating in a particular culture, attitude and socialization, with no defined geographic area, and whose lives (economically and socially) are influenced in some way by fishing. There are social and cultural differences between the L'Anse and the rest of Gouyave. The differences presented below are based on the researcher's observation.

The culture of the people is perhaps the most distinguishable feature of the fishing community. It is defined here by the values, attitude, and socialization of community members. Community members are loud-mouthed, 'in-your-face', tell it as it is, cursing, and boisterous. Regular conversations are usually raised and high pitched, as if in an argument. Individuals are proud, difficult to deal with, and they 'know' everything; thus, it is difficult to train or teach them. Yet they are innovative and quick to find solutions to problems. It is also easy for outsiders to live among members of the community because of their generosity (giving of fish, meals, and crops). The culture of the rest of Gouyave is more similar to Grenadians, who tend to be less aggressive in their mannerisms.

The fishing community has clearly defined social rules and practices. The social rules of the community are not the same as the rest of Gouyave. The community decides the highest level of personal accomplishment its members may attain. Anyone who goes beyond this level is shunned or 'bad-mouthed'. Community members call this cultural rule 'cry you down'. Presently personal accomplishment levels are very low. For

example, a wooden house with minimum furnishing is considered a good status. If a boat owner decides to save his/her money and build a concrete house and bar, people immediately associate this action as 'acting better than the rest', and word would circulate not to work his/her boat. The rules are quite clear: live above the personal accomplishment level set by the community and you will be forced to live in isolation (See Table 7.2).

Another aspect of the fishing community culture is that men gain respect and social status by spending much of their income on gambling, alcohol, entertaining many women, and 'making 'fairs' (or 'making fares')[3]. Making 'fairs is practiced mainly in the fishing community and to some extent in the rest of Gouyave. Gaining respect is a right of passage for most, if not all, young males. If they refuse to participate in such practices they will be shunned, teased, and treated as an outsider. This practice is important for younger men between the ages of 20-35, the prime income-earning age, but less meaningful to older men (See Table 7.2). The researcher knows of one case where a young man left the community because he was unable to deal with peer pressure regarding affairs.

Almost everyone in the community has kinship ties, kinship networks, associations, and sharing systems. This held true for the L'Anse and the rest of Gouyave. It is not unusual to find children in a household fathered by different males, and siblings living in different households. Take, for example, a female (head of household), living with her aged father, three children, and a visiting male partner. Her eldest daughter, whom she never visits, lives with her father's family in another village. The father of her second daughter, fisher X, lives alone but has seven other children with five different females in the community. Her son's father, fisher Y, also lives alone and has a visiting relationship with the mother of his youngest child and her three children. Her youngest child's father, fisher Z, who presently visits the household, has one other child from a previous relationship. This household kinship ties extend to the female head's siblings and the children's siblings in other households. Community members describe households as "multi-mother and multi-father structures".

[3] Making 'fairs or 'making fares' is to pay for sexual favour ("pay for your pleasure"). The relationship usually extends over a period of time, and not a one time exchange of money for sexual favour. More study is needed to understand this type of relationship.

The fishing community of Gouyave appears to be a unique community in terms of its social rules and culture, including attitudes towards drinking cursing and affairs. Although study offers no hard data on this point, high disposable income (See Chapter 4) does not seem to be channeled to better housing, cars, and amenities, as one might expect, but rather to drinking and womanizing. An appropriate comparison may be the farming community of Maran, about a ten-minute walk north of Gouyave, where disposable income is converted mainly in concrete houses, cars, and household goods. Social status in the fishing community of Gouyave does not depend on conspicuous consumption, but rather on those activities, such as mentioned above, that seem to have the highest social values. Social characteristics of the fishing community in Gouyave are also consistent, to some extent, with other fishing communities in the Caribbean and the world (Price, 1966; Aronoff, 1967; Acheson, 1981).

## 3.2 The longline fishing industry

This section describes the components of the longline fishing industry, namely fishers and gears, infrastructure, processing and marketing, and the government system.

The fisheries can be classified as small-scale, exploiting small and large pelagic stocks (tuna, mackerel, billfish, flyingfish, dolphinfish, barracuda), coastal pelagic stocks (jack, bigeye scad, rainbow runner), and deepslope and reef demersal stocks (grouper, red hind, snapper). The most important fishery is the large/oceanic pelagic species. The main fish species caught by longline, in terms of quantity and fishing effort, are yellowfin tuna (*Thunnus albacares*), white marlin (*Tetrapturus albidus*), blue marlin (*Makaira nigricans*), common dolphinfish (*Coryphaena hippurus*), sailfish (*Istiophorus albicans*), swordfish (*Xiphias gladius*), blackfin tuna (*Thunnus atlanticus*), wahoo (*Acanthocybium solandri*), bigeye tuna (*Thunnus obesus*), and skipjack (*Katsuwonus pelamis*) (Fisheries Division landings statistics). The first six species account for 95% of the catch. Since 1979, large pelagic fish landings in Grenada increased steadily from 257 MT in 1981 to 1,816 MT in 2001 (Fisheries Division, unpublished report Fig. 3.5; Mohammed and Rennie, 2003). Gouyave has made a significant contribution to the increased landings (Fig. 5.4).

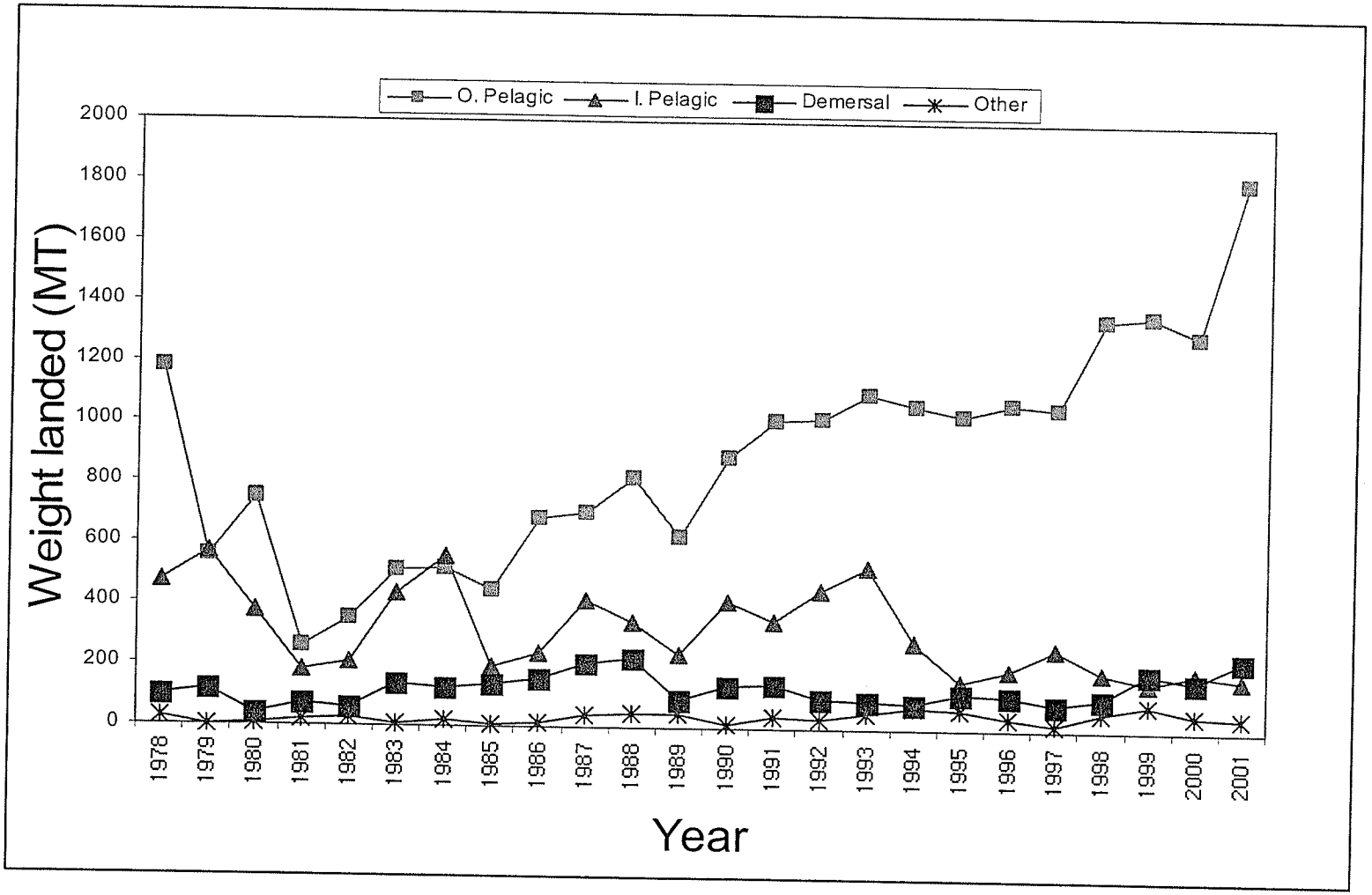



**Fig. 3. 5: Total fish landings by fishery groups, Grenada (1978-2001). Source: Fisheries Division statistics (unpublished data)**

### 3.2.1 Profile of fishers

Of the estimated 2,200 fishers in Grenada over 300 operate from Gouyave. Fishers are similar to Grenadian fishers with respect to levels of education, role in the fishery, and group participation (Table 3.2). Primary school is the last formal education of fishers. Gouyave has similar percentage crew members to Grenadian fishers, but the percentage of boat owners doubled the national average. Only 14% of fishers are active members of fishermen's groups (namely the St. John's Fishermen Association and St. John's Fishermen Cooperative), the others are reluctant to join any group.

In Gouyave, the most common marital status are single, visiting relationships (male and female), common-law, and married. The national dataset has no information on visiting relationships. Visiting relationship is when male or female have personal homes, but visit the other for sexual relations. Information on visiting relationship is consistent with the report by Pat Ellis (1992). In addition, the age of fishers in 2003 ranged from was between 15 to over 64 years; the median age was 42 years.

**Table 3. 2: Profile of Grenadian and Gouyave fishers**

| Profile (%) | Grenadian fishers | Gouyave fishers (N=104) |
|---|---|---|
| Education | | |
| Primary | 88.8 | 85.0 |
| Secondary | 9.3 | 9.0 |
| Other | 1.9 | 6.0 |
| Marital status | | |
| Married | 39.0 | 8.8 |
| Single | 36.3 | 36.3 |
| Common-law | 24.7 | 22.5 |
| Visiting relationships | -- | 32.4 |
| Role in the fishery | | |
| Crew | 54.9 | 55.6 |
| Boat owner/captain | 38.3 | 32.0 |
| Boat owner | 6.2 | 12.4 |
| Fisher group | | |
| No | 85.0 | 86.0 |
| Yes | 15.0 | 14.0 |
| Sources | Finlay, 1990; Straker, 1998 | Present study (Appendix A-12) |

Fishers' housing amenities differ from the rest of Gouyave (Table 3.1). The average number of rooms in a house is five. The houses are 10% more likely to be made of wood, many with no toilet or bathing facilities. These results are consistent with Finlay (1990). In addition, fishers' households have on average three members, with 37.1% with only one individual. Many fishers lived alone in a sparsely furnished small house, while women lived with their children in better furnished homes. The general contents of a male's home are a bed, chairs, table, stove, and housewares: "When man living by himself, he doesn't need much convenience" (Daniel Phillips, pers. comm., 2003). Females generally have a fridge, stove, microwave oven, colour television, cable, sofa, and some, a washing machine. Fishers generally save either with a bank (79%); only 11% are not able to save. Twenty-one percent are able to access loans from their bank in times of crisis or to invest/re-invest in the fishery. In recent years the lending rate increased from 8% to 12.5-15%, and resulted in the number of individuals borrowing at the bank being reduced.

### 3.2.2 Boats and gear

Gouyave has a multi-boat and multi-gear fishery, which is similar to the fishery of Grenada. There are three main categories of fishing vessels in Gouyave: open and cabin pirogues, launchers, and double-enders. The boat census conducted in 2003 revealed there were 173 boats: 97 open pirogues (25 inactive), 26 cabin pirogues (6 inactive), 8 launchers, and 6 double-ender or beachseine boats (Table 3.3). Inactive vessels were waiting to be sold or repaired, as they could re-enter the fishery at any time. Baldeo (2003) in his report describes three categories of fishing vessels. The first category, the pirogues are of two types -- open and cabin. The semi-decked, wooden open pirogues are 5-7 m long, powered by a single 15-40 hp outboard engine, and equipped for multiple-purpose fishing. Open pirogues are equipped for handline, trolling, seche and bankfishing; the other boats are used for longline. The wood and/or fibreglass cabin pirogues are 7-9 m long, powered by two 40-60 hp outboard engines, and equipped for longline fishing. Not all these vessel types have a cabin. The second vessel category is the wooden and fiberglass launchers, 9-15 m in length, powered by a 130-300 hp inboard

diesel or gas engine, and equipped for overnight longline fishing. The third vessel category is the wooden double-enders which could be a seine or attendant boat; these boats are powered by oars. No data were available on the number of double-enders or sloops (recreational sailing vessels) in Grenada because the Fisheries Division only registered ocean-going vessels (Roland Baldeo, pers. comm., 2005).

**Table 3. 3: Main gear type by boats in Gouyave**

| Boat types | Gear types | Active | In-active |
|---|---|---|---|
| Open pirogues | Longline | 64 | 22 |
| | Bank fishing | 9 | -- |
| | Trolling | 5 | -- |
| | Transport | 4 | -- |
| | Ballahoo net | 4 | -- |
| | Bottom longline | 3 | -- |
| | Handline | 3 | 2 |
| | Seche | 3 | 1 |
| | Fish pot | 1 | -- |
| | Other | 1 | -- |
| Cabin pirogue | Longline | 20 | 6 |
| Launcher | Longline | 8 | -- |
| Double-ender | Beachseine | 6 | -- |
| Sloop | Sailing | 11 | -- |
| | **TOTAL** | **142** | **31** |

The main gear types are longline, handline, beachseine, trolling, bankfishing, and seche (See Appendix B for detailed gear description). Over 82% of fishers were involved in longline fishing. Longline comprises three major components: the mainline, dropline, and buoyline (Fig. 3.9). The mainline ranges from 3-10 km in total length, is made of monofilament nylon with a 136 kg breaking strain. Braided nylon loops 1.5 cm thick are inserted every 18 m along the mainline, onto which the droplines are clipped during the gear set. Droplines vary in length from 3-32 m, using five to eight different lengths depending on fishers' preference, also bait with live flyingfish (*Hirundichtys affinis*) or jack (Carangidae). Buoylines, 3 m in length, are attached after every third hook. Flags are placed at either end of the mainline to signal to other boats that a longline is in the area. Mainline and droplines are deployed from separate manual reels.

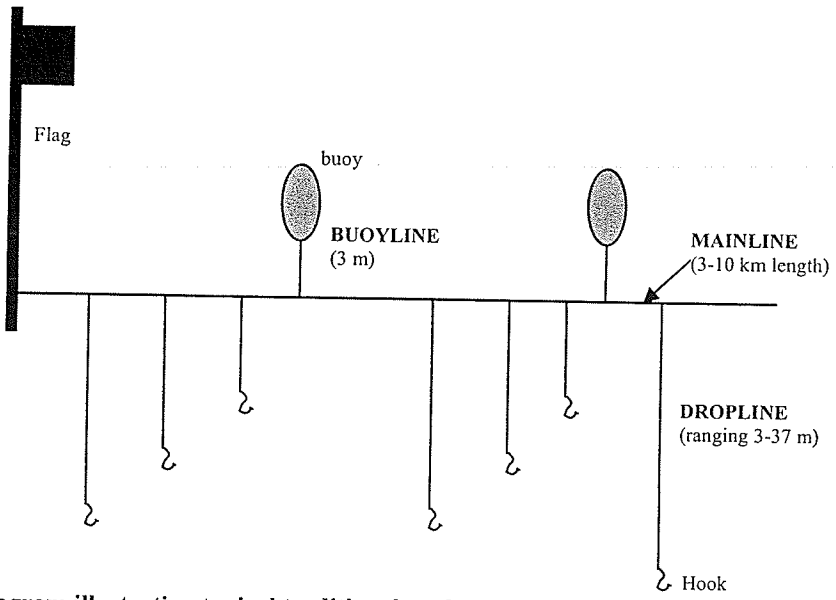



**Fig. 3. 6: Schematic diagram illustrating typical traditional surface longline gear used by Gouyave longline fishers**

### 3.2.3 Fishing Infrastructure

Gouyave is one of seven official longline sites in Grenada (Table 3.4) and as such has a fish market equipped with three cold rooms for the storage of fish, fish vending area, and offices. The community also has a jetty to dock vessels, a fishermen centre, and 25 fishermen lockers/gear sheds. The fishermen centre was built in the 1990s with financial assistance from the Japanese government, and is equipped with ice-making machines with ice holds, a walk-in freezer, staff offices, a fishermen meeting room, store room, small workshop space, and standby generator room. Beside the fishermen centre is a gas station where fuel and marine oil is sold to fishers. The station is managed by the St. John's Fishermen Association.

**Table 3. 4: Number of landing sites with various types of shore facilities. Cells marked with an X indicate the presence of these facilities (Source: Fisheries Division)**

| Parish | No. of fisher | No. of boat | Fish landing site | Official landing site | Fish market | Jetty/dock | Lockers/gear shed | Fishermen centre | Gas station | Longline fishing site |
|---|---|---|---|---|---|---|---|---|---|---|
| St. George's | 535 | | Woborn | | | | | | | |
| | | | Calliste | | | | X | | | |
| | | | Grand Anse | | | | | | | |
| | | | Lagoon Road | X | | | | | | X |
| | | | Carenage | | | | | | | X |
| | | | Melville Street | X | X | X | | | | X |
| | | | Grand Mal | | | X | X | | X | X |
| | | | Happy Hill | | | | | | | |
| | | | Beausejour | | | | | | | |
| | | | Petite Bacaye | | | | | | | |
| | | | True Blue | | | | | | | |
| St. John's | 563 | | Woodford | | | | | | | |
| | | | Marigot | | | | | | | |
| | | | Grand Roy | | | | X | | | |
| | | | Gouyave | X | X | X | X | X | X | X |
| St. Mark's | 176 | | Victoria | X | X | | X | X | X | X |
| | | | Waltham | X | | | | | | X |
| | | | Duquesne | X | X | | X | | | |
| St. Patrick's | 150 | | Sauteurs | X | X | X | X | | | |
| | | | Levera | | | | | | | |
| | | | Darvey | | | | | | | |
| St. Andrew's | 305 | | Conference Bay | | | | | | | |
| | | | Grenville | X | X | X | X | X | X | |
| | | | Soubise | | | | | | | |
| | | | Marquis | | | | | | | |
| St. David's | 64 | | Requin | | | | | | | |
| | | | Corinth | | | | | | | |
| | | | Fort Jeudy | | | | | | | |
| Carriacou | 407 | | Bogles | | | | | | | |
| | | | Harvey Vale | | | | | | | |
| | | | Dover | | | | | | | |
| | | | Belmont | | | | | | | |
| | | | Grand Bay | | | | | | | |
| | | | Hillsborough | X | X | | X | | | |
| | | | Windward | | | | | X | | |
| | | | L'Estere | | | | | | | |
| Petite Martinique | | | Petite Martinique | | | | X | | X | X[1] |
| **TOTAL** | **2200** | **735** | 37 | 9 | 7 | 5 | 10 | 4 | 5 | |

[1]Longline boats from Petite Martinique operate from the Carenage in St. George's town

### 3.2.4 Marketing

Of the five fish exporters/primary processors, two operate from Gouyave, namely the NORDOM Seafoods Ltd. and Caribbean Seafood Ltd. (CSL). Marketing and distribution include local and export sales of fish landed in Gouyave (Fig. 3.7). Large pelagic species are landed at the fish market, except yellowfin tuna (YFT) which is cleaned, weighed, and tagged with a number corresponding to the buyer, then placed in the cold room. Fishers decide to whom they would like to sell their fish before it is placed in the cold room. The next morning, vendors present their tags to officers in the fish market for their fish. YFT is graded for quality[4], cleaned, weighted, and chilled on ice for export. YFT landed at the NORDOM Seafoods Ltd. processing plant is processed for export, while other fish species such as sailfish are packaged for the local market. The GCFL and Caribbean Seafoods Ltd. have a small holding facility to receive fish. Fish are later transported to their relevant processing plants in St. George's town. Processing plants either receive fish directly from the fishers or purchase them through the fish market. Over 23% of large pelagic species landed is exported mainly to the USA (Fig. 3.7). Ex-vessel fish prices in late 2003 were: YFT (grade 1) EC$5.50; YFT (grade 2) EC$5.00; YFT (grade 3) EC$4.00; by-catch (other large pelagic species) EC$4.00; and shark EC$1.25.

The number of fish vendors fluctuates from year to year depending on the availability of employment in other sectors. In 2003, 26 active vendors were counted, although there were also opportunistic vendors who sold fish when the opportunity arose. There were 15 retail vendors who sold fish in fish markets, and four retail distributors assisted by six conductors/drivers who transported fish in the back of vans through communities, blew a conch shell to alert buyers, and sold fish. Only one wholesale distributor operated from Gouyave. Bernadette Williams purchased 18% of fish landed in Gouyave and sold to restaurants, supermarkets, hotels, and retail vendors throughout Grenada.

[4] Grade 1- high quality, OK for export; grade 2- OK for export; grade 3/'burn'- not suitable for export.

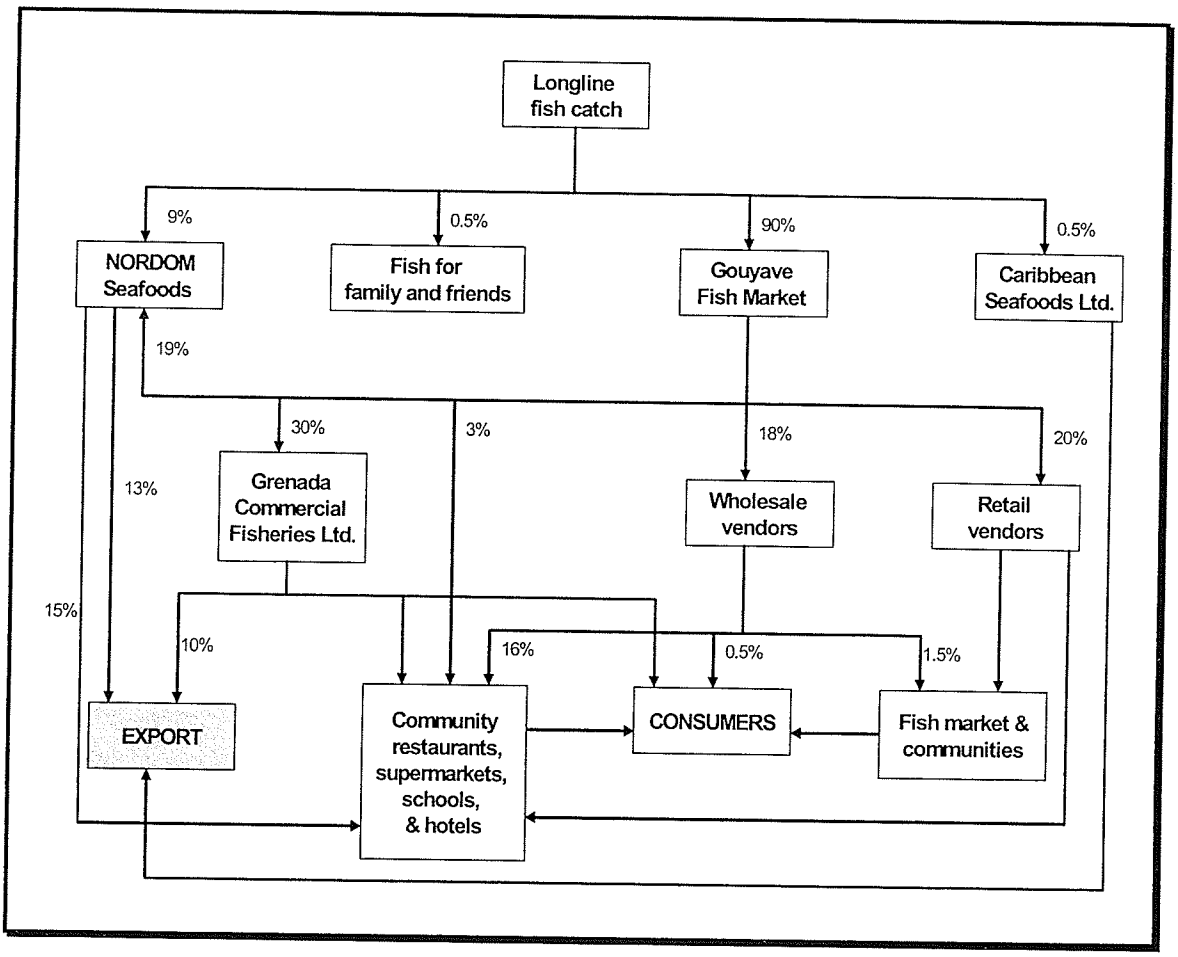



**Fig. 3. 7: Path diagram of longline fish catch showing percentage of clean weight of fish from fishers to the consumers. Percentages based on 2003 daily landings data at the Gouyave Fish Market. Percentages indicate the amount of product moving along each pathway.**

### 3.2.5 Cost and earnings

Economic characteristics of the longline fishery are outlined in Table 3.4. Capital investment and expenditure vary by boat type, however, income is dependent on catch rates. In recent years, there has been a shift from the cabin pirogue to a lower input open pirogue; the main reasons being the lower investment and operational costs. This shift also increases the number of fishers who are now able to own and captain their boat. Most inputs for commercial fishing are exempt from import duty and value added tax. According to Cabinet Conclusion #749/93 all navigation, safety items, and boat repair material are 100% duty and 100% General Consumption Tax (G.C.T) exempt. The government also provides gas rebates (EC$0.83 per gallon) and loans to fishers at lower

interest rates. Banks offer normal commercial lending rates of 12.5 - 15% to fishers for the purchase of fishing equipment. For example, a loan of EC$30,000 over 4 years would be repaid by a fisher at EC$812 per month.

**Table 3. 5: Financial and economic characteristics of individual longline fishing units by vessel type (figures expressed in US$)**

| Items | Open pirogue | Cabin pirogue | Launcher |
|---|---|---|---|
| Capital cost (new) – including equipment | $6,000 | $18,000 | $120,000 |
| **Annual profitability** | | | |
| Average longline trips per year | 89 | 74 | 35 |
| Average expense per trip (fuel, oil, bait, food, ice, boat helper) | $70 | $130 | $825 |
| Average engine and boat repair and maintenance per month | $100 | $160 | $250 |
| Average monthly loan repayment | $100 | $207 | $550 |
| Average monthly insurance | - | - | $62 |
| Average income per trip[1] | $350 | $525 | $4,375 |
| Average gas rebate per trip (income) | $6 | $21 | $139 |
| **Personal annual net income** | | | |
| Owner | 50% | 50% | 50% |
| Crew 1 | 25% | 25% | 17% |
| Crew 2 | 25% | 25% | 17% |
| Crew 3 | | | 17% |
| Source: [1]Baldeo, 2003 | | | |

### 3.2.6 Fisheries management system

The Fisheries Division is under the jurisdiction of the Ministry of Agriculture, Lands, Forestry and Fisheries. The Grenada Fisheries Act No. 15 of 1986 obligates the Minister responsible for Fisheries to promote the management and development of the fisheries sector in a sustainable manner. Other legislation and regulations in support of the Fisheries Act are: the Fisheries Regulation SRO #9 of 1987; Fisheries (Fishing Vessel Safety) Regulations SRO #3 of 1990; Fisheries (Amendment) Regulations SRO #24 of 1996; Fisheries (Amendment) Act #1 of 1999; Fish and Fishery Products Regulations SRO #17 of 1999; and Fisheries (Amendment) Regulations SRO #2 of 2001.

The Chief Fisheries Officer and ten Fisheries Officers have the task of managing the marine and riverine resources in Grenada. The main roles of the Chief Fisheries Officer are to prepare plans for the management and development of fisheries, and to

manage the Division. The main functions of the Division are: (1) administrative - to issue fishing licenses, provide concessions, maintain a data collection and information system, enforce the regulations, and provide quality control of fish markets; and (2) the management and development of fisheries - identify each fishery, determine their present state, define objectives for management, and identify management measures (Phillip, 2003). The Division has six research and management sections:

- Administration – daily management of the Division (resources, budget, projects);
- Fisheries Biology and Marine Protected Area (MPA) unit – stock and habitat management and conservation, fisheries research, management of MPAs;
- Statistical Unit – maintain fishers, licensing and registration, and catch and effort databases and information;
- Fisheries Technology Unit – promote and monitor fishing technology, safety at sea, search and rescue;
- Extension Unit – liaison with the Fisheries Division and fishers, enforcement; and
- Quality Control, Health, and Safety – liaison with the Ministry of Health, Bureau of Standards to inspect fish processing establishments, and assist the industry in meeting local and international safety standards.

Ultimately, it is the Fisheries Division that is charged under the UN Convention on the Law of the Sea Convention (UNCLOS) and the UN Fish Stock Agreement to work through regional and international fisheries management organizations to manage the fisheries (Mahon, 2001). Thus, the Minister can appoint a Fisheries Advisory Committee to advise on the management and development of the fisheries sector, enter into regional cooperation agreements for the exploitation, management and development of fisheries on a regional basis, and enter into fisheries access agreements with regional and international states and agencies (Phillip, 2003).

## 3.3 Conclusion: scope of the case study

The 'scope' of the case study is critical in this research and subsequent analysis. The scope is a comprehensive understanding of the interactions among relevant components of the fishery system being managed (Charles, 2001). Based on data in

previous sections of this chapter, a high-level systems diagram of the longline fishery components is presented (Fig. 3.8). The fishery has six components: the fishing community, the fishers, longline fishing activities, marketing (local and export), financial services, and government. Goods and services such as fish, money, labour, expectations, and regulations, link the components.

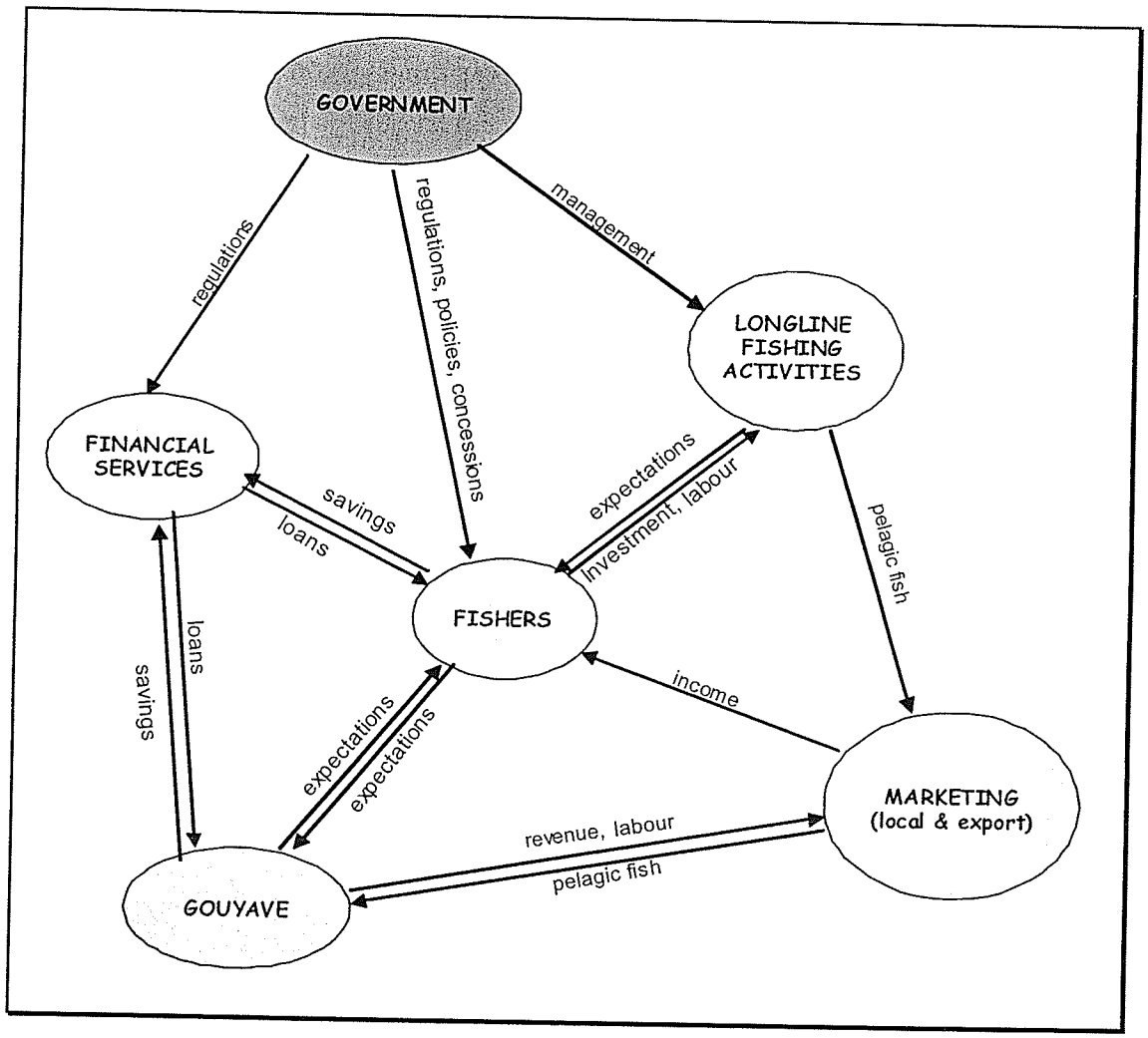



**Fig. 3. 8: A high-level system representation of the longline fishery components at the community level. The arrows show the flow of goods and services between components of the system (Adapted from Manwaring, 1994)**

Gouyave fishing community component includes government services (health care, schools, essential services), general living conditions, recreational activities

(sailing), entertainment (disco, arcade, gym), community development organizations, support services (grocery stores, hardware, haberdashery), and the norms and values of the community. Fishers require labour (boat helpers, fish cleaners, assistance in hauling boats to shore) from the community. They also expect in-kind support such as preparing meals and washing clothes. In some regards fishers expect emotional support from the community, and services beyond the call of duty, e.g., shopkeepers opening stores at 5 am, so they can purchase breakfast and food (drinks, crackers) before going to sea. In return the community expects gifts of fish, cash, and other in-kind support when needed.

The fishers' component encompasses their living conditions, household characteristics, education and training, livelihood strategies, social life (recreation and entertainment), participation in community activities, financial situation, and their expectations of self and the community's expectations of them. Fishers invest money and labour in longline fishing activities, and in return they expect the gear and equipment to catch fish.

The longline fishing activities component includes the natural ecosystem, fishing operations, purchase and maintenance of equipment, supply and cost of gas, skill and knowledge of longline fishing, and seamanship training in navigation and safety at sea. It also includes aspects of the bait fishery. Fishers use skill, knowledge, gear, and equipment to catch fish.

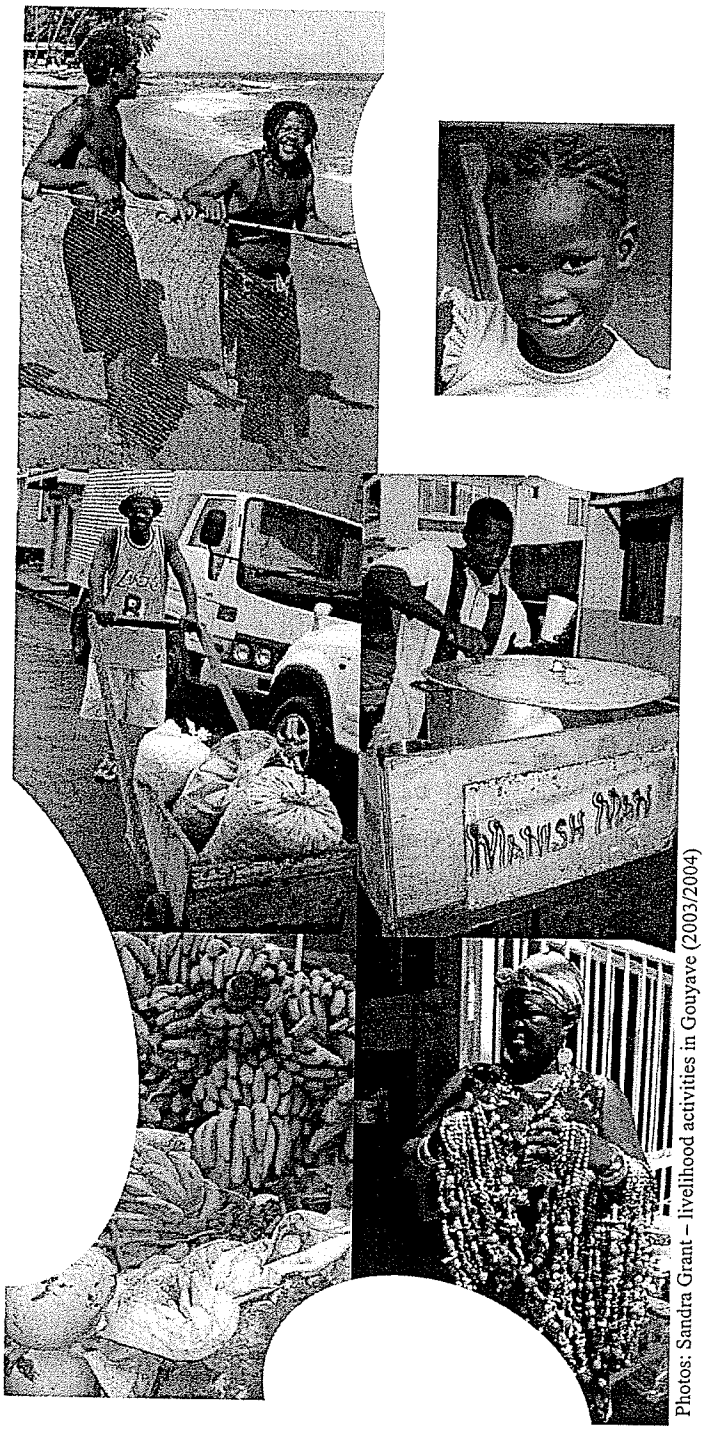
The marketing component includes local and export marketing and distribution of fish, health and safety standards to handle fish, quality control at processing establishments, infrastructure development, and fish-price regulations. The Gouyave community provides labour to process the fish and vendors to distribute it. The sale of fish provides revenue to labourers and processing establishments.

The financial service component includes fishers and community access to finance. Fishers mainly save with a bank; in return banks provide loans for fishing equipment, housing, and vehicles. Over the years the Fisheries Division has provided financial assistance to fishers through the bank. At times, investors and fish vendors lend money to fishers to re-invest in the fishery. In many instances, boat owners help crew members in times of need.

The government (Fisheries Division) component includes fisheries administration, management, legal framework (fisheries management, regulations, and policy), and industry support (loans, concessions, gas rebate). The government creates policies and regulations directed at fishers and the industry. Likewise, they subsidize fishing equipment and fuel, and maintain fishing infrastructure.

# CHAPTER 4:

## Gouyave livelihood system



Photos: Sandra Grant – livelihood activities in Gouyave (2003/2004)

# CHAPTER 4: Gouyave livelihood system

The objective is to determine how livelihood issues can be analyzed and included in fisheries management. The results of this assessment will be applied to the MOD fishery planning process in Chapter 8. The chapter discusses three issues: the strategies used to provide food and income for individuals and households; how income from fishing circulates to sustain the community; and the changing nature of livelihood systems.

## 4.1 Introduction

Caribbean fishery managers, as elsewhere, generally use biological and economic objectives to manage fisheries. The need to include social objectives has been discussed, but little has been done to actually integrate these objectives into fisheries management (CFRAMP, 2001; Bunce and Pomeroy, 2003). One way to work towards the inclusion of social objectives in fisheries management is to understand livelihood issues and gendered roles in fishing communities. Fishers in Gouyave describe sustainable livelihood as the ability to economically sustain their household and the community. They argue, "If there was no more fish, not only would the household suffer but the community as well." This chapter pursues this line of argument to understand the livelihood system in Gouyave and the link between fish and sustaining the community.

To understand livelihood systems and strategies, 'livelihoods' will be defined. "A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household" (Ellis, 2000:10). It is important to note that a livelihood is not just about economic activity, but includes the wide range of activities people engage in to make a living (Helmore and Singh, 2001). A livelihood is sustainable when it can cope with and recover from stresses (long term) and shocks (short term), maintain or enhance its capabilities, assets, and entitlements, while not undermining the natural resource base (Chambers and Conway, 1992).

To maintain and improve their quality of life, poor rural households generally engage in livelihood strategies which may include:

- diversification, widening the income earning portfolio (Titi and Singh, 1994; Davies, 1996; Scoones, 1998; Hussein and Nelson, 1998; Ellis, 2000; Marschke, 2005)
- agricultural intensification, investing in an intensive production mechanism (Carswell, 1997; Scoones, 1998)
- migration, moving to other areas to earn a living (Titi and Singh, 1994; McDowell and de Haan, 1997; Scoones, 1998; Marschke, 2005)
- modification of consumption pattern (Davies, 1996), and
- stinting, hoarding, protecting, depleting, and making claims on relatives, friends, and government (Chambers and Conway, 1992).

Fishing households include other strategies such as:

- flexibility within fishing activities, using different types of gears
- geographic mobility, fishing in different areas (Allison and Ellis, 2001), and
- specialist-generalist alteration, operating in one fishery or multiple fisheries (Smith and Mckelvey, 1986)

This chapter focuses on livelihood diversification strategies employed in Caribbean fishing communities. Diversification is a common livelihood strategy of rural households in developing countries (Ellis, 2000, 2004; Chambers, 1997; Ellis and Allison, 2004) and fishing communities (Acheson, 1981; Panayotou, 1986; Allison and Ellis, 2001). It is "the process by which, rural households construct an increasing diverse portfolio of activities and assets in order to survive and to improve their standard of living" (Ellis, 2000:15). In the Caribbean, poor and rural communities have been known to pursue diversification strategies (also termed occupational multiplicity or occupational pluralism) to support their households (Davenport, 1956; Comitas, 1962; Rubenstein, 1987; Momsen, 1993). Since no one livelihood activity can be lucrative enough for individual full-time specialization, rural households engage in numerous social negotiations and economic activities in order to secure a living (Comitas, 1964). Rubenstein (1987) contends that diversity and complexity allow poor villagers in St. Vincent some "degree of maneuverability in the economic arena". Not only is

diversification a common strategy, it is also a good approach to reduce poverty, as it lessens food insecurity and builds households assets (Ellis and Allison, 2004).

The main determinants of livelihood diversification are: seasonality, coping behaviour, labour and credit markets, and savings, investment and risk strategies (Sahn, 1989; Davies, 1996; Chambers, 1997; Ellis, 2000). Of these determinants, seasonality is of particular interest to this research and will be discussed later in greater detail. Seasonality affects natural resource-based production, market sales, the demand for labour, and the ability of households to provide income and food during lean seasons (Chambers et al., 1981; Sahn, 1989; Ellis, 2000, 2004; Pitt and Khandker, 2002). For example, in farming systems, the "returns to labour in both on-farm activities and off-farm labour markets vary during the year causing seasonal changes in occupation as labour time is switched from lower to higher return activities" (Ellis, 1998:11).

However, seasonality is not only manifested in agricultural systems. Fishing communities also pursue diverse livelihoods which are highly seasonal. Allison and Ellis (2001:383) describe the link between fishing seasonality and diversification:

> Fishing is a high-risk occupation, and one prone to seasonal and cyclical fluctuation in stock size and location, some of which are highly unpredictable in occurrence. Diversification reduces the risk of livelihood failure by spreading it across more than one income source. It also helps to overcome the uneven use of assets (principally labour) caused by seasonality, to reduce vulnerability, to generate financial resources in the absence of credit markets, and it confers a host of other advantage in the presence of widespread market failures and uncertainties.

Mobility of labour in and out of fishing depends on the income from fishing and other parts of the economy. When income from fishing increases above that of other economic activities, the result is an influx of new entrants. However, if income in the wider economy increases then individuals would leave fishing (Allison and Ellis, 2001). Like fishing, food-crop incomes fluctuate due to seasonal planting and harvesting (Chambers et al., 1981; Sahn, 1989). The seasonal cycles of fishing and farming can be beneficial to fishing households (Geheb and Binns, 1997), and for this reason it is imperative that fisheries managers are aware of the innate rhythms of the communities they serve.

In fishing communities, household survival is also dependent on gendered roles and contributions. Gender is defined as "a social construct which is shaped by cultural,

social, economic, political ideological environment of specific countries and regions, and which defines the identities of men and women and arranges their access to resources, status, and power" (Barriteau, 1998:16). It is argued that livelihood diversification was widespread among women as well as men (Hussein and Nelson, 1999; Whitehead and Kabeer, 2001). In the Caribbean, diversification strategies are largely tied to gender – the men harvest, while the women seem to focus mainly on post-harvesting activities. In many instances, the male/female combination in the household would maximize income by controlling harvesting, post-harvesting, and entrepreneurial non-fishing activities (Grant, 2004). Women tend to control the high-entry point of the fishing economies, that of marketing and distribution. They control market prices of fish products and dictate to fishers what they are willing to pay for the product. In some instances, women provide loans to fishers to purchase gasoline to go fishing, thus they controlled to whom the fishers can sell and at what price.

In conclusion, a livelihood system can become sustainable if individuals are able to diversify livelihood activities and take advantage of seasonal flows (Chambers, 1997). The more diverse a livelihood system, the more people are able to deal with losses in one sector as they can switch to other livelihood activities to either maintain or improve their standard of living. If the economic base is reduced owing to a lack of livelihood opportunities, the household becomes more vulnerable to poverty.

## 4.2 The livelihood system in Gouyave

To understand the livelihood system in Gouyave this section describes livelihood activities during the main field research in 2003. It documents livelihood strategies used by households and fishers, discusses how the income from fishing helps to sustain the community, and describes changes to Gouyave livelihood system after Hurricane Ivan in 2004.

### 4.2.1 Livelihood activities in 2003

Economic livelihood activities available to community members are summarized from the livelihood survey data (Appendix A-12). Males and females respondents in

Gouyave were involved in numerous livelihood activities (ranging from one to seven activities), with most individuals involved in two. The principal income sources for males were fishing and fishing-related activities such as vendor, support services, processing work (72%), small business (6%) and government work (6%). Secondary income sources for males were fishing and fishing-related activities (32%) and agriculture (12%). The main income sources for females were agriculture (20%), homemaking (16%), fishing and fishing-related activities (vendors) (13%). The secondary income sources for females were business (33%), government work (13%), and fishing and fishing-related activities (12%) (Table 4.1). Table 4.2 lists the actual occupations covered by specific occupation groups. Overall, respondents' principal and secondary income sources were fishing and fishing-related activities, micro-businesses, agriculture, and government jobs.

**Table 4. 1: Principal and secondary sources of income of respondents by gender**

| Category | Occupation group | Principal occupation | | | Secondary income source | | |
|---|---|---|---|---|---|---|---|
| | | Male | Female | Total | Male | Female | Total |
| Fishing livelihoods | Fishers | 66 | 1 | 67 | 11 | 1 | 12 |
| | Fish vendor | 7 | 6 | 13 | 5 | 4 | 9 |
| | Support services | 10 | | 10 | 20 | 1 | 21 |
| | Fish processing worker | 3 | | 3 | 1 | | 1 |
| | **SUB-TOTAL** | **86** | **7** | **93** | **37** | **6** | **43** |
| Non-fishing livelihoods | Businessperson | 7 | 7 | 14 | 5 | 17 | 22 |
| | Agriculture | 1 | 10 | 11 | 14 | | 14 |
| | Government worker | 7 | 3 | 10 | 3 | 7 | 10 |
| | Retired | 5 | 4 | 9 | | | 0 |
| | Homemaker | | 8 | 8 | | 1 | 1 |
| | Construction | 6 | | 6 | 6 | | 6 |
| | Service industry | | 4 | 4 | 2 | 1 | 3 |
| | Student | 4 | | 4 | | | 0 |
| | Domestic worker | | 3 | 3 | | 2 | 2 |
| | Professional | 1 | 1 | 2 | | | 0 |
| | Tourism | 1 | 1 | 2 | | | 0 |
| | Entertainer | | | | 2 | | 2 |
| | Unemployed | | 3 | 3 | | | 0 |
| | No secondary source | | | | 48 | 18 | 66 |
| | **SUB-TOTAL** | **32** | **44** | **76** | **80** | **46** | **126** |
| | **TOTAL** | 118 | 51 | 169 | 117 | 52 | 169 |

**Table 4. 2: Occupation grouped under general headings and actual occupation by fishing and non-fishing livelihood activities in Gouyave**

| Category | Occupation group | Occupation |
|---|---|---|
| Fishing livelihoods | Fishers | Sailor/crew, captain, boat owner & captain, boat owner |
| | Fish vendor | Retail vendor, retail distributor, wholesale distributor, 'conductor/driver', opportunistic vendor |
| | Support services | Boat builder, boat repair, '*lambia*'[1] or boat helper, engine repair, clean fish |
| | Fish processing worker | Manager, clerk, worker, driver |
| Non-fishing livelihoods | Agriculture | Farmer, labourer, nutmeg processor |
| | Businessperson | Entrepreneur, hairdresser, barber, land owner, restaurant/shop owner, dressmaker, shoemaker, street vendors (petty, mobile restaurant and bar) |
| | Construction | Masonry, carpenter, bricklayer, contractor, electrician, house painter, plumber, tile layer, welder, road construction |
| | Domestic worker | Cook, washerwoman, servant, babysitter |
| | Government worker | Civil servant, police, fire, postal employee, road worker[2], port worker |
| | Homemaker | Stay home and take care of children, home care for elderly |
| | Professional | Teacher, manager, nurse, accountant, pilot, clerk |
| | Retired | |
| | Service industry | Bartender, waiter, janitor, sales person, shop keeper, security guard |
| | Student | Primary, secondary, vocational |
| | Tourism | Craft maker, craft vendor, hotel worker |
| | Entertainer | DJ entertainer |

[1] '*Lambia*' or boat helper is an individual who works for a boat owner or captain removing fish from the boat, cleaning the boat, purchasing gas, and making sure the boat was ready for the next fishing trip
[2] cleans roadside drains

In terms of fishing activities, males were mainly involved in fishing while females did little or no fishing. Only one female fished regularly with her male partner. Prior to the early 1970s, women were actively involved in the beachseine fishery and in marketing fresh and sun-dried fish. As the longline fishery became more widespread, women no longer participated in fishing activities, except as vendors and investors. Females reported that with longline fishing, the work was strenuous and the distance they had to fish from shore, prevented more active participation.

Regarding non-fishing livelihood activities women dominated in: agriculture (mainly nutmeg processing where nuts are cracked and sorted); micro-businesses (mainly

petty/street vendors, mobile bar from which to sell alcohol and drinks from 'igloo' containers on wheels, and mobile restaurants which involves placing a small stove on a table and selling fried chicken and fish whenever there was an event); and homemaking (staying home to care for children and the elderly).

One important male livelihood was construction and although the numbers in the sample are low, this does not reflect the lack of importance of construction as a livelihood activity. Jobs in construction depended on available construction projects in and near the community. Once a project started, e.g., road or building construction, many fishers and community members would leave fishing temporarily to take advantage of available jobs. During the time of the survey, there was no new construction activity in the community.

### 4.2.2 Livelihood strategies used by households

#### 4.2.2.1 Combining livelihood activities

To determine the nature of livelihood diversity, principal occupation groups were cross-tabulated with secondary income sources (Table 4.3). Of the respondents 21% were engaged in fishing-only activities, while others combined fishing and non-fishing livelihoods. Respondents involved in non-fishing livelihoods chose fishing as a secondary source of income. For example, an individual whose main livelihood was construction could fish on weekends or early mornings. He would participate in a beachseine haul, get paid in cash or fish (which he later sold), then went to another job for 9 am. The income from a few hours of fishing could be more than a day's wage pay.

As for agriculture, 63% of respondents did not have access to agricultural land, only 9% owned land, and 16% had access to family land. Yet despite the lack of access to agricultural land, 11% of respondents were involved in backyard/kitchen gardens on their house-spots. In addition to these, households also planted dasheen (*Colocasia esculenta*) beside drains in their yard, and the leaves of the dasheen, also called callaloo, are eaten. Respondents involved in agriculture harvested produce mainly for household consumption. Only five households in the survey had livestock (cow, chicken), which they kept for home consumption or sold for additional income.

**Table 4. 3: Cross-tabulation of principal occupation groups and secondary source of income to determine how individuals combine occupations**

| Principal occupation | Secondary source of income | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fishing | Fish vendor | Other support service | Agriculture | Construction | Government | Other business | Other | None | Total |
| Fishing | | 3 | 7 | 8 | 4 | 3 | 2 | 4 | 36 | **67** |
| Fish vendor | 2 | | | 1 | | | 3 | 1 | 6 | **13** |
| Support services | 4 | 1 | 2 | 2 | 1 | | | | 3 | **13** |
| Business | | 2 | | 2 | 1 | 1 | 3 | 1 | 5 | **15** |
| Government | 2 | 1 | 4 | | | | 2 | | 3 | **12** |
| Agriculture | 1 | 3 | | | | 1 | 1 | | 5 | **11** |
| Construction | 2 | | 2 | | | | 1 | | 1 | **6** |
| Professional | | | 1 | | | | | | 1 | **2** |
| Other | 1 | | 5 | 1 | | 3 | 9 | 2 | 9 | **30** |
| **Total** | **12** | **10** | **21** | **14** | **6** | **8** | **21** | **8** | **69** | **169** |

## Household diversification strategies

The respondents were engaged in one to seven livelihood activities with the mean being two; and one to five household members were engaged in one or more livelihood activities. Household livelihood strategy ranged from situations where only the head engaged in economic activities (as in Case 1) to those where many household members worked and each person was involved in one or more livelihood activities (as in Case 2).

**Case 1**: This case had only the fisher who earned an income and his wife stayed home to take care of the children. When the fisher was asked how he was able to support his family, this was his response paraphrased.

> I am a crew member on a large longline vessel, going to sea two to four days at a time. When I am not fishing I work on my farm, or repair nets, and make sacs and 'bazor' [fishing gears] for other fishermen. During fishing off-seasons, July to September, I use my small wooden boat to go snapper fishing using bottom longline and bankfishing. And during the fishing season I rent this same boat to the beachseine fishery. The income from snapper fishing is very small compared to longlining, but I am able to eat and make some extra money for my family. I have to support my wife and six children.

> I rent three acres of agricultural land, just one mile from my house. I plant nutmeg, cocoa, banana, corn, yam, and pigeon peas. Nutmeg is my highest income crop, so I spend a lot of time picking, removing mace, drying, and transporting it to the nutmeg pool [Grenada Cooperative Nutmeg Association]. My wife and children help me a lot, especially with drying nutmeg and 'shelling' pigeon peas.
>
> I would say I spend about 90% of my time fishing and 5% on agriculture, but I earn 80% of my income from fishing and 15% from agriculture. These days, it is very difficult to make ends meet. You have to do a number of different things to support your family, and you also have to give a little to your neighbour because you can never tell what will happen to you tomorrow; you may need the help.

This fisher was involved in a number of livelihood activities to take care of his family. Fishing-related activities included serving as a crew member on a fishing vessel, renting out his small canoe boat, fishing (longline, beachseine, bottom longline, and bankfishing), and making and repairing nets for other fishers. He was also involved in non-fishing livelihood activities such as agriculture. The remaining 5% of his earnings came from his involvement in logging and sailing in recreational competitions.

**Case 2**: In this household of seven members (father, mother, and five children) each person was involved with various livelihood activities. They depended on the income from fishing and construction to meet their needs. When there was no work in construction the father worked for his daughter's common-law husband in fishing. The eldest son, a fisher, captained another boat and provided fish and cash for the household. The youngest son worked after school as a boat helper and sometimes went near-shore handline fishing with friends. The money he earned as a boat helper and fishing was used to pay school expenses (school fees, books, lunch, clothes, and bus fare). The second daughter had graduated from secondary school and was employed as a receptionist at a hotel in St. George's town. Sometimes her monthly income was not enough to cover her expenses, so she had to rely on her brothers and father for additional financial assistance. Mother (sometimes with assistance from her younger daughters) cooked, cleaned, washed her sons' clothes, shopped, and took care of the house. The sons gave their mother extra cash towards household expenses in exchange for meals and clean clothes. The mother also worked part-time sorting nutmeg for the Grenada

Cooperative Nutmeg Association (GCNA) when there was a large supply to be processed.

#### 4.2.2.2 Combining fishing activities

There was also diversification in fishing activities. Fishers were involved in multiple fishing activities, combining specialization (a single activity) and multi-tasking/generalization (many activities simultaneously). The following sets of tables were generated by merging individuals involved in fishing as principal and other sources of income, thus the figures in this section may not be consistent with Table 2.4. To generate tables based on principal occupation diminishes the overall impact of fishing.

**(1) Role specialization and multi-tasking.** Twenty percent of fishers, involved in fishing as a principal occupation or other source of income, combined roles. For example, a boat owner may spend most of his time as captain of his own boat, but could also serve as crew or captain on another boat, depending on the circumstances (Table 4.4). See Box 4.1 for an example.

**Table 4. 4: Number of fishers by role in fishing**

| Role in fishing | Numbers |
|---|---|
| Crew | 34 |
| Captain | 18 |
| Boat Owner (BO)/Captain | 17 |
| Boat Owner/Investor | 12 |
| Boat Owner/Investor and BO/Captain | 5 |
| Boat Owner/Captain and Crew | 4 |
| Boat Owner/Captain and Captain other owners' boat | 4 |
| Boat helper | 4 |
| Captain and Crew | 2 |
| Boat Owner and Captain other owners' boat | 1 |
| **TOTAL (N)** | **101** |

***Box 4.1: Example of role specialization & multi-tasking***

Fisher D recently purchased a small wooden canoe, but was not successful at longlining. On several trips he went to sea and returned to shore with no fish. His expenses mounted to the point where it was not feasible to go fishing anymore. Instead of sitting on shore with nothing to do and a family to support, he decided to fish on another boat until he was able to clear his debt.

**(2) Gear specialization and multi-tasking.** Of the fishers interviewed, 30% were specialists, i.e., they used only longline gear; 54% had combined specialization and multi-tasking, i.e., they specialized in the longline gear and switched to other gears when necessary; while 17% were not involved in longline fishing (mainly due to age because operating the gear required strength and agility). Seventeen different combinations of gears with longline were reported (Table 4.5). See example in Box 4.2.

**Table 4. 5: The many gear combinations of respondents whose principal occupation was fishing (See Appendix B for gear description)**

| | Fishing Gears | No. |
|---|---|---|
| **Longline only** | Longline only | 28 |
| **Longline and other gears** | Longline, beachseine | 10 |
| | Longline, throw bait for 'common tur' (throw bait) | 8 |
| | Longline, beachseine, ground palar, barracuda line | 5 |
| | Longline, ground palar | 4 |
| | Longline, throw bait, ground palar | 4 |
| | Longline, throw bait, 'common tur' longline, ground palar | 4 |
| | Longline, bankfishing, beachseine | 3 |
| | Longline, throw bait, bank fishing, seche, beachseine | 2 |
| | Longline, beachseine, bankfishing | 2 |
| | Longline, beachseine, 'common tur' longline | 2 |
| | Longline, beachseine, common tur longline, bankfishing | 1 |
| | Longline, gillnet | 1 |
| | Longline, bankfishing, vertical longline | 1 |
| | Longline, ground palar, bank fishing, seche, beachseine | 1 |
| | Longline, seche | 1 |
| | Longline, throw bait, fish pot, ground palar, bankfishing | 1 |
| | Longline, 'common tur' longline, ground palar, beachseine | 1 |
| **Other fishing activities** | Beachseine only | 10 |
| | Bankfishing only | 2 |
| | Throw bait only | 2 |
| | Trolling only | 1 |
| | Trolling, bankfishing | 1 |
| | Beachseine, bankfishing | 1 |
| **TOTAL (N)** | | **96** |

*Box 4.2: Example of gear specialization & multi-tasking*

Fisher C specialized in longline fishing, and depending on the weather, availability of bait, phase of the moon, and availability of fish species he would switch gears regularly. If he went longline fishing on Monday and Tuesday for yellowfin tuna and sailfish and caught nothing, but observed that others caught nothing, instead of wasting his money to purchase gas to go offshore, he would switch gear on Wednesday to handline for blackfin tuna close to shore. If handline fishing was not fruitful, he would switch gear on Friday (depending on the phase of the moon) to bottom longline for snapper.

**(3) Combining fishing occupations.** Of the respondents 15% mixed fishing occupations (Table 4.6). Although most fishers were specialists in longline, they were able to perform other fishing activities. Some sold fish or worked part-time as boat helpers. They could easily switch from one fishing occupation to another, with the exception of engine repair and boat building which required special training. A few key individuals in the community strengthened the local fishing industry by combining fishing occupations and investing in the local industry (Box 4.3). Male students were actively involved in the fishing industry, mainly as boat helpers and fishing (Box 4.4).

**Table 4. 6: Number of respondents involved in main fishing by other fishing livelihood activities**

| Principal fishing livelihood | Other fishing livelihood | | | | | Total |
|---|---|---|---|---|---|---|
| | Fishing | Fish vendor | Boat helper | Rents boat | Opportunistic vendor | |
| Fishing | | 2 | 1 | 7 | 1 | 11 |
| Boat helper | 2 | 1 | | | | 3 |
| Engine repair and maintenance | 2 | | | | | 2 |
| Fish cleaner | | | 1 | | 1 | 2 |
| Fish processing worker | | | | 1 | | 1 |
| Fish vendor | 1 | | | | | 1 |
| Opportunistic vendor | 1 | | | | | 1 |
| Student | 4 | | 1 | | | 5 |
| **Total** | **10** | **3** | **3** | **8** | **2** | **26** |

*Box 4.3: Example of combining fishing occupations*

Norbert Simon and partner Dominique Lucas migrated to England in the 1960s and returned to the island in the 1980s. In 1988 they responded to a growing demand to export fish from the community and started NORDOM Seafoods Ltd. Over the years Mr. Simon supported the longline fishing industry by:

- **Process and export fish**. "I ship dolphinfish, kingfish (prices low), yellowfin tuna (main export fish), and bigeye tuna (sometimes) to the USA mainly New York, Boston, and Miami. I used to ship fish to England and Canada but not anymore, it depends on the airline (if they are willing to take fresh chilled fish). My main problem is demand and availability, i.e., the amount of fish you want to sell and when the buyers want the fish."

- **Process and sell fish locally**. "I slice, package, and sell fish to supermarkets, schools, consumers, and hospitals in St. George's, St. Patrick's and Victoria. We have our own transportation [refrigerated truck] to deliver fish."

- **Loans to fishers and community**. "The loans I give to fishermen I do not have any contracts or binding agreements. I just want to help them and not pressure them. Many of them, when they come to me, they owe others before me. Fishermen still owe me EC$300,000. A lot of them make a lot of money, but they would not pay me but they still come back. My thing is to help so they could help themselves. They are dependent on the industry as am I."

- **Design larger boats**. "Pirogue boats cost a lot to operate. I had to convince the bank that if they don't give money to the fishers the industry would not survive. Then I arranged with the bank to meet and discuss the idea of bigger boats with two successful fishers and they agreed. Once the finance was available, I went to the USA and explained to a boat builder what we wanted, something affordable to suit our needs. We bought eight boats priced between EC$200,000-$245,000."

- **Boat owner**. "I own four pirogues and employ captain and crew to fish the boats. Fishermen are fickle; they say they will sell you their fish and then they don't. So I decided to invest in my own boats to make sure the business would have fish."

- **Sell fishing equipment**. "I started selling fishing equipment because others were selling it far too expensive. I buy in bulk and am able to sell for almost buying price."

- **Invest in new technology**. "I try to do as much as I can to improve the industry, so I invest in new fishing technology. I believe we have to constantly improve ourselves to make things better. I have some lobster traps in Sauteurs hoping that they will perform better that the present traps we have."

- **Manufacture and sell ice**. "Large longline boats need ice, they are at sea three, sometimes five days. We used to take the boats to GCFL in Grand Mal to purchase ice and fuel, because Gouyave Fish Market does not have an ice-making machine (at least not anymore). Recently I purchased an ice-making machine and now I sell crushed ice to fishers. I use the ice in my daily processing and boat operation activities."

"My contribution is to help fishers better themselves, help their personal development, and build the industry. Overall it is our understanding of the business, the role of government and fishers. People here just don't understand the business [fishing]." (Norbert Simon, pers. comm., 2003)

*Box 4.4: Example of combining fishing occupations (2)*

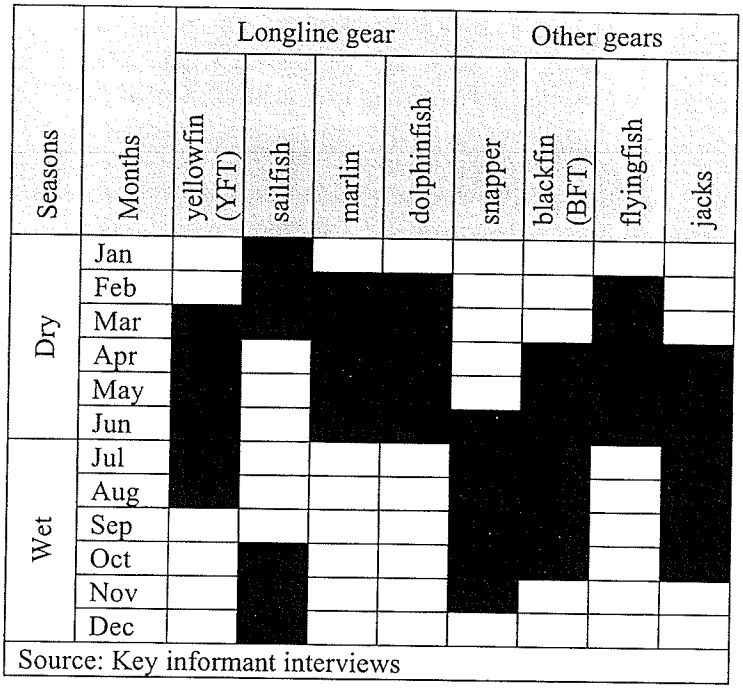
Student A was in grade 11 at St. John's Christian Secondary School preparing to sit four Caribbean Examination Council (CXC) exams in mathematics, english language, agricultural science, and social studies. A junior athlete, he represented Grenada in football and athletics (CARIFTA games). His household included his father (a Fisher), his mother (housewife), and three sisters. In order to attend school and pay for his exams he had to work part-time in the fishery. He worked as a boat helper for two boats and during the summer holidays and on weekends he went fishing (handline, longline, and ground palar). His father also expected him to help plant corn and pigeon peas at the end of the dry season.

### 4.2.3 Seasonal livelihood patterns

Diverse sources of income sustained fishing households in Gouyave. The main sources of income were fishing and fishing-related, business, and agriculture. All three occupational groups were seasonal as they depended, to some extent, on the harvesting of fish and food crops, creating spin-off business activities that further contributed to household income.

**Fish:** There are peak harvesting periods for the main species of fish landed in Gouyave (Table 4.7); consequently, fishers' income fluctuated during the year. Usually the main pelagic species season, using longline, is from February to June, and during off-season fishers switched to other gears and species. Yellowfin tuna and blackfin tuna peak harvesting season, using longline and handline respectively, is from March to August. The peak harvesting season for sailfish (also called 'Christmas fish'), using longline, is from November to February. Flyingfish, using gillnet, peaked February to May, while harvesting of jacks, using beachseine, is June to August. These last two species are important sources of bait, in catching pelagic fish species.

**Table 4. 7: Peak harvesting periods for main fish species and gear caught by fishers in Gouyave (shaded).**




Fishers earned most of their income during March to August; the period of peak harvesting for pelagic species. The income and social contribution to the community of different fish species varied in Gouyave (Table 4.8). For example, yellowfin tuna was the highest income earner, mainly because it was exported, thus not much of it was given as gifts to community members except for discarded pieces. Fishers preferred to give flyingfish and jack which was considered the 'fish to feed the community'. Longline fishing for large pelagic species was considered the main fishery, and the income from other fish species was considered a subsistence-type activity, which provided some income for lean months. The excess fish, mainly flyingfish and jack, were given or sold to community members who either fed their household, or processed and sold the fish to generate additional income for their household.

**Table 4. 8: Economic and social value of main fish species harvested in Gouyave**

| Fish species | Marketing | Income earner | Social contribution |
|---|---|---|---|
| yellowfin tuna | export | high | low |
| sailfish | local | high | medium |
| marlin | local | high | low |
| dolphinfish | local | medium | low |
| snapper | local | low | low |
| blackfin tuna | local | medium | medium |
| flyingfish | local | low | high |
| jacks | local | low | high |

**Agriculture**: Agricultural commodities had seasonal harvesting times. The main time to plant seeds was between the dry and wet seasons in April/May to August. For the rest of the year different crops were harvested. It should be noted that respondents who participated in agriculture did not consider themselves farmers, but as 'gardeners'. The term 'gardener' refers to an individual practicing agriculture, but he/she is not committed to or tied to the land. It is a subsistence-type strategy that is done during one's leisure time, and the mix of crops chosen is based on the area of available land and the needs of the household.

Six fishers who were involved in agriculture were interviewed about their gardening practices. From these discussions, two types of gardening activities were identified: backyard/kitchen and larger gardens. Backyard gardens were house plots with available space for a garden. The households utilized the space to plant crops such as pepper, corn, pigeon pea, tomato, cabbage, seasoning, sorrel, carrot, and banana. Not much effort was required to maintain these gardens, with usually no more than a few hours per day spent on watering and weeding. These crops are not entirely dependent on rainfall and will require irrigating during the dry seasons from the domestic water supply. While the fishers were at sea, other members of his household took care of the garden. Outputs from this garden were mainly for household consumption, and any surplus either sold or given to community members.

Larger gardens were generally not attached to the house spot, with some plots being 11 km away. Their size ranged from 0.1 - 2 ha and were associated with more serious gardeners who were involved in cutlassing (land preparation using a machete), forking, planting and tending to fruit trees. The main agricultural commodities planted

were fruit trees (golden apple, citrus, mango, guava, soursop), nutmeg, cocoa, banana, fig, bluggoe, roots and tubers (dasheen, tannia, yam, potato), corn, and pigeon peas. Such plots were visited two to four times per week. These gardens were rainfed. In some cases the entire household was involved in the harvesting and maintenance of the fields, while in others, labourers were hired. The aim of gardeners with larger gardens was to sell their products commercially. Thus nutmeg was sold to the GCNA, food crops and fruits to the Grenada Marketing Board, food vendors, and petty street vendors.

For fishers who were also gardeners, there was a seasonal cycle for planting and harvesting specific crops (Table 4.9). For yam, sorrel, and pigeon peas, the peak harvesting season was December and February. Corn harvesting was done August to October. Nutmeg, depending on whether the trees were on lowlands or high in the mountains, was harvested August and September, respectively. Fruit (mango, plum, sapodilla, cherry) harvested August to September, and citrus (orange, grapefruit, tangerine) May to June, with a small crop in December. Vegetables (cabbage, carrot, sweet pepper, lettuce) were harvested September to March, but varied depending how well they were watered.

**Table 4. 9: Planting (pale) and harvesting (dark) of main crops planted by gardeners in Gouyave**

| Seasons | Months | yam | corn | pigeon peas | sorrel | vegetables | fruits | citrus | banana | nutmeg | cocoa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dry | Jan | ■ | | ■ | | ■ | | | ■ | | ■ |
| | Feb | ■ | | ■ | | ■ | | | ■ | | ■ |
| | Mar | ■ | | ■ | | ▒ | | | | | ■ |
| | Apr | | | | | ▒ | | ■ | | | ■ |
| | May | | | | ▒ | ▒ | | ■ | ▒ | | ■ |
| | Jun | ▒ | ▒ | ▒ | ▒ | ▒ | | ■ | ▒ | ■ | ■ |
| Wet | Jul | ▒ | ▒ | ▒ | ▒ | ▒ | | | | ■ | |
| | Aug | ▒ | ■ | ▒ | | ▒ | ■ | | | ■ | |
| | Sep | | ■ | | | ■ | ■ | | | | ■ |
| | Oct | | ■ | | | ■ | | | | | |
| | Nov | ■ | | | ■ | ■ | | | | | |
| | Dec | ■ | | ■ | ■ | ■ | | ■ | ■ | | |

Source: Key informant interviews

According to Mr. Mollar "It is difficult to determine the exact months for reaping crops as drip irrigation and watering crops from a domestic water supply have become popular, thus crops are not totally dependent on dry and rainy seasons to ripen. Planting and reaping of cash crops, banana, and corn is year round" (Charlie Mollar, pers. comm., 2003).

**Spin-off business activities**: The combined seasonal harvesting cycle of fish and agricultural commodities created seasonal spin-off business opportunities in the community (Table 4.10). That is, purchasers of fish and crop commodities processed and sold these items to supplement or generate income for their household. These purchasers bought commodities from fishers, fishers/gardeners, and farmers from the surrounding villages. During the harvesting season flyingfish was used as bait and the excess was given or sold to community members. Females mainly 'de-boned' or filleted and packaged the flyingfish prior to selling it to hotels and consumers. Cocoa, as a general rule, was sold to the Grenada Cocoa Association, however, subsistence grown cocoa was sometimes used by women to make 'cocoa balls'. The women would grind the cocoa, mix it with spices, roll it into a ball, then package and sell it to supermarkets and customers, who then made a hot beverage. Women also set up mobile restaurants during social events, mainly the Fishermen's Birthday celebration and carnival, to sell fried fish (blackfin tuna (BFT) and sailfish), chicken, and fries.

**Table 4. 10: Monthly peak harvesting of fish and agricultural commodities and the resulting spin-off business activities**

| Months | Fish commodities | Agricultural commodities | Spin-off business activities |
|---|---|---|---|
| Jan | sailfish | reap yam, pigeon peas, cash crops, banana, cocoa | pigeon peas |
| Feb | sailfish, flyingfish, marlin | | fillet flyingfish, 'cocoa ball' |
| Mar | YFT, BFT, flyingfish | | |
| Apr | YFT, BFT, flyingfish | planting season | |
| May | YFT, BFT, flyingfish, marlin | | |
| Jun | YFT, BFT, jack, marlin | | mobile restaurants |
| Jul | YFT, BFT, jack | | dried jack |
| Aug | YFT, BFT, jack | | mobile restaurants, roast corn, fruits |
| Sep | BFT, jack, snapper | reap yam, corn, pigeon peas, sorrel, cash crops, fruits, citrus, nutmeg | roast corn, fruits, dried jack |
| Oct | BFT, jack, snapper | | roast corn, dried jack |
| Nov | sailfish | | |
| Dec | sailfish | | pigeon peas, sorrel |

When jack is abundant, a few women continued the tradition of cleaning and sun-drying them, before transporting them for sale in Grenville. When fruit is in season, they were washed, bagged and sold by female street and market vendors. During the corn-harvesting season, women purchase and roast corn on a coal stove by the roadside. Pigeon peas are picked green or dried, then shelled, bagged and sold to consumers. This is usually a social activity where friends or household members are invited to participate in removing the peas from the pod. Sorrel (fleshy sepal of a tropical plant (Roselle)) was grown to make a drink at Christmas. The plant is stripped, bagged, and sold to consumers. It was not uncommon to find some households taking advantage of seasonal commodities and economic activities (Box 4.5).

***Box 4.5: Household taking advantage of seasonal income***

Female x is a 52 year old single mother living with six children. Her income earning activities are highly seasonal. Between October and April, the tourist season, she purchases spices (nutmeg, clove, cinnamon, saffron, and ginger) from farmers, and uses the spices to make necklaces or package them in dried calabash. She sits by the roadside under her small stall and awaits the arrival of tourists from the cruise ships in St. George's town to sell her spice crafts. During the week long celebrations for Fishermen's Birthday (29 June) and carnival celebrations (August), she roasts and sells corn and alcoholic beverages. Whenever her sons (both fishermen) have extra jack, she sells them by the roadside. And whenever she gets oranges, she sells them between her other activities.

### 4.2.4 Social support an important component of livelihoods

Livelihood is more than economic activities, and includes other activities by which to secure a living. The economic contributions to livelihoods have been described above. This section describes those social activities community members engage in order to supplement their income. Community members relied on social support or assistance usually in the form of food/gift exchange to offset some of their expenses. Social support is described below.

When household heads were asked (as part of the livelihood survey) if they were able to adequately support their household, 43% said yes, 40% said barely (only able to meet immediate financial obligations), 16% said no, and 1% had no response. Many

households relied on regular assistance in cash and kind from family and friends both locally and overseas (66%), while 25% received no assistance, and 9% did not respond. Of the households, which reported they could adequately support themselves without assistance from outside the household, 30% said they received assistance from families and friends. Assistance included: giving fish (43%); giving cash (24%); cooking and sharing meals (17%); grooming hair (5%); cleaning fish, domestic assistance, giving loans (4% each); giving food crops (3%); and other (10%). Some respondents gave what they were asked (13%), while others did not have to give (2%).

Assistance was one way households ensured survival during times of need. People gave with the intent that if they needed cash or in-kind in the future that it would be forthcoming, or merely because it was a social obligation. While cash was not always available, the community in-kind support served as an insurance policy, whereby members of the community deposited and withdrew favours when needed, e.g., the exchange of fish for agricultural produce, domestic work, cooking meals, and cleaning fish. This was a traditional custom that reinforced the need for interdependence among community members.

The giving of fish was very common in the community, as 93% of fishers interviewed reported they gave an average of 16 kg of pelagic fish per trip to community members. For example, the head, section of the tail, and organs (heart, liver, stomach, and gonads) of yellowfin tuna destined for export were given away. These parts of the tuna made up to 17% of its total weight before cleaning. Sailfish and dolphinfish were cut up and given away. Some fishers preferred to give leftover bait (flyingfish and jack) after fishing. Fish given to community members was then eaten by their households or sold to make extra income.

Community members mentally recorded social transactions. In the case of fish giving, to whom fish was given was noted, thus later when individuals were asked for favours they did so as a means to repay their social debt (Box 4.6). Not only was the favour noted, it was also valued and time of repayment recorded to memory. Favours were valued accordingly: low value (cooking a meal), medium value (washing clothes), and high value (painting or constructing a house, which may require more than one day's work). For example, a gift of fish could equate to a meal, while two to three gifts of fish

would be sufficient to paint a room. Gift exchange could be immediate or long-term, as the transaction of giving two to three gifts of fish could take one day or months to complete. There were no defined rules in evaluating and repaying favours, as they were based on experience and social relationships. In some cases fishers wrote off favours to individuals because they were not in a position to repay. In other cases they gave charitable donations to community members, knowing that such donations would not obligate the recipient to perform favours in the future. Favours could be passed from one generation to the next, i.e., a son paying his father's obligations. In the case of old retired fishers, community members gave generously to them, because when they had been active fishers they were known to give fish to the community. Thus, vulnerable groups in the community such as the poor, old fishers, and those with small incomes obtained social assistance when needed.

***Box 4.6: How social transactions are recorded***

Fisher X notes in his social memory bank that he gave individuals A, B, and C about 2 kg of fish each. Individual A carried yam, banana, and orange from his farm and left them by the home of the fisher, knowing that he got fish in the past or would get more in the future. Two months later fisher X wanted to paint a room in his house. Instead of paying a painter, he called on his good friend individual B to help him paint the room. Individual B expects nothing in return as he was given fish two months earlier. Lady C weekly washed the fisher's clothes by the river and in return she got fish and cash for her effort. His friend D needed his boat repaired, thus a group of fishers came together to give him a day's work. In return, his friend cooked fish broth on the beach for all the workers.

### 4.2.5 Income from fishing circulating and sustaining Gouyave

To understand the link between fish and sustaining the community, economic principles were applied. The aim here is to show that spending the income from fishing boost the local economy, thus sustaining the community. Fishing was the main contributor to the local economy and the main source of food, income, direct employment (vendors), and spin-off economic activities (micro-businesses). To demonstrate the effects of fishing on the local economy the circular flow of national income and Lowry

model in economics was applied (See section 2.3 for details on the economic analysis). According to the modified national product equation adapted by the researcher, income in cash and kind earned by fishers was spent on household and personal expenses, fishing equipment, fishing operational and maintenance costs, goods and services given not sold. Money sent abroad went to purchase fishing equipment. This spending in the community created jobs in other sectors (See the Lowry model Fig. 2.2).

To demonstrate the effects of fishing, the income and expenditure of fishers operating from seven longline vessels was analyzed in detail. Longline vessels included four open pirogues or canoes, two cabin pirogues, and one launcher. The data were compiled for boat owners/captains and crew members on each boat. Boat income was estimated for January to December 2001 fish landings recorded at the Gouyave Fish Market. To calculate total income in 2001, fish species weights were multiplied by prices (in 2001) and summed. Incomes of boat owners and crew are estimated based on share system percentages in Table 4.4. Expenditures (investment and consumption) were obtained from interviews with fishers on personal and fishing-related spending habits. Investment was estimated as mean variable costs per trip, repair and maintenance costs, and monthly loan repayments. Consumption was estimated as mean monthly household expenses, alcohol purchases, smoking habits (including marijuana), gambling, and 'making 'fairs'. Saving was calculated by subtracting expenditure from income (Table 4.11).

In Table 4.11 each row describes a fisher, his role in the fishery, the type of boat used, the gear used, his income, percentage of his income saved, and percentage of income invested and consumed. The table reveals the diversity of income and expenditure in the community. Some fishers had high incomes, while others were in debt, spending more on investment costs than their income from fishing. For example, one fisher was spending about US$9,000 for the year on operational and maintenance costs, but catching only US$6,924 worth of fish in that year (denoted [c] in the table). This meant he had to supplement his income from other sources, or depend on other members of his household.

**Table 4. 11: Individual longline fishers estimates of income, savings, investments, and expenditure based on 2001 fish landings provided by the Fisheries Division**

| Boat type | Gear type | Income (US$) | % Saving | % Investment | % Expenditure | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | household | alcohol | gambling | smoking | 'fairs |
| **Boat owner/captain** | | | | | | | | | |
| Canoe | longline only | 23,531 | 30 | 43 | 19 | 6 | 1 | 0 | 2 |
| Canoe | longline only | 15,776 | 25 | 49 | 14 | 8 | 1 | 0 | 3 |
| Canoe | [a]longline & other gear | 6,924 | (-) | [c] (130) | 32 | 0 | 0 | 0 | 0 |
| Canoe | longline & other gear | 6,712 | (-) | [c] (111) | 7 | 1 | 0 | 0 | 3 |
| Pirogue | longline only | 2,537 | (-) | [c] (470) | 44 | 2 | 0 | 0 | 0 |
| Pirogue | [b]longline & other gear | 7,124 | (-) | [c] (172) | 16 | 1 | 0 | 9 | 0 |
| Launcher | longline only | 36,181 | 7 | 82 | 6 | 4 | 0 | 0 | 1 |
| **Crew** | | | | | | | | | |
| Canoe | longline only | 7,631 | 4 | 0 | 29 | 17 | 2 | 23 | 23 |
| Canoe | longline only | 5,259 | 4 | 0 | 17 | 25 | 3 | 34 | 17 |
| Canoe | longline & other gear | 2,308 | 4 | 0 | 96 | 0 | 0 | 0 | 0 |
| Pirogue | longline only | 822 | 40 | 0 | 54 | 6 | 0 | 0 | 0 |
| Pirogue | longline only | 889 | 19 | 0 | 50 | 6 | 0 | 25 | 0 |
| Launcher | longline only | 8,861 | 25 | 0 | 75 | 0 | 0 | 0 | 0 |

[a] Boat owner had two boats & two engines; [b] Boat owner had two boats & three engines; [c] Fishers invested more than they earned from fishing.

Income varied by boat type, combination of gear use, role in the fishery, and more importantly a fisher's skill at catching fish (see Chapter 4 on the skills required to catch fish). The data revealed the income of boat owners/captains on canoes and launcher longline boats was significantly higher than that on pirogues. Although the incomes of boat owners/captains were higher, they were responsible for all maintenance costs to boats, engines, and equipment; although, operational expenses were shared with crew members. In many of the cases documented, boat owners were in debt due mainly to high investment costs.

The income of crew members on canoes and launcher boats was higher than pirogue boats. Crew members' contributions to operational costs were deducted before they were paid. They were not obligated to contribute to maintenance costs. Thus, they were able to save a higher percentage of their income than boat owners. It should be noted that most fishers saved with the intent to purchase a boat and engine in the future. Based on the overall economic performance of open versus cabin pirogues, crew

members opted to purchase less expensive locally built wooden open pirogues valued at US$6,000 (including equipment) over cabin pirogues at US$18,000.

To overcome debt, fishers and/or households used different strategies to supplement their income. They could work as crew with other fishers (example in Box 4.2), switch to other fishing gear, female partners and/or other household members could work outside the home, fishers could use savings accumulated in previous years to offset their present debt, or apply for a loan. Another option would be to rationalize their capital investment. That is, a boat owner could sell his cabin pirogue boat and purchase an open pirogue (canoe) with less operational and maintenance expenses (Table 4.4). This strategy increased the number of open pirogues in Gouyave from 12 in 1997 to 64 in 2003 (See Chapter 5 for details).

**Circular flow analysis**

To illustrate the circulation of income from longline fishing, using data in Table 4.11, the national income diagram was applied (Fig. 4.1) (See Chapter 2 for details on the analysis). As a reminder, definition of terms will be repeated:

- Gouyave longline fishers had two main sources of income: (Y) income from fishing activities and ($Y_2$) in-kind (social support), which could not be valued.
- Consumption (C) was money spent on daily household expenditures, alcohol, smoking, gambling, and making 'fairs.
- Investment (I) was the cost of replacing and maintaining fishing equipment, and the cost of fishing operations.
- Government expenditures (G) were in the form of fishing infrastructure such as maintaining the fish market and fishing equipment and gas subsidies; fishers did not pay taxes.
- Withdrawal ($W_1$) was in-kind assistance given to community members; over time $Y_2 = W_1$ (they would cancel each other).
- Exports (X) were the income from exported fish, and savings and pension money from overseas which returning residents invested in the fishery.
- Imports (M) were money paid overseas to purchase fishing equipment.

- Savings (S), income not spent, was estimated by $S = Y - I$. Theoretically $S = I$; however, Gouyave fishers saved part of their income for low fish catch months.

This calculation has limitations, as a number of variables were difficult to quantify. For example, it was difficult to estimate $Y_2$, G, $W_1$, X, and M. However, the little information that was known does give some idea of how the local economy works.

Figure 4.1 shows fishers using their income from fishing to invest in the fishery and for consumption. Fishing equipment was purchased either in the community (at the St. John's Fishermen Association tackle store, hardware store) or in the capital city - St. George's town (at Island Water World, Marine World – fishing tackle stores). If the income of fishers was greater than expenditure, they were able to save. Not all the money from consumption circulated in the local economy. Community members liked to shop in St. George's town, and money from the purchase of marijuana usually leaked from the local economy. Nonetheless, much of the income was consumed in the community on food (grocery store, meat shop, bakery, restaurant, and petty/street vendor), alcohol (bar), clothing (haberdashery), and entertainment (cinema, disco, guest house, and concert). When fish catches were high, income and consumption increased, which resulted in a boost to local businesses.

The income from fishing generated employment in the fishing and service sectors, resulting in a multiplier effect on other sectors. Based on the Lowry model and equation (Chapter 2), with an estimated 400 fishers and support service workers, an average of four individuals per household, and using a service multiplier of 1/10 (from Lowry's example and not estimated fro Gouyave), over 1,600 people in the household sector would benefit from the industry. These household members would demand service facilities (grocery shops, bars, restaurants, bakery, haberdashery) creating an estimated 300 service jobs (See Chapter 2, Equation 3). Workers in the service jobs had families, thus creating a second small cycle of households and more service jobs. The diminishing cycles would be repeated many times (three to four times). Thus, for every three fishing jobs one service sector job was created. The number of fishers by jobs created in the service sector was not an exponential relationship, as the social and ecological systems were not infinite. As the fishery reached the optimum level, fish landing would decline and jobs in the basic fishing sector decreased, resulting in less demand for services. In

turn, some bars would close and businesses would lay off workers. Hence the direct link between the fish and the sustainable community.

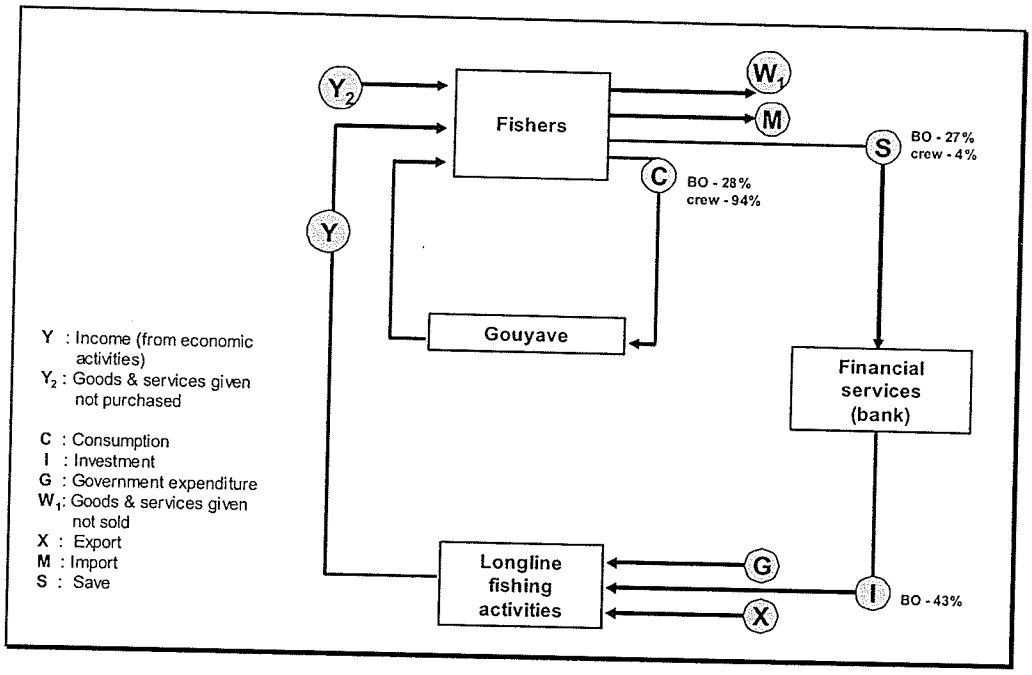



**Fig. 4. 1: The circular flow and the longline fishery sector in Gouyave: diagram showing the flow of money in an open economy. A large percentage of crew income is consumption, and boat owner (BO) divide their income between consumption, saving, and investment. The estimates in the figure show the distribution of income of boat owner/captain and a crew member on a canoe longline only vessel.**

### 4.2.6 Changes to Gouyave livelihood system after Hurricane Ivan in 2004

In 2004, the livelihood system in Gouyave changed as a result of Hurricane Ivan. On the 9th of September 2004, Hurricane Ivan, the most powerful hurricane (category 3) in 14 years (since Hurricane Janet in 1955), passed directly over Grenada and caused extensive damage. Government assessed 89% of houses and buildings were damaged or destroyed at a cost of EC$ 1.4 billion, 91% of forest areas and watershed destroyed (EC$20.8 million), 80% of nutmeg trees uprooted and 90% of cash crops wiped out (EC$100 million), 70% of hotel rooms rendered inoperable (EC$406 million), 85% of schools were damaged or destroyed (EC$196 million), and many churches and government buildings including the national stadium damaged and/or destroyed (IICA,

2004; Government of Grenada, 2005). In St. John's parish the overall damage to crops, livestock, and farm roads was EC$9.8 million, while the fishing industry suffered EC$1.3 million damage to boats, equipment, gear, communication equipment, and infrastructure (Government of Grenada, 2004).

Seven months after the hurricane, the agriculture and fisheries sectors were showing signs of recovery. The construction industry increased significantly, due to the demand for labour to rebuild the island's infrastructure (houses, hotels, government buildings, schools, businesses, and roads).

**In agriculture**: The government approved the Agriculture Emergency Recovery Project from October 2004 to January 2005 at a cost of EC$14 million to assist farmers in planting material (seeds), fertilizers, labour support to clear land, and equipment support (chain saw, weed cutters). By January 2005 some vegetables and bananas were being harvested and by April nutmeg trees were bearing fruit, cocoa had a 60% recovery, and fruit trees were showing signs of recovery (Mr. Winsborrow, pers. comm., 2005). A farmer from Cloizer, St. John's relates the impact of the hurricane on his agriculture dependent livelihood. His response is paraphrased below:

> Before the hurricane my wife and I had nutmeg, banana, cocoa, cash crops, poultry, and flowers. After the hurricane we lost 90% of our income from agriculture, including the loss of our poultry house and chickens. Through the Agriculture Emergency Recovery Program we received some income and seeds from the government. The small package of seeds the government gave was from overseas, but they didn't grow so well, either something was wrong with the seed or the different climate. We had to depend on the government for seeds from overseas as neither the government nor the farmers had any emergency seeds. Seven months after the hurricane, we have some cash crops (dasheen, banana); cocoa ready now; nutmeg will take another year to produce fruits as the foliage is now recovering; and we were able to rebuild the poultry business to over 2,000 chickens.

**Tourism**: The tourism sector increased with the return of cruise ship visitors to the island. The Minister of Tourism and Civil Aviation, Senator Brenda Hood summed up the status of the tourism industry, "There was an average increase in the number of cruise ship passengers coming to the island since November 2004 through February 2005... during the period there were 153,380 visitors as compared to 134,645 in the 2003-2004 period. This was despite the fact that there were eleven cruise ships less

coming to the destination during the period under review" (Grenada Today, Friday April 15, 2005: 8). Tourists continued to visit the GCNA sorting station in Gouyave to observe nutmeg processing and purchase spices from local vendors. Tour operators living in Gouyave continued to transport tourists around the island.

**Fishing**: Fishing infrastructure, boats, and equipment recovered from the effects of Ivan, thanks to financial assistance from international agencies such as the Food and Agriculture Organization (FAO), the Government of Canada and the Canadian International Development Agency (CIDA), and the United States of America and the States Agency for International Development (USAID). Gouyave's fishing infrastructure and boats damaged during the hurricane have been repaired or replaced. The Gouyave Fish Market was expanded to accommodate a fish-cleaning area and proper drainage. Compared to other areas, boats and equipment in Gouyave suffered relatively minor damages. In total, an estimated 80% of the fishing fleet in Gouyave was undamaged by Hurricane Ivan. Open wooden pirogues received very little damage during the hurricane as fishers secured boats in the street. Boats moored in the lagoon in St. Georges' town, mainly cabin pirogues and launchers suffered some damage. The Fisheries Division received financial assistance to repair damaged boats, purchase new engines, and replace damaged or lost equipment. Some fishers received loans or partial grants to repair or purchase new equipment. It was also an opportunity for the government to provide funding to install proper navigational lights on small canoes.

Although fishing capacity (number of boats) remained relatively the same, fishing effort (hours of fishing) and fish catch declined due to problems with the availability of bait, rough seas, and labour shortage as fishers went to work in the construction sector. The reduction in fish landings was, however, offset by an increase in ex-vessel fish price from EC$4 to $6 per pound for all types of fish, except jack. In October 2004, NORDOM Seafoods Ltd. exported its first batch of fish from the island, injecting life in the local fishing industry (Norbert Simon, pers. comm., 2005). The main concern of the industry was the high percentage of low quality tuna not fit for export.

The livelihood system in Gouyave had changed between the time of the research (2003) and a year later. The type of economic activities available to community

members had shifted from a dependence on fishing, agriculture, and micro-businesses to construction and fishing. In discussing the changes in livelihood systems with Osmond Small and Norbert Simon, they pointed out that the livelihood systems had changed far more since the 1950-60s. They were given ten stones, representing levels of activities, to divide among the main livelihood activities for three periods: 1950-60s, 2003 (pre-Ivan), and 2005 (post-Ivan). They distributed the stones as Table 4.12.

Over the years the contribution of agriculture to the local economy declined significantly, except nutmeg. The contribution of fishing increased with the popularization of the longline gear and construction increased with improvements to infrastructure and housing. After Hurricane Ivan the main contributors to the local economy were fishing and construction, with very little contribution from agriculture. Losses to the agriculture sector and the nutmeg industry in particular meant many workers in Gouyave, mainly females, lost their jobs or saw their work hours reduced. It also meant a loss to spin-off economic activities which depended on agricultural produce, again impacting on female dominated livelihoods. With the losses to agriculture and micro-business, females and their households became vulnerable to poverty. Males easily switched from fishing and agriculture to work in construction, although some females accepted jobs in construction to provide for their household.

**Table 4. 12: Changes in the livelihood activities in Gouyave at specific time periods. Dots represent stones distributed by two key informants to represent the level of economic activities in each of the livelihood activities.**

| Periods | Agriculture | | | Fishing | Construction | Road work | Govt. |
|---|---|---|---|---|---|---|---|
| | Farming | Nutmeg | Livestock | | | | |
| 1950-60s | ●● ●●● | ● | ● | ● | ● | ● | |
| 2003 (pre-Ivan) | ● | ●● | | ●● ● | ·● ● | · | ● |
| 2004 (post-Ivan) | | · | | ●● ● | ·●● ●● | | ● |

KEY: ● full stone/rock · half stone representing the level of economic activity

## 4.3 Conclusion: sustainable livelihoods and fisheries management

What can fishery managers learn from the findings on sustainable livelihoods issues in Gouyave?

(1) *Fishers are able to secure a living for their household by using diversification strategies, taking advantage of fishing and non-fishing seasonal cycles, switching livelihood activities, and social exchange.*

Daily life is unpredictable in Gouyave. Fishers have no set patterns or procedures, no set time to go fishing, which is dependent on the weather, sea conditions, and the migration patterns of pelagic fish (See Chapter 5). Every season is different; March to May one year tuna maybe abundant, the next year scarce. What they do, how they do it, and where depends on household needs, community needs, and the marine ecosystem. 'Gardening' is also subject to uncertainty such as the arrival and intensity of dry and wet seasons. Consequently, the unpredictable nature of fishing and agriculture affects the type and success of spin-off business activities.

The unpredictable nature of the ecological system has forced the socio-economic system to create strategies so as to maximize economic returns. The community adopted three main livelihood strategies: livelihood diversification - constructing income sources from fishing, agriculture, construction, and small business; fishing diversification - learning to switch to alternative gear, roles, and occupations to take advantage of species availability and fishing livelihood activities; and extending social support - giving and accepting cash and in-kind assistance from family and friends both locally and overseas.

Livelihood is further complicated by combining these three strategies at the individual and household levels. The diversity and complexity of livelihoods spread the flow of income and food across the season, and made households more stable and less vulnerable to the uncertainty in food production and the unpredictability of daily life (Chambers et al., 1981; Sahn, 1989; Geheb and Binns, 1997). Households in Gouyave were able to diversify by varying economic activities, spin-off activities, and gift exchange. For example, if a fisher went fishing and caught nothing, he could go to his/her kitchen garden, cut off a few bananas and a few stalks of callaloo, as ingredients

for preparing a meal. Or he could pick some mangoes, sell them, and use the money to buy lunch at one of the local restaurants.

Not only is the livelihood system diverse and seasonal, but community members were able to switch between and among fishing and non-fishing livelihoods. The loss of an income earning activity meant individuals could switch to another. For example, Kendal was a fish and food vendor for part of the year. Later that same year he organized a group of friends to work with him on the government's west coast road construction project. At the end of his contract he returned to selling fish. Kendal's apparent fluidity between fishing and non-fishing livelihood activities was key to securing an income to support his family. Hence, it is important that government policies strive to attain a certain flexibility that could facilitate this movement back and forth between fishing and non-fishing livelihood activities.

(2) *Fishers are able to sustain Gouyave by spending much of their income in the community boosting the local economy.*

One could tell by walking down the street if fishers were catching fish. If the streets were relatively quiet, with a few people, and a number of shops closed, one could tell that no fish had been caught in a while. But if a lot of people were in the streets making noise, the bars were open late, and everyone was happy and making merriment, you knew that the fishery was doing very well. Street and business activities were an indicator of fish catch in Gouyave. An attempt is made in this chapter to document that multiplier effect of the income from fishing and its effect on the local economy. The available data does support what is seen on the ground, i.e., fishers and support service workers employed in the longline fishing industry could create jobs in the service sector. It also shows the strong link between fish and the community. More importantly, how fragile the community is to any fisheries management policies that advocate reduction, quota, or conservation without first providing alternative means of employment.

As world fish resources continue to decline there will be more and more regulations on fish stocks, thus fishing may not be able to sustain the community in the future. It becomes imperative that non-fishing livelihood activities are managed for sustainability, as any further losses in the non-fishing sector could result in increased

labour in fishing. The problem for the Fisheries Division is non-fishing livelihood issues are outside their area of influence. Livelihood issues, such as agriculture and land policy, tourism and tour guide policies, construction and building codes, are under the mandate of different government ministries and departments. The challenge is to foster collaboration with the relevant agencies to promote sustainable livelihoods for the community.

When the economic base of a community is lost, in this case fishing, it has the potential to lose more than the fishing industry. First, the community loses income and employment resulting in the closure of small businesses; then larger ones close. This will force community members to seek employment in other towns resulting in the loss of strong kinship ties and social connections between individuals. With the dispersal of community members cultural ties and values will also be lost. Therefore, the loss of a fishery is expensive for a community. It is the loss of social, cultural, and economic identity of households and a community. Thus, the needs of a community can no longer be ignored; fishers and community should be engaged in fisheries planning and management (Chantraine, 1993; Jentoft, 2000).

(3) *Social-ecological systems are constantly changing due to disturbances, shocks, stresses, or crises. Livelihoods can change overnight as a result of storm surges (destroying boats), agricultural pests (the mealy bug destroying trees and export earnings), government policy (catch quota), or natural disasters (hurricane).*

From the commencement of this research project to the writing of this dissertation the livelihood system in Gouyave has changed and will continue to change in the future. In the process households adapt to maintain and secure if not improve upon their quality of life. This case study is a good example to show how livelihood systems change. Hurricane Ivan was a major shock to the island, which resulted in changes to livelihood options and strategies for many community members. The reliance on fishing and agriculture seasonal cycles to generate yearly income had to be re-negotiated and new strategies had to be developed. The losses to agriculture, the main source of employment for females, meant a decline in economic opportunities for those households dependent on this sector. Spin-off activities and gift exchange which involved agricultural

commodities were also affected. The loss or decline of economic opportunities could make specific groups or communities vulnerable to poverty if they are unable to pick up the slack with other economic opportunities. In Gouyave the construction sector was able to pick up the slack in employment. However, the new livelihood system disadvantages females as it favours the employment of males.

# CHAPTER 5:
## Longline fishing knowledge

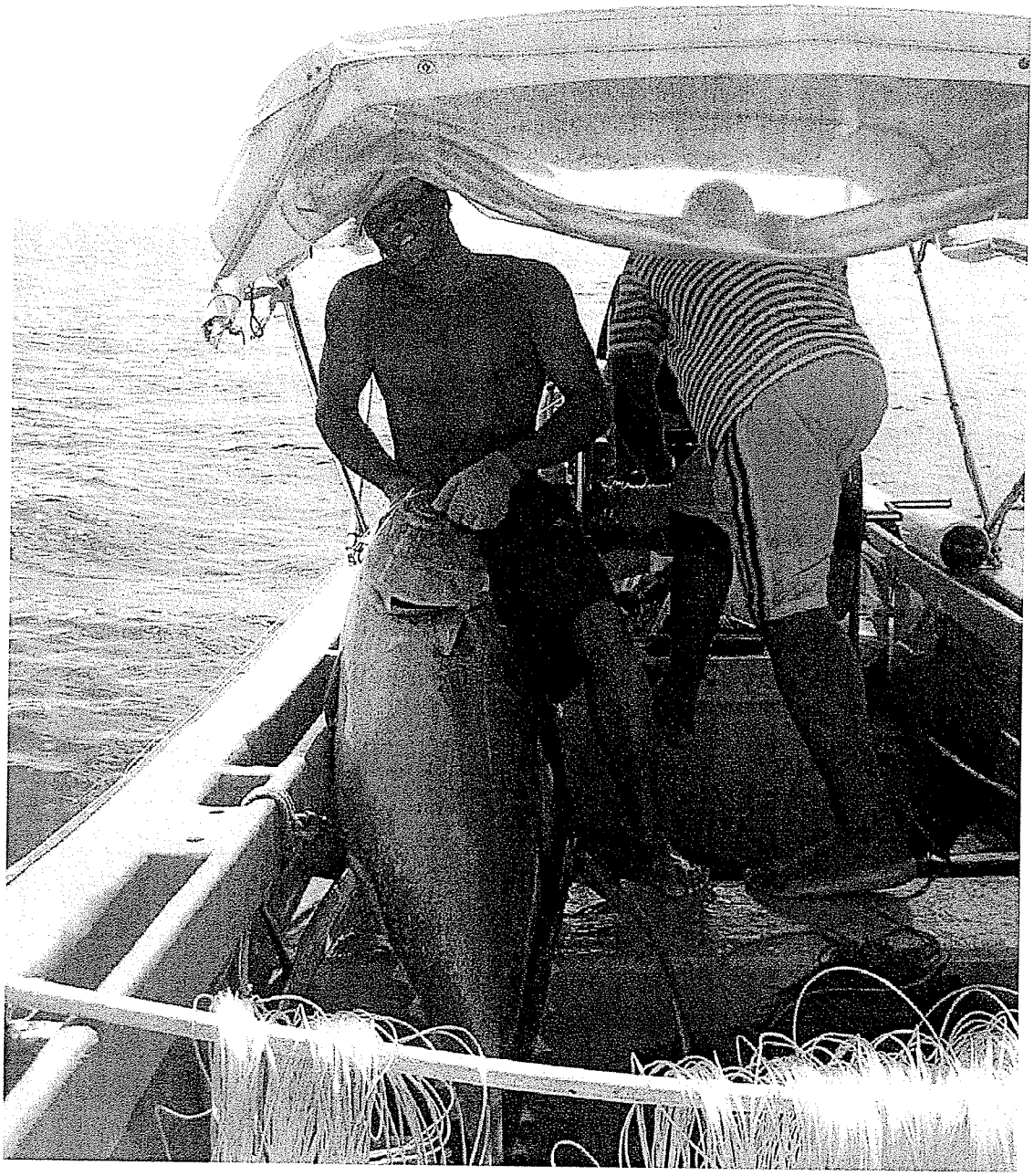


Photo: Sandra Grant – yellowfin tuna catch (2003)

# CHAPTER 5: Longline fishing knowledge

The objective of this chapter is to determine how the use of fisher knowledge, can inform institutions at various levels of management. This chapter explores how fisher knowledge of large pelagic species provides useful information for fisheries management and the MOD fishery planning process in Chapter 8. More specifically, it discusses the development of technological and ecological knowledge, and the potential value of fisher knowledge in fisheries policy and management.

## 5.1 Introduction

Despite the fact that much progress has been made in the scientific study of fisheries, marine ecology, and oceanography, there is insufficient information to manage fish stocks, especially those of multi-species fisheries in tropical seas. Fisheries models require a large amount of data and highly trained experts, but these elements do not always work. Simpler approaches can be more practical and cost effective (Pitcher et al., 1998; Berkes et al., 2001). Tropical small-scale fisheries tend to be based on small stocks; the revenues generated by these stocks are not likely to justify large research expenditures (Mahon, 1997). Therefore management of these fisheries needs to devise ways to work with lower inputs of data, use of qualitative indicators where possible, proximate variables, and the use of local and traditional knowledge. Fishers have detailed reliable knowledge of the fishery that is qualitative and based on continuous interaction and transmission (Johannes, 1981; Ruddle, 1993, 1994). This knowledge system may have passed from many generations in traditional or indigenous communities (Berkes, 1999; Berkes and Folke, 1998), or within only a generation.

Traditional ecological knowledge is defined as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission" (Berkes, 1999: 8). This knowledge base is both cumulative and

dynamic, building on experience and adapting to change. It is an attribute of societies with historical continuity in resource use in a particular area. Practical knowledge that does not have such historical and multi-generational character can simply be called local knowledge or fisher knowledge.

Local or fisher knowledge can be useful to resource management. Local ecological knowledge can complement scientific knowledge. It can provide empirical information on fish behaviour, marine physical environments and fish habitats. It is also an important guide to knowing when and how to fish, and an information base for local resource management (Ruddle, 1994). As Johannes et al (2000) note that confidence in scientific and fishers' observations increases when the two concur. Participatory management, combining science with local knowledge and views, also increases the legitimacy of decisions, spreading the risk of making wrong decisions (Berkes et al., 2001). For example, Hanna (1998: 208) observes in regard to the Maine soft shell clam fishery the use of scientific and fisher knowledge together helped to "bridge the gap between knowledge needed to use the resource in the short-term, and knowledge needed to sustain the resource over the long-term". Berkes and Folke (2002) also report that local and traditional knowledge can complement scientific knowledge by qualitative monitoring, and by providing long-term local observation and institutional memory for understanding ecosystem change.

Local ecological knowledge can provide the means to improve decision-making (Berkes and Folke, 1998). Common property theory informs us that information availability is a key ingredient of collective action (Ostrom et al., 1994). The exchange of information among fishers and managers can lead to learning by both parties and to the development of problem-solving skills. Such a process can develop in an iterative way, with social learning (Checkel, 2003) or adaptive co-management (Olsson et al., 2004), involving feedbacks from decision-making experience with resource management problems. Finally, local ecological knowledge can provide useful information that could be included in fisheries management (Seixas and Begossi, 2001; Seixas, 2002; Berkes et al., 2001; Silvano and Begossi, 2005).

In seeking solutions to biological poor data for sophisticated models and low research expenditure experienced in managing small-scale fisheries (Mahon, 1997;

Berkes et al., 2001), local ecological knowledge can help widen the range of information available for decision-making (Johannes, 1998; Berkes et al., 2001) and begin the process of co-management (Silvano and Begossi, 2005). But first, western scientists have to recognize the value of fisher knowledge in sustainable management of the ecosystem (Gadgil et al., 1993; Johannes, 2001). To natural scientists, fishers can provide knowledge about once abundant species that are now gone; for social scientists, they can provide knowledge on social organization and networking of fishers; and for resource managers, fishers can provide the history of the fishery. The new framework for fisheries management should include fisher knowledge, qualitative indicators, and scientific knowledge to evaluate and determine future directions. This approach incorporates uncertainty and takes a precautionary approach to resource management (Berkes et al., 2001).

In the Caribbean, local ecological knowledge of fishers has been little studied. There are the isolated cases like the management of sea urchin resources in St. Lucia and Barbados (Warner, 1997; Berkes, 1999); using fisher knowledge of sea colour and debris to indicate the presence of flyingfish (*Hirundichtys affinis*) and large pelagic species in the eastern Caribbean (Gomes et al., 1998); and traditional management system of the artisanal fishery of the Black River Morass in Jamaica (Johnson, 1998). And recently, there are cases of fisher knowledge in the wider Caribbean (Breton et al., in press). The problem with Caribbean fisheries management and planning is that fishers with intimate knowledge of the fishery do not participate in fisheries planning, thus, a whole knowledge base goes unacknowledged. This chapter documents fisher knowledge of longline fishing and contributes to the literature on fisher knowledge of the marine environment.

## 5.2 Fisher knowledge

Since the introduction of longline in the late 1970s, Gouyave longline fishers went fishing every day with the hope of returning to shore with a large catch. Their interaction with the marine environment provided clues on how best to extract more fish. They quickly learnt that by altering the gear, knowing how, when and where to set the line would increase the catch. This section documents the technological and ecological knowledge of fishers.

### 5.2.1 Learning and developing technology knowledge

Improving the effectiveness of the gear to catch more fish was the aim of fishers. This section will trace the history of longline and boat changes in Gouyave prior to the 1960s to the present. This in-depth technological study was conducted with six active and retired longline fishers. They were on average 49 years old with 35 years of fishing experience. Of the fishers, one was a captain, two boat owners, and three retired. The information was further verified by two Fisheries Officers. The results of the interviews are presented below. Based on significant technological changes, three major periods are identified and will be described: before longline (1950-1978), the growth of longline (1979-1999), and present longline (2000-2004).

#### 5.2.1.1 Before longline (1950 – 1978)

During this period, Gouyave fishers used traditional fishing techniques. The main gear was beachseine for inshore pelagic species. Others included: 'bazor' and handline for flyingfish; touch and 'cali' gear (similar to a dip net) for ballyhoo; '3-line' (a handline technique) and 'seche' fishing (specialized handline) for ocean pelagic species; fish pot for demersal; and trammel net for lobster and turtles (Osmond Small, pers. comm., 2003).

The '3-line' handline fishing technique required three fishers with a monofilament line and a single straight hook; a bow-line, the deepest baited with a live flyingfish; a middle-line, constructed with a swivel and lead weight to keep the line suspended in mid-water; and the stern-line, the shallowest, both baited with a piece of fish. Using different depths and placing lines at different sections of the boat prevented the lines from becoming tangled. Some fishers attached the line to a 15 cm bamboo/trap that would

'dance' or signal to fishers that a fish was on the hook. This technique was used to catch the occasional large pelagic species such as marlin and sailfish.

In the early 1970s fishers having observed Venezuelan industrial longline vessels fishing off the coast of Grenada, they lifted lines from the water to copy the technology. They copied as much as they had the technology to copy, and the rest they invented. Later two boats started experimenting in secret with a very primitive form of longline, using cord, wire, and 26 straight hooks. The mainline and droplines were made from braided nylon, with twisted copper wires to attach the straight hook to prevent fish from cutting the line when they 'bite' (Fig. 5.1). Fishers affixed the line to the stern of the boat with a 5-8 cm tire trap, drifted with the current and set the line, fishing 11-13 hours per day depending on the wind. This primitive form of longline had problems, namely that the raw material for longline construction was very expensive and the lines burst continuously due to the tension. Fishers did not know that they should allow the line to drift. With the primitive longline, fishers caught flyingfish, sailfish, marlin, dolphinfish, and kingfish. According to fishers, the longline performed 10% better than the '3-line'.

There were two types of vessels: open pirogues, 4-5 m in length, powered by oars (and at times a sail); and sloops or double-ender wooden boats, 4-6 m in length, powered by oars and sails. By the early 1950s, open pirogue boats were modified by opening the shaft on the stern to secure an engine (Epple, 1977). The Wilson brothers (from the USA) were the first to fit an inboard engine on larger wooden boats in Gouyave. By the late 1960s, diesel inboard engines were introduced. During this period (1950-1978) fishers did not have navigational or safety equipment; they used the stars and land formation to navigate at sea.

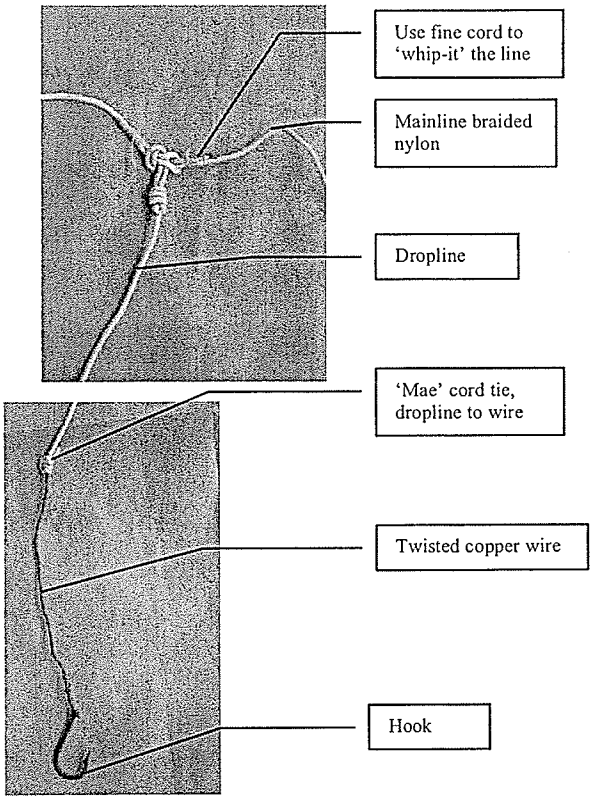



**Fig. 5. 1: Primitive longline made with braided nylon cord, wire, and straight hook**

### 5.2.1.2 The growth of longline (1979 – 1999)

In 1979 the People's Revolutionary Government (PRG) with assistance from the Cuban government helped to popularize longlining. Fishers were sent to Cuba to be trained, and Cuban master fishers with fishing equipment were sent to train fishers in Grenada. Grenadian fishers were trained in pole fishing ("fly fishing") for skipjack tuna with artificial bait, the construction of fish and lobster traps, the art of surface longlining, bottom longlining for shark, and gillnet for flyingfish (Johnson St. Louis, pers. comm., 2003). Of all the gears, longlining had the greatest impact on Gouyave fishers. Boat technology also improved with longline changes over the years. Vessels evolved from wooden open pirogues to wooden forward cabin pirogues, to fibreglass forward cabin pirogues, and then to larger fibreglass boats.

**Cuban design (1980-83)**

The popularization of longline started with the Cuban design, using 2 by 113 kg test strain monofilament, drilled and twisted mainline and dropline, stored and deployed from a ply box, using curved 8/0 #9202 tuna hooks (Fig. 5.2).

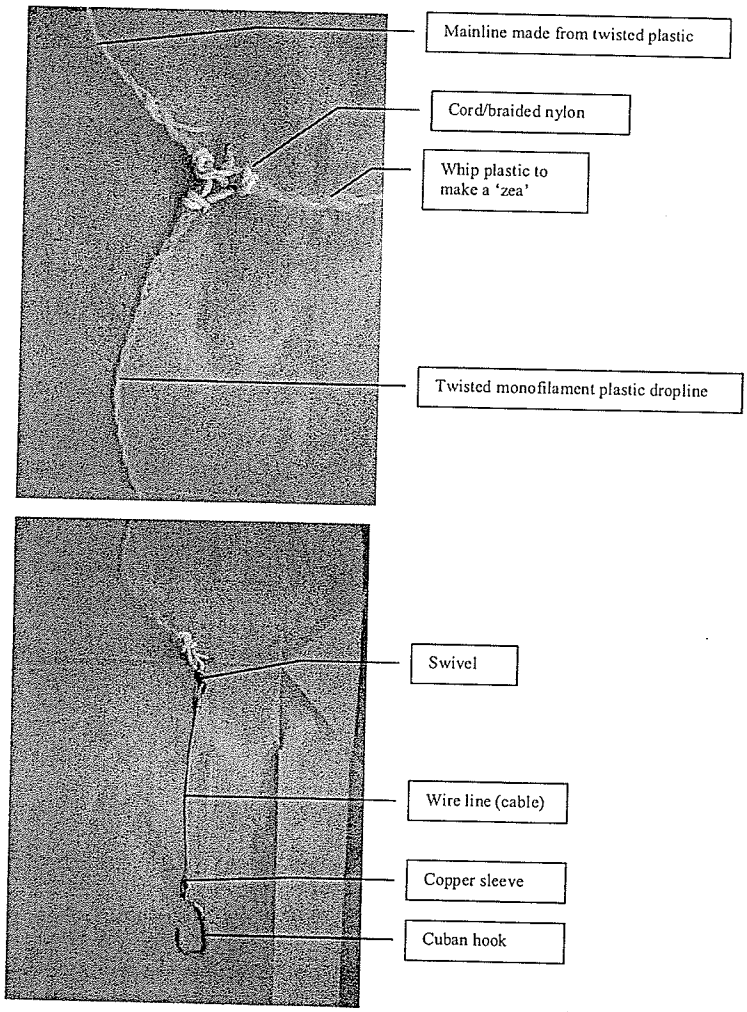



**Fig. 5. 2: Adapted Cuban design made with twisted monofilament, wire, and curved hook**

The distance between droplines on the main was fixed at 18 m. Dropline lengths were fixed in the order 18, 14, 9, and 4.6 m. Droplines were attached to the mainline, using #18 braided nylon cord/rope to make a common fisherman's knot. Fishers used 30-50 hooks per line with a total length 0.5 km. Main species caught were yellowfin tuna, sailfish, and marlin (Table 5.1).

The Cuban technology fished 80% better than the primitive longlines, attracting more fishers and investors to fishing. During this time fishers caught so much fish there was not enough freezer storage space at the fish market. "At that time the revolution was pretty young and we hadn't enough cold-storage facilities on the island to store tuna and bycatch." (Joseph Taviner, pers. comm., 2003). In many instances, fishers had to bury fish because of spoilage.

Fishers were trained on seven Cuban ferro-cement boats, 12 m in length and 4.6 m wide, with two cabins (one in the bow and the other in the stern) powered by sails and inboard engines. Four Cubans and four Grenadians were aboard each vessel, working together as a team (captain, cook, engineer, and fisher); Grenadians learning from Cubans; "... each Grenadian was given a specific task [on the boat]. We watched what the Cubans were doing and learn" (Matthew Duncan, pers. comm., 2003). Fishers used similar boats as during the pre-longline era.

**Early Gouyave design (1985-1987)**

Following the revolution of the PRG in 1983 fishers continued using the Cuban technology but with some adaptation. This new adapted version is referred to in this dissertation as the early Gouyave design. Fishers were still using twisted monofilament mainline, but with a single monofilament dropline of 181 kg. Droplines were snapped to the mainline using a branch hanger, with hooks attached directly to the line instead of using a cable. The main and droplines were stored and deployed from a box. Dropline length varied by boat size: small boats used lengths between 4.6-23 m with 7/0 hooks; while larger boats used 27-32 m with 8/0 #7698 mustard hooks. Longlines were now using up to 100 hooks (6-10 km in length). Main pelagic species caught were yellowfin tuna and sailfish (Table 5.1).

Over the years, boats increased in length and power. Small open pirogues, 4-5 m in length, were mainly mechanized with one 25-30 hp outboard engine; larger wooden boats, 6.7-7 m in length, had two outboard engines (built wider to accommodate two engines). Large wooden boats with inboard engines were still operating.

**American design (1987-1989)**

In 1988 the government approved foreign fishing licenses for seven US longliners to fish in Grenadian waters, with one local fisher onboard as an observer (Roland Baldeo, pers. comm., 2003). Their technology, termed the 'American design', was single 318-363 kg strain monofilament mainline and a 181 kg strain dropline, stored and deployed from hydraulic reels. All dropline lengths were between 14-18 m. The distances between droplines were arbitrary, as the system was totally dependent on hydraulic reels. Branch hangers were used to attach droplines to the mainline. Each longline had about 300 flat 9/0 #7698B hooks. Buoyline lengths were 14-18 m; one buoy for every six hooks. Lines fished 27-41 m deep, with a total line length of 32 km. The specie targeted was swordfish using a light stick (Table 5.1).

**The Gouyave design I (1987- early 1990s)**

From observing fishing operations on the Cuban and American vessels, reading, and the technical training provided by the Fisheries Division, fishers started experimenting with different designs to develop a localized system. Fisher Desmond Gill (2003) summarized the changes:

> During the period [1988-1990] I had a small wooden canoe boat, about 4.6 m in length, powered by a 15 hp Yamaha engine. It was only two of us [fishers] at the time. We tried using a 36 kg monofilament strain with cable to catch kingfish, blackfin tuna, and barracuda. But big fish burst the line. So we increased the strain to 59 kg, still fish burst the line. So we increased the strain again to 91 kg, and we started catching sailfish and yellowfin tuna. Once we caught six sailfish, we had to tie them to the side of the boat because there wasn't enough space inside the boat. Then we made bigger canoe boats, 5.5-6 m, powered by 40 hp, and increased line strain to 113 kg. Later we increased the strain to 136 kg.

The mainline and droplines were now made from single monofilament plastic. Reels were introduced to keep the line firm and straight. Fishers also started using sleeves on the line, and increased the number of hooks to about 100.

Small open pirogues, 5 m long, powered by one 15 hp outboard engine, were still operational. There were also larger wooden boats without forward cabins, powered by two outboard engines; and large wooden boats with forward cabins powered by inboard

diesel engines. In 1986/87 a local boat building company in Mount Moritz fashioned fibreglass cabin pirogue boats from a Trinidadian mould (Samlalsingh et al., 1999; Roland Baldeo, pers. comm., 2003). These boats were 6-9 m in length and powered by two 40-48 hp outboard engines. There was other boat designs made from fiberglass with no cabin, 9 m long, powered by two 40-48 hp outboard engines, with a crew of three fishers.

**The Gouyave design II (late 1990s-1999)**

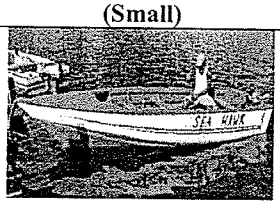
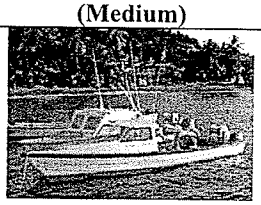
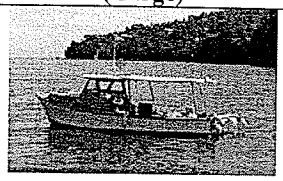
In 1990-1993 there was a boom in fibreglass cabin pirogue vessels with a forward cabin, powered by 60-85 hp engines. By the late 1990s, fishers began noticing a decline in fish stocks and decided they needed boats that could go further offshore, so they could fish longer. Also, the operational cost of the fibreglass cabin pirogue was very high, due to high fuel consumption and cost. According to one fisher, "Our expense was more than our wages." Thus in 1997, fishers and investors came together to design a larger semi-industrial/launcher vessel (built in the USA) that was affordable, with relatively low operational costs and could travel further offshore. With the introduction of these larger vessels, the weight of lines increased, the number of hooks increased, and droplines were set deeper to target swordfish at night (Table 5.2).

The 1997 boat census reported Gouyave had 72 vessels: 44 cabin pirogues and 12 open pirogues involved in longlining (Straker, 1997). Later large longline vessels were 10-13 m in length, powered by inboard diesel engines, forward cabin (cooking and sleeping accommodations), hydraulic mainline, dropline, and buoyline reels (some boats), and staying three to four days at sea, with safety and navigational equipment (Table 5.2).

**Table 5. 1: Evolution of the longline gear in Gouyave (1980s to 2004)**

| *VARIABLES* | a CUBAN DESIGN (1980-83) | b EARLY GOUYAVE DESIGN (1985) | c AMERICAN DESIGN (1987/88) | d PRESENT GOUYAVE DESIGN (1990s-2004) |
|---|---|---|---|---|
| *Boat size (m)* | • 12-14 | • 5-9 | • 9-14 | • 5-12 |
| *Monofilament plastic* | • Splice the ends<br>• Used twisted plastic<br>• 2X113 kg strain drilled and twisted into a line<br>• Manual system of deployment<br>• Tie dropline to mainline<br>• Cable used between hook and line | • Crimp end with sleeves<br>• Manual twisted plastic mainline (2X113 kg) and single dropline 181 kg strain<br>• Snap dropline to mainline<br>• No cable between hook and line | • Crimp end with aluminum sleeves<br>• Single monofilament plastic<br>• Hydraulic mainline: 318-363 kg strain<br>• Hydraulic and manual dropline 181 kg strain<br>• Snap on dropline to mainline<br>• No cable between hook and line | • Crimp end with aluminum sleeves<br>• Single monofilament plastic<br>• Mainline 68-227 kg strain<br>• Dropline 45-136 kg strain<br>• Tie with snap on dropline to mainline<br>• No cable between hook and line |
| *Deploy line* | • Used box to store main and drop lines.<br>• Hooks were detached; when setting attached hooks to line. | • Used box to store mainline<br>• Dropline on reel | • Used hydraulic reels to store lines | • Small boats, mainline and dropline on manual reel<br>• Larger boats, some with hydraulic mainlines |
| *Dropline* | • Vary dropline 14-18 m<br>• Distance between dropline varies from 4.6-23 m<br>• Mainline fixed 18 m spacing | • Vary dropline from 4.6-23 m<br>• Distance between dropline: small boats 4.6-23 m and large boats 27-32 m | • All dropline the same 14-18 m (some boats)<br>• Distance between dropline arbitrary (hydraulic system) | • Vary dropline from 2.7-27 m<br>• Distance between dropline varies 16-32 m apart |
| *Hooks* | • Curved hooks 8/0 tuna hook 9202<br>• 30 – 50 hooks per line | • Small boats 7/0, and large boats 8/0 mustard hooks 7698<br>• Up to 100 hooks per line | • Flat hooks<br>• 9/O 7698B<br>• 300 hooks per line | • Hooks 7/0 or 8/0<br>• 100- 500 hooks per line depending on boat size. |
| *Buoyline* | • Set at 4.6 m depth<br>• 1 buoy every 3 hooks | • Set at 4.6 m | • Lines 14-18 m, others at 18 m<br>• 1 buoy every 6 hooks | • Set at 1.8-4.6 m<br>• 1 buoy every 3 hook |
| *Depth fished* | • 4.6-23 m | • 4.6-23 m | • 27-41 m (fishing deep) | • 23-27 m |
| *Distance* | • 44 hooks set out about 0.5 km | • 75 hooks set out about 6 km | • 400 – 500 hooks set out 32 plus km<br>• | • 100-500 hooks set out 3-12 km |
| *Species targeted* | • yellowfin tuna, sailfish, marlin | • yellowfin tuna, sailfish | • swordfish (using stick lights), yellowfin tuna | • yellowfin tuna, sailfish, dolphinfish, marlin |

Table 5. 2: Description of three categories of longline vessels in Gouyave (2003)

| Variables | Open pirogue (Small) | Cabin pirogue (Medium) | Semi-industrial/Launcher (Large) |
|---|---|---|---|
| |  |  |  |
| **BOAT** | | | |
| *# active boats* | 64 | 20 | 8 |
| *Crew* | 2 | 2-3 | 3-5 |
| *Boat Size (m)* | <5.5 m (open) | 6-9 m (forwards cabin) | 9-12 m (wheel house) |
| *Boat material* | Wood | Wood or fibre | Fibre |
| *Ice* | No | No | Yes |
| *Storage* | Small | Medium – small cabin | Large – sleeping quarters and storage |
| *Water (litre)* | 19 | 38 | 378 |
| *Navigational System* | Basic | Basic | Advanced navigational system |
| **PROPULSION** | | | |
| *Numbers of engines* | 1 | 2 | 1 |
| *Fuel* | Gas; 57 litre/day; 2 tanks | Gas; 113 litre/day; 4 tanks | Diesel; 227 litre/trip; carries up to 757 litre |
| *Power* | Outboard 15-75 hp | Outboard 40-90 hp | Inboard 70-350 hp |
| **GEAR** | | | |
| *Gear used* | 1 manual mainline reel<br>1 manual dropline reel | 1 manual mainline reel<br>1 manual dropline reel<br>1 manual bouyline reel | 1 hydraulic mainline reel<br>1 manual dropline reel<br>1 manual bouyline reel |
| *Longline (Monofilament line)* | 113-136 kg strain | 136-181 kg strain | 227 kg strain mainline<br>204 kg strain dropline<br>136-204 kg strain buoyline |
| *Length of longline* | 3-10 km | 5-10 km | 11 km |
| *Number of hooks* | 150 hooks;<br>16 m apart | 160-180 hooks;<br>16-18 m apart | 300 plus hooks;<br>27-32 m apart |
| **FISHING OPERATIONS** | | | |
| *Trips* | 1 day trip (8 hours) | 1 day trip (up to 24 hrs.) | 4-5 days trip |
| *Fishing area: distance from shore* | 11-13 km West | Up to 32 km West | Up to 161 km West |
| *Species targeted* | yellowfin tuna<br>blue & white marlin<br>dolphinfish<br>sailfish | yellowfin tuna<br>blue & white marlin<br>dolphinfish<br>sailfish | yellowfin tuna<br>blue & white marlin<br>dolphinfish<br>sailfish<br>swordfish |
| *Bait* | Carry live jack<br>Catch flyingfish at sea | Carry live jack<br>Catch flyingfish at sea | Carry live jack<br>Catch flyingfish at sea<br>dead bait |

### 5.2.1.3 Present Gouyave longline technology (2000 – 2004)

Between 2000 and 2004, three major technological adaptations were made and added to the diversity of longlining: changes in line construction; changes in the weight of monofilament plastics; and changes in boat construction (Table 2.2).

**Changes in line construction**

The length of mainlines ranged from 3-10 km with a 136 kg breaking strain. Braided nylon loops 1.5 cm thick were inserted every 18 m along the mainline, onto which droplines were attached by branch hangers during the gear set. Droplines varied in length from 3-32 m, using five to eight different lengths, marked by coloured beads (Fig. 4.3). Buoylines, 3 m in length, were attached after every third hook. Mainline and droplines were deployed from separate manual reels with over 300 hooks.

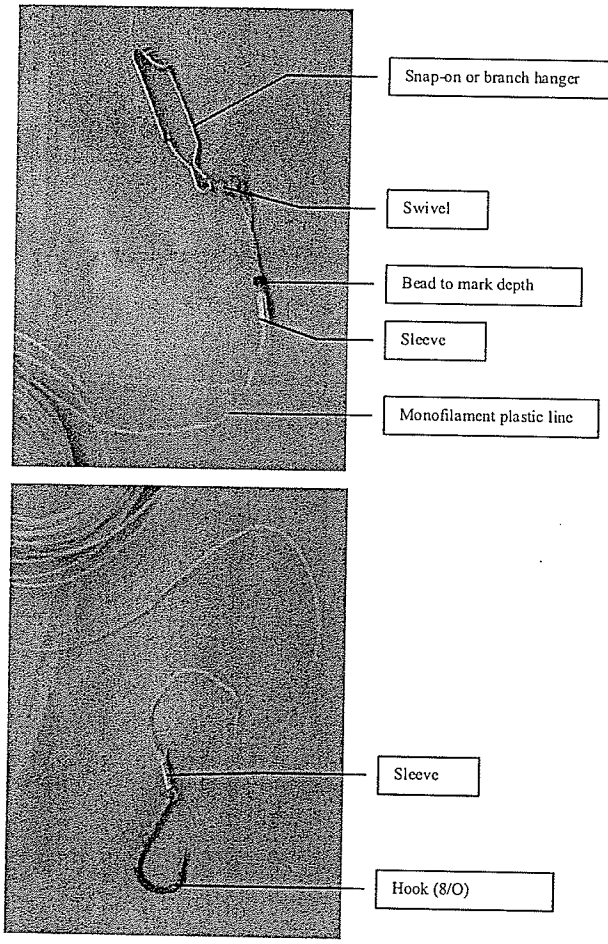



**Fig. 5. 3: Present dropline design made with single monofilament, straight hooks, sleeves, and branch hangers**

By 2003 there was no standard longline construction. In the past, fishers constructed lines using single monofilament plastic, with dropline lengths ranging from the longest length (23 m) to the shortest length (4.6 m), with 4.6 m increments, e.g., 23, 18, 14, 9, 4.6 m. Fishers changed line construction by mixing dropline length, e.g., 23, 4.6, 11, 2 m, with some fishers having up to ten different dropline lengths.

**Changes in weight of monofilament plastic**

In 1979 fishers used twisted 2 by 113 kg strain monofilament line. However, with constant experimentation with lighter breaking strain lines, hooks, and gear design, six longline types evolved. The underlying principle guiding this experimentation was, "The lighter the line, the easier it would drift with the current, and the bait would swim and look more natural, thus the fish would be attracted to the bait" (Garvey Mc Phie, pers. comm., 2003).

(1) *Large line* made with a 227 kg single strain monofilament line with large buoys; hooks baited with live flyingfish; line operated from a hydraulic reel on semi-industrial vessels; seasonal fishing October to June targeting yellowfin tuna, sailfish, and marlin.

(2) *Regular longline* made with a 136 kg strain monofilament line; 7/0 and 8/0 hooks baited with medium and large sized live jack or flyingfish; line operated from a manual reel on all vessel types; fishing year-round targeting yellowfin tuna, sailfish, and marlin.

(3) *Light line* made from a 91-113 kg strain monofilament line; 7/0 and 8/0 hooks baited with medium and large sized jack; line operated from a manual reel or box on all vessel types (in 2004 semi-industrial vessels started using this line); seasonal fishing targeting yellowfin tuna, sailfish, and marlin.

(4) *Light-light line* made from a 68-91 kg strain monofilament line with small buoys; 7/0 hooks baited with small live jack; line operated from a box on open pirogues and cabin pirogue vessels; seasonal fishing December to February targeting sailfish.

(5) *Common tur line* made from a 36-45 kg strain monofilament line; hooks baited with small live jack on open pirogues only; night fishing operations, depending on the phase of the moon, targeting blackfin tuna and sailfish.

(6) *Barracuda line* ("wire line") made from a 36-45 kg strain line; dropline has cable near the hook; hooks baited with small dead or live jack bait on open pirogues and cabin pirogue vessels; line operated from a box; seasonal fishing targeting barracuda, sharks, and blackfin tuna.

Many boats had at least two longline weight types, e.g., open pirogues had a regular and light line. Use of line was based on availability of fish species and gear performance.

**Changes in boat construction**

Storm surges caused by Hurricane Lenny in 1999 destroyed 25% of cabin pirogue boats in Gouyave. Fishers then started to evaluate the benefits of open pirogues versus cabin pirogues. With increased fuel costs it became more expensive to operate two 75 hp engines. Open pirogues had similar catch rates, lower operational costs, and higher incomes, thus more fishers were attracted to this vessel type. This resulted in a decline in cabin pirogue boat operations and an increase in open pirogues. In 2001, there were 68 longline boats, 40 open pirogues, 20 cabin pirogues (a decline from 44 in 1997), and eight semi-industrial vessels.

By late 2003, there were three longline boat designs in Gouyave: wooden canoe/multi-purpose boats operating near-shore; cabin pirogues operating mid-shore; and semi-industrial/launcher vessels operating offshore (Table 5.2). Wooden open pirogues - totaled 64, were 5.5 m in length, 8 hrs day trip, with one outboard engine, fishing 11-13 km from shore, longline carrying 150 hooks, with two crew. Some fishers further adapted these boats as multi-purpose vessels for longline (removable reels), trolling (bamboo pole fitting), and other fishing gears. Fibreglass cabin pirogues - totaled 20, were 6-9 m in length, with a forward cabin, up to 24 hrs day trip, with two outboard engines, fishing up to 32 km from shore, longline carrying up to 180 hooks, and two crew (reduced crew from three to two). Semi-industrial vessels - totaled eight, were 9-12 m in length, with wheelhouse, fishing trips four to five days, with inboard engine, fishing up to 161 km from shore, longline carrying over 300 hooks, with three to five crew members.

Fishers also made changes to boat construction to accommodate the use of live jack for use as bait. The seasonal availability of bait flyingfish in previous years, restricted longline fishing activities between January and June, but fishers found that with

live jack from the beachseine fishery, they could fish year-round. To accommodate live jack, fishers remodeled boats to include a bait-well, which allowed sea water to move in and out through holes in the bottom. They were constructed below the engine in open pirogues and in the centre of cabin pirogue boats. The bait-well kept bait alive for the entire fishing trip. In early 2004, two of ten semi-industrial vessels converted an ice-box to a bait-well so they could fish with jack.

### 5.2.2 Learning and developing ecological knowledge

With technological knowledge of longline gear and boats, fisher knowledge of large pelagic species and the open ocean environment also evolved over the years. Fishers developed the knowledge of how and where to set their lines based on their knowledge of the presence of birds, current movement, seawater colour, fish movement, fish behavioural patterns, and bait preference (based on fish-stomach content observation). This locally based knowledge is recent and still developing. This in-depth ecological study was conducted with 40 active and retired longline fishers, who had an average of 21 years fishing experience (range 5 – 50 years). This sample included fishers aged between 20 and 78 years, of whom 70% were captains, 20% crew members, and 10% retired fishers. Active fishers went on an average of 80 fishing trips per year. The results of the interviews are presented below.

#### 5.2.2.1 When to fish

**Weather conditions**

According to fishers (95%) weather conditions were important as it affected fishers' ability to go fishing. To fishers, weather was a combination of rainfall, cloud cover and type, and wind intensity. The dry season (March – June) was the best time for longline fishing as reported by 78% of fishers. Rainy conditions were dangerous for small open pirogues to go fishing, as they could get swamped quite easily. It was also difficult to navigate boats in such conditions due to poor visibility (difficulties in observing land feature used for navigation). Fishers also observed cloud cover, type of cloud, and cloud movements. Cloud cover and type indicated rainy conditions, while

cloud movement indicated wind direction and strength. Heavy winds were associated with rough seas. Based on fishers' experience they ventured out during good to fair conditions, but during bad weather conditions they would stay ashore.

**Seasons**

Fishers all agreed that knowing the harvesting and reproductive seasons helped to determine when to put most of their efforts into fishing specific large pelagic species and when to switch to different longline types. Fishers reported that the reproductive season for yellowfin tuna was between March and July. Dolphins and sailfish had two periods, March to June and December. Not much was known of swordfish and marlin, because according to fishers they had never observed 'ripe eggs' (i.e., sign of reproductive activity) in marlin. The peak harvesting seasons for yellowfin tuna were March to May and September to October; marlin, January to February and May to June; dolphinfish, March to August; sailfish, October to January; swordfish, September to January; and flyingfish, January to early June.

#### 5.2.2.2 How to fish

**Bait**

Longline fishing required the use of live or dead bait. Prior to the 1980s, large quantities of flyingfish (*Hirundichtys affinis)* were landed as food fish. At that time, they were caught using dipnet and handline with very small hooks. However, in the 1990s with changes in gear and fishing fleet technology for oceanic pelagic species, flyingfish were predominantly targeted for bait using gillnets, although some were retained and sold as food. Flyingfish are highly seasonal, between January and June each year. At the end of the season, fishers used to moor or pull up boats and wait until the next fishing season. In 1995, fishers started experimenting with the use of live jack as bait, which they obtained from the beachseine fishery. By 2001, all boats had converted to using medium and large sized live jack. Small jack were used for other fishing activities such as bottom longline for snappers (Lutjanidae species) and handline fishing for blackfin tuna (*Thunnus atlanticus*).

What has evolved is the use of four bait types: flyingfish (*Hirundichtys affinis*) caught with gillnet; jack (*Selar crumenophthalmus*) caught with beachseine net; ballyhoo halfbeak (*Hemiramphus brasiliensis*) caught with gillnet; and imported squid. Flyingfish and jack were the main bait used, and when these were scarce, fishers resorted to ballyhoo and squid. Fishers (70%) acknowledged that flyingfish are the natural and preferred bait for large pelagic species. However, due to the seasonal nature and low abundance of flyingfish, fishers started using jack. The initial outcome was fishers used flyingfish between January and May, and jack between June and December. Fishers also experimented with jacks to determine the preferred size and attractiveness of the bait to its prey. They discovered that yellowfin and marlin prefer live medium and large sized jacks and sailfish of any bait size. The prey are attracted to jack because of their shiny body colour, movement, and the sounds they made.

Longline fishing practices were influenced by bait type. The two techniques will be described:

**Fishing with flyingfish**: Fishers lured flyingfish with coconut branches (as shade) and macerated fish, then used a gillnet (mesh size 2.54 cm) approximately 30 m in length to catch them. Usually one gillnet haul taking 30-45 minutes would catch enough flyingfish to bait 150-200 hooks. Fishers then set the longline using the 'drift and set' technique, i.e., allowing the boat to drift with the current in a north to south direction, while placing the line in the water. This technique was dependent on the movement of the current and the abundance of flyingfish. On average a fishing trip was from 7 am to 10 pm.

**Fishing with jack**: Fishers had to modify their boats to store live jack. They designed a bait-well at the stern of small open pirogues and the middle for cabin pirogues vessels. Fishers purchased live jack from beachseine fishers, stored them in 'sacs' at sea (about 90 m from shore) for up to a maximum of one week. This was the optimum time to store jack before they lost weight. At the start of a fishing trip, fishers removed the jack from the sac and placed them in the bait-well. Fishers set longline using the 'steam and set' technique, i.e., using engine power to set the line perpendicular to the shore. With this technique, fishers were able to return to shore by 4 pm.

**Feeding behaviour**

Feeding behaviour was also important to fishers, as this determined the time they would go fishing and their approach when catching fish. They agreed that yellowfin tuna were fast, fierce, hungry-feeding fish. Tuna fed in the early morning between 4 am and 9 am and late evening between 4 pm and 8 pm, traveled in schools for many miles to get their food, and burned a lot of energy. Once they met bait, they swam in a circle, making the circumference smaller so as to move the bait closer together. Once the circle was small enough, they brought the bait to the surface and fed. While the school of yellowfin tuna fed, the Audubon's shearwater (*Puffinus Iherminieri)* bird ate the slime on the body of the yellowfin tuna. Marlins used their upper jaw ("sword") to spear prey, surfaced out of the water, shook off the bait catch, and ate the prey. Sailfish curved their body, swimming in a circular pattern around the bait, with their caudal fin and upper jaw almost touching to keep the bait from escaping. Then they extended their dorsal fin ("umbrella") to prevent their bait from escaping then fed. Dolphinfish were slower and smarter feeders.

**Stomach content**

Fishers investigated the stomach content of pelagic species to determine the bait type and size eaten by the fish. Such study was done while the fish were being cleaned, aboard the fishing vessels or at the fish market. The stomach was cut open, water passed over the contents, and larger objects removed and identified. Fishers considered the amount of digested and undigested food, and the prey type and size in the fish's stomach very informative. If the stomach was empty, it meant there was no prey around, which could be associated to seawater colour or current movement. And if the stomach was full, it could mean it was the feeding time for the fish, and prey were around. Stomach content was also associated with fish diet and potential bait in the future. Fishers concluded that the diet of yellowfin tuna and marlin included large and small finfish, cephalopods, and crustaceans. The diets of dolphinfish, sailfish, and swordfish included small finfish and cephalopods (Table 5.3). This was how they deduced that squid was excellent bait for large pelagic species. The size of the fish in the stomach was also

important. This was how fishers determined the size of jack suitable to attract different fish species.

**Table 5. 3: Diet of yellowfin tuna, marlin, dolphinfish, sailfish, and swordfish according to fishers in Gouyave (N=40). X indicates a positive association.**

| Food item | Species name | Fish association | | | | |
|---|---|---|---|---|---|---|
| | | yellowfin | marlin | dolphinfish | sailfish | swordfish |
| blackfin tuna | *Thunnus atlanticus* | X | X | | | |
| kingfish | *Scomberomorus cavalla* | | X | | | |
| skipjack tuna | *Katsuwonus pelamis* | | X | | | |
| yellowfin tuna | *Thunnus albacares* | | X | | | |
| dolphinfish | *Coryphaena hippurus* | X | X | | | |
| wahoo | *Acanthocybium solandri* | | X | | | |
| flying gurnards | *Dactylopterus volitans* | X | | | | |
| atlantic thread herring | *Opithonema olignum* | X | | | | |
| ballyhoo | *Hemiramphus brasiliensis* | X | X | X | X | X |
| jack | *Selqr crumenonophthalmus* | X | X | X | X | X |
| anchovies | *Anchoa hepsetus* | | | | X | |
| couvally | *Caranx hippos* | X | | X | X | X |
| filefish | Monacanthidae (Family) | X | | | | |
| four-winged flyingfish | *Hirundichtys affinis* | X | | X | X | X |
| guincaman | *Cypselums cyanopterus* | X | | X | | |
| robin | Decapterus spp. | X | X | X | X | |
| brazilian sardine | *Sardinella brasiliensis* | X | | | | |
| squid | *Loliginidae* | X | X | X | X | X |
| crab (unspecified) | | X | | | | |

### 5.2.2.3 Where to fish

Knowledge of 'folk oceanography' gave fishers clues of where to find fish. Such knowledge includes the presence of birds, seawater colour, and current strength and direction.

**Seabird as indicators**

> If you want to be an effective fisherman, you have to analyze how the birds fish, the movement of the birds, where they are heading, where they are feeding, what time they come and feed, and then you will always be catching

fish. You could have the technology, but you still have to know the natural influences. (Roger Gill, pers. comm., February 18, 2003, Gouyave).

Fishers (98%) were in general agreement that the presence of birds was an indicator that fish was present. Fishers agreed that if there were no birds, then no fish was in the water, because the birds traveled with the fish. A large flock of birds flying close to the surface of the seawater was a strong indicator that fish were present. Fishers were able to identify over 15 species of birds, and associate the presence of certain fish species with birds (Table 5.4). Based on their experience, they concluded that birds did not follow marlin but mainly followed dolphinfish, yellowfin tuna, sailfish, and flyingfish. Brown booby, Magnificent frigatebird, and Laughing gull all signaled the presence of dolphinfish and yellowfin tuna. Brown Noddy and Black Noddy signaled the presence of sailfish. Strom-petrel and Roseate Tern signaled the presence of flyingfish. Fishers also observed other birds but did not associate them with the presence on any particular fish species, for example Red-footed booby (*Sula sula*), Masked booby (*Sula dactylatra*), Red-billed tropicbird (*Phaeton aethereus*), and Cory's shearwater (*Calonectris diomedea*).

**Table 5. 4: Bird species associated with the presence of fish species identified by Gouyave fishers with reference to common English names according to Raffaele et al. (2003), and local names used fishers (N=40). X indicates a positive association.**

| English name | Bird specie | Local Gouyave name | Fish association | | | |
|---|---|---|---|---|---|---|
| | | | yellowfin | dolphinfish | sailfish | flyingfish |
| Brown booby | *Sula leucogaster* | Booby | X | X | | |
| Audubon's shearwater | *Puffinus Iherminieri* | Jablote or duck bird | X | | | |
| Magnificent frigatebird | *Fregata magnificens* | Tancoon or Seaso | X | X | | |
| Laughing Gull | *Larus atricilla* | Mauve or sea gull | X | X | | |
| Strom-petrel | *Oceanodroma sp.* | Hazel | | | | X |
| Roseate Tern | *Sterna dougallii* (or Tern) | Kawit | | | | X |
| Brown Noddy | *Anous stolidus* | Moien | | | X | |
| Black Noddy | *Anous minutus* | Moien | | | X | |
| | *Stercorarius* sp. | Sea Hawk | | | | X |

### Seawater colour

> Even if you have the technology, you have to watch the situation with the type of seawater, then you can analyze if fish is in the water (Roger Gill, pers. comm., February 18, 2003, Gouyave).

There was general agreement among fishers (93%) regarding occurrences of different coloured seawater, but not always good agreement on species composition in the different kinds of water (Table 5.5). Fishers identified three seawater colours: blue, green, and dark green. Blue coloured water occurred mainly between December and July. According to fishers, sailfish, marlin, and flyingfish swam in blue water. According to fishers, in blue water fish chose what to eat because they can see the bait; therefore, it is important to use live bait that will attract the fish. Fishers commented that fish generally preferred green water. More yellowfin tuna was caught in this water colour. There was also a darker shade of green water, sometimes called "grumsy water". The green and dark green shade of water occurred mainly due to the Orinoco River water flow, usually during August to November. This nutrient-rich water from the Orinoco, a major river that empties out into the Caribbean, creates lenses of greenish water rich in plankton and small fish. The dark green water occurred mainly in August. In dark water fish feed on anything because they are not able to see the bait or prey. Thus fishers used live or dead bait with similar catches. There was not much agreement among fishers on the preferred water for dolphinfish.

**Table 5. 5: Seawater colour and main fish species associated with the water mass (N=40). X indicates a positive association.**

| Water colour | Local name | Characteristics identified | Fish association | | | | |
|---|---|---|---|---|---|---|---|
| | | | yellowfin | marlin | dolphinfish | sailfish | flying fish |
| Blue | clear water | Occurs intermittently eight months of the year (December to July) | X | X | X | X | X |
| Green | green water | Occurs intermittently four months of the year (August to November) | X | | X | | X |
| Dark green | 'grumsy water' | Occurs less unpredictably and for shorter periods than green water (mainly in August) | X | | X | | |

**Current strength and direction**

Most fishers (95%) agreed that fish moved with the current. In strong current the fish drifted away, and in slow (or 'soft') current the fish stayed in the area to feed. Fishers commented that the north and northwest currents were better for fishing as they brought the fish. Fishers usually caught yellowfin tuna in the north current. Fishers described current direction as 'up' meaning north; 'down', south; 'in', east; and 'out', west. For example, an 'up and out' current was one moving from Gouyave to Sauteurs (St. Patrick's) and at the same time from shore to the ocean meant a northwest current. This current direction stretched the longline making it easier to fish. The south and southwest currents were usually stronger and carried fish away. Constant changes in current directions, referred to by fishers as 'old weather tide' caused problems, as a longline could fold back and become tangled.

**Fish movement**

Fishers (85%) knew nothing of the migration patterns of large pelagic species outside Grenadian waters, while 15% knew very little. They agreed that large pelagic species traveled from northern waters where it was cold, to warmer southern waters like the Caribbean. However, fishers knew how to track the movement of fish in Grenadian waters. They relied on boat catches by area to give clues as to where fish were traveling, although, most fishers tried to keep fishing grounds secret by approaching the village from different directions. To gather information fishers interrogated other fishers who landed a good catch to determine where they fished. Many used GPS to track their performance, others noted where on the line fish were caught and set the line accordingly on the next trip. All this gave fishers a spatial picture of where the fish were traveling and changes in fish movement patterns.

## 5.3 Conclusion: fisher knowledge and fisheries management

What is the potential value and use of fisher knowledge in planning and management? Fishers have extensive knowledge of longline technology and ecological knowledge of the marine ecosystem. They use this knowledge to build a knowledge base

which resides with the fishers, but it is not shared enough with the Fisheries Division. Fisher knowledge could provide contextual data for scientific assessments, and is consistent with published biological data.

***(1) Building a knowledge base amongst fishers***

Fishers make daily decisions regarding when, how, and where to fish base on their ecological knowledge of the marine environment and technological knowledge of longline. The process to find fish begins with knowing the seasons (harvesting and reproductive) and bait (type, abundance, and size) availability. Base on the outcome of seasons and bait, they then choose the most appropriate longline weight type. If weather conditions (rainfall, rough seas, and cloud) are favourable, fishers would make the decision to go fishing. While at sea, the type of bait and fish habits and behavour (feeding and movement) determine the fishing practice ('steam and set' or 'drift and set' technique). Where fishers actually place the longline in the water depends on their knowledge of 'folk oceanography' (seabirds, seawater colour, and current) and fish movement (areas where fish are located).

How fishers seek out, find, and catch large pelagic species varies due to ecological uncertainties. High uncertainty and associated variability meant fishers have to build this reliable knowledge base from which to solve problems related to finding and catching fish. Building this knowledge base is based on trial and error investigations of over 300 fishers with on average 80 trips per year and 10 years fishing experience. After each fishing trip, fishers review the outcome and add to their knowledge base. This process over time strengthens the knowledge around longline fishing.

The knowledge base resides with the community of fishers in Gouyave. Ecological and technological knowledge is transmitted by word of mouth and observation. Of the fishers interviewed 53% said they learnt from older knowledgeable Fisher, 31% from observation, 19% from the Cuban (original source of technological knowledge), and 13% from their father or family members (question allowed for multiple responses). The techniques used to ensure the building and strengthening of the knowledge base are: apprenticeship, new fishers working with experienced fishers; data exchange, fishers meeting socially in small groups to discuss fishing experiences and

strategies; and mentorship, whereby committed experience fishers are paired with outstanding older fishers. These are examples of how fishers learn from each other, creating a learning community.

*(2) Fisher knowledge providing contextual information*

Gouyave fishers are aware of contextual information which is useful in interpreting fish landings. Between 1993 and 2002, the total large pelagic species landings showed an increase from 1993-1995, then a decrease (to 1997), and since 1999 landings increased (Fig. 5.4 continuous line), compared to a gradual increase in national landings (Fig. 5.4 broken line). In comparing Fig. 5.4 with information from fishers, there are some correlations, as will be demonstrated.

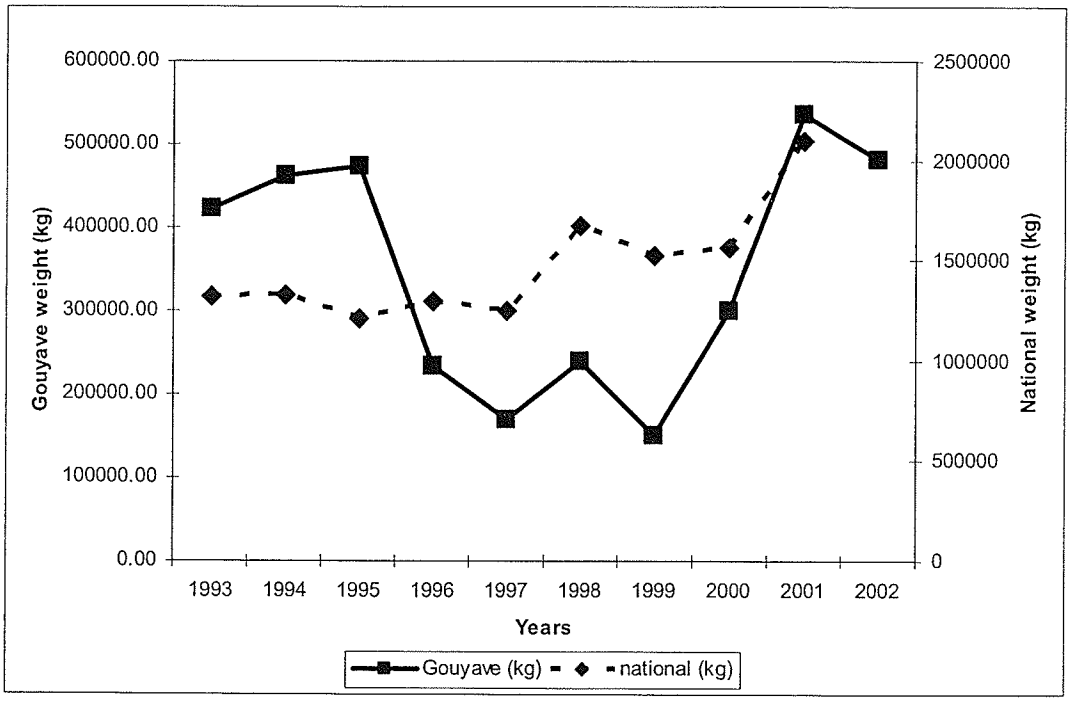



**Fig. 5. 4: Total large pelagic species caught by Gouyave fishers compared to the national total (1993-2002)**

Between 1993 and 1995, there was an increase in fish landings from 423 MT to 474 MT, which corresponded to the boom in cabin pirogue boats. By 1996 and 1997, there was a sharp decline in landings which corresponded to fishers noting the decline in

near-shore fish stocks and wanting to obtain bigger boats to go further offshore to increase catch. By 1997, they secured larger longliners, and by 1998 fish catch improved. In 1999, there was a decline in fish landing, the lowest it had ever been over the ten-year period (150 MT). This was the year fishers found dead fish (mainly demersal) floating in the water. For four months consumers refused to eat any type of fish. Then by the end of the year, storm surges from Hurricane Lenny destroyed boats and coastal roads, and stopped fishing activities for some time. Since then, fish landings increased, peaked in 2001 (536 MT) and slowed in 2002, which was the period of intense changes and adaptation in fishing technology.

Species composition also changed over the years (Fig. 5.5). Using base years 1993 (end of early Gouyave design I), 1998 (end of Gouyave design II), and 2002 (present technology), comparisons were made of changes in species composition. Yellowfin tuna, swordfish, and dolphinfish increased while other species decreased. Changes in species composition may have resulted from species abundance and gear adaptation over the years.

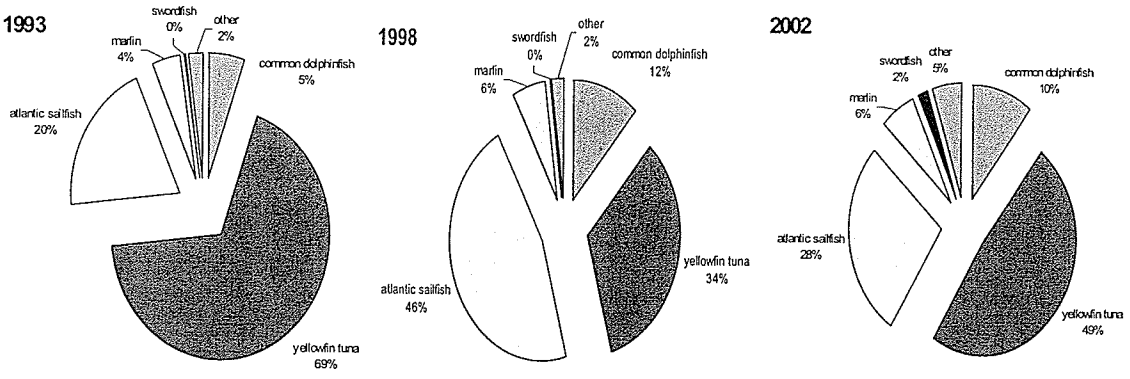



**Fig. 5. 5: Species composition of large pelagic species in Gouyave 1993, 1998, and 2002**

Fish landings do not merely reflect species abundance; they are also a factor of fisher knowledge. Fishers' decisions to go fishing were based on species biology, market forces, and social factors. These decisions affected fish landings, fishing effort, and catch rates (Grant and Rennie, 2005):

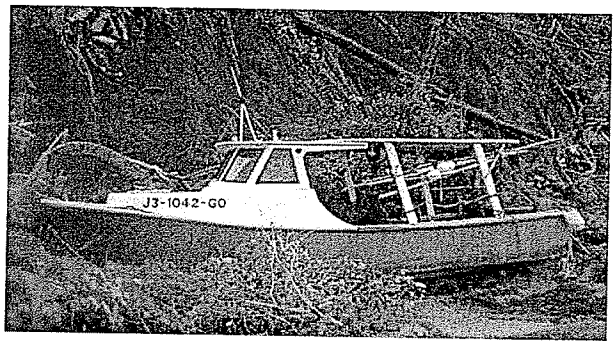
- fish landings were affected by the type of bait used (e.g., the use of jacks increased large pelagic species landings)
- fishing effort was affected by availability of bait, crew reliability, weather conditions, and the fishers' ability to meet social and financial obligations (e.g., the number of longline trips per month was affected by weather conditions (% rough sea days)
- catch rate was affected by fishing area, fisher experience, local knowledge, fishing operations, fishing technology, and marketing.

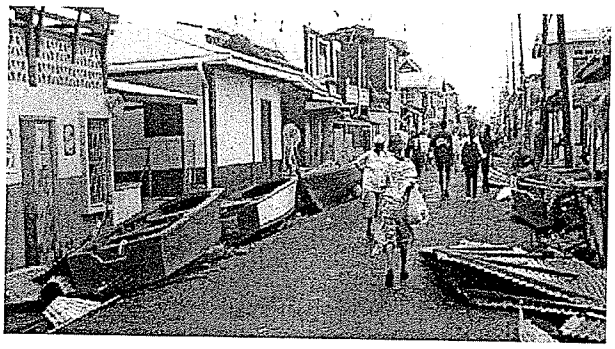
***(3) Fisher knowledge supporting published biological data***

Fishers' biological knowledge of large pelagic species is consistent with published biological data about the ecology and behaviour of yellowfin tuna, marlin, sailfish, dolphinfish, and swordfish. Published data include: harvesting and spawning seasons (Mahon, 1993; Oxenford, 1999); stomach content (Roger and Grandperrin, 1976; Oxenford and Hunte, 1999); effects of the Amazon on seawater colour in the eastern Caribbean (Khokiattiwong, 1988; Gomes et al., 1998); and the use of birds as fish indicators (Diamond, 1978; Gomes et al., 1998; Vlietstra, 2005). See also the compiled data in fishbase (Froese and Pauly, 2003; http://www.fishbase.org [online December 2005]).

# CHAPTER 6:

## Resilience and the longline fishery



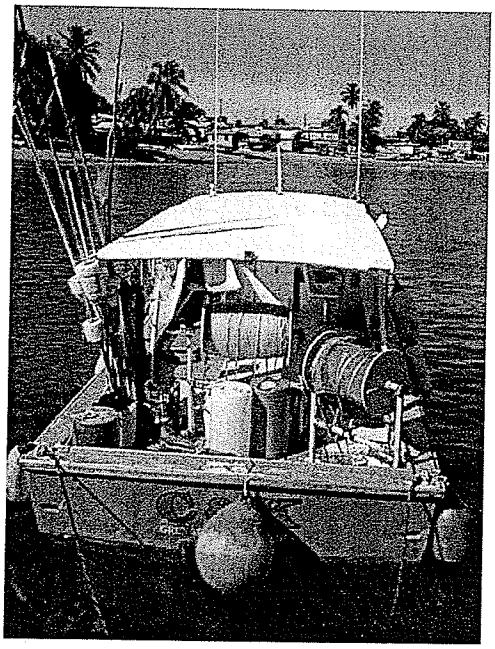


Photo: Sandra Grant and Roland Baldeo – securing fishing vessels before hurricanes and storms

# CHAPTER 6: Resilience and the longline fishery

The objective of this chapter is to evaluate how social and ecological systems related to the longline fishery, reorganize around change using a resilience approach. First, the chapter discusses periods of change and how people and nature relate and organize around change, using the longline fishery in Gouyave as a case study. Specifically, the focus is on periods of change caused by disturbance and crisis, followed by periods of renewal and reorganization which signal the 'backloop' of the adaptive renewal cycle. Second, it analyses how fishers, the community, and the Fisheries Division respond to change. Three hierarchical levels (fishers, Fisheries Division, regional and international organizations) of the adaptive renewal cycle illustrate multiple level interactions and responses to critical changes in the fishery. The lessons from this evaluation are useful for fisheries management and will be applied to the MOD fishery planning approach in Chapter 8.

## 6.1 Introduction

Managing small-scale multi-species fisheries based on qualitative single equilibrium models (e.g., Maximum Sustainable Yield) (Walters, 1986; Munro, 1983; Sparre and Venema, 1992; CFRAMP, 2001) disregards the complex nature of marine ecosystems (Wilson, 2000; Scheffer et al., 2001; Berkes et al., 2003). The emerging view is that ecosystems are complex, unpredictable, non-linear, and having multiple equilibria and scales in which these processes occur (Gunderson et al., 1995; Holling and Meffe 1996; Gunderson and Holling, 2002; Berkes et al., 2003). This shift in view of ecosystems has two major implications for fishery management approaches: first, the ability to predict the behaviour of multiple equilibrium complex system is severely limited (Charles, 2001; Berkes et al., 2001; Berkes et al., 2003); and second, it brings the human element (fishers) in to the management process (Adger, 2000; Berkes et al., 2001).

Discussions of ecosystem-based management include social systems (issues of governance, systems of knowledge) and ecological systems (or ecosystem, communities of organisms interacting with themselves and the environment). To emphasize the integrated concept of humans-in-nature, the terms social-ecological systems and social-ecological linkages are used. The idea is that social and ecological systems are linked, and delineation is artificial and arbitrary (Berkes and Folke, 1998).

The organizing concept of resilience is used to analyze the response of social-ecological systems to environmental, social, economic unpredictability and change. The resilience of a system refers to its ability to buffer or absorb perturbations (Holling, 1973; Ludwig et al., 1993; Berkes et al., 2003). Resilience has three defining characteristics: the amount of change the system can undergo and retain the same controls of function and structure; capability to self-organize; and capacity for learning and adaptation (Resilience Alliance, 2004). The working definition for resilience is "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still sustain essentially the same function, structure, identity, and feedback" (Walker et al., 2004:6). This approach is fundamentally different from a command-and-control style of management, which typically tries to reduce environmental variability by assuming resource problems are well bounded (Holling and Meffe, 1996). A resilient social-ecological system can buffer a great deal of disturbance, by maintaining diversity and variability, leaving space for flexibility, and learning how to enhance adaptability (Berkes et al., 2003).

**The organizing concept of resilience**

To understand the significance of the 'backloop', Holling's concept of adaptive renewal cycle will be reviewed. Holling (2001) argue that regular cycles of organization, collapse, and renewal are important characteristics of all ecological systems. The stylized representation of an adaptive renewal cycle (Fig. 6.1) depicts the process of ecological succession or cycles. Three properties shape the adaptive renewal cycle: potential or wealth, which sets limits for what is possible; internal controllability or connectedness, sensitivity to perturbation; and adaptive capacity, which determines how vulnerable the system is to unexpected disturbance and surprise. The cycle consists of four phases:

exploitation, conservation, release, and reorganization. It starts with exploitation (r) and conservation (K) (the 'front loop'), which is a long period of accumulation and transformation of resources. During this phase connectedness and stability increases, while capital is accumulated; this section of the loop is relatively predictable (Folke and Berkes, 1998; Gunderson and Holling, 2002).

The release ($\Omega$) and reorganization ($\alpha$) (the 'backloop') are triggered by a period of disturbance; a shorter period that creates opportunities for innovation. During this period, connectedness is low, potential is high, and resilience is high. It is also a period of unpredictability and high uncertainty. This is a fertile environment for experiment, but it is also a time for both crisis and opportunity. During the release stage ($\Omega$) of the adaptive cycle, a time of high uncertainty and unpredictability exists; there is high connectedness between internal controlling variables and processes, and natural resource wealth (future options) and resilience are low. Ecological knowledge and understanding generated, accumulated and transferred through a trial-and-error learning process, allows for learning and reorganization (Holling, 2001; Gunderson and Holling, 2002).

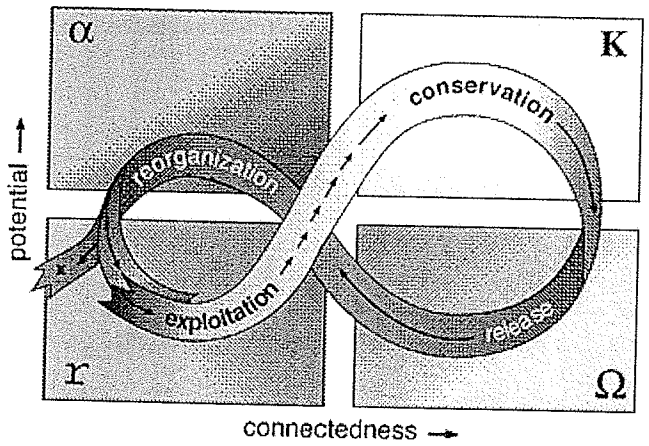



**Fig. 6. 1: The adaptive renewal cycle. A heuristic model of the four system stages and flow of events. The cycle reflects changes in two properties: y-axis: the potential that is inherent in the accumulated resources and structure; x-axis: the degree of connectedness among controlling variables. The exit (marked with an X) from the cycle indicated at the left of the figure suggests, in a stylized way, the stage where the potential can be leaked away and where a shift is most likely into a less productive and organized system. The shaded past of the cycle is termed the 'backloop' and concerns the release and reorganization phases (Source: Holling, 2001)**

The adaptive cycle occurs at a number of hierarchical scales and the social-ecological system exists as 'panarchy'. The term panarchy illustrates hierarchy as a nested set of adaptive cycles (Holling, 2001), or adaptive cycles interacting across multiple scales (Walker at al., 2004) (Fig. 6.2). There are two connections that are critical in creating and sustaining adaptive capabilities. One is 'revolt', a critical change in one cycle cascades up to a vulnerable stage in a large slower stage. The other is 'remember', it facilitates renewal by drawing on accumulated potential in a larger, slower cycle. The interaction between cycles in the panarchy combines learning with continuity. The sustainability of a system depends on the functions and communication between different adaptive cycles and different speeds. Each level goes through its own cycle of exploitation, conservation, release and reorganization. Speed is represented by a slower, smaller, and faster cycle; a medium and slower adaptive cycle; and a larger and much slower adaptive cycle (Chambers, 1997; Holling, 2001).

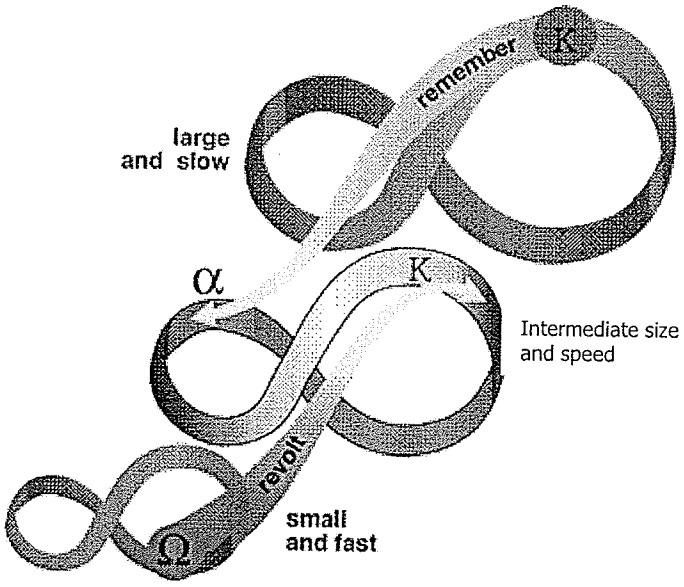



**Fig. 6. 2: Adaptive renewal cycles nested across scales: panarchy. Adapted from Gunderson and Holling (2002).**

To maintain resilience and reduce the risk of ecosystem collapse when there is a disturbance, systems conserve sufficient memory (information, knowledge, and experience) to allow innovation, learning, and reorganization (Holling and Meffe, 1996; Folke and Berkes, 1998; Holling, 2001; Gunderson and Holling, 2002). Memory has both an ecological and social components, and is defined as "the accumulated experience and history of the system, and it provides the sources for self-organization and resilience" (Berkes et al, 2003:20).

## 6.2 Change, reorganization, and renewal: the longline fishery

### 6.2.1 Learning and reorganization in the longline fishery

The idea of using successive iterations of the adaptive renewal cycle to show historical changes in the longline fishery was taken from Gunderson et al. (2002). The history of the fishery was first divided into four historical eras as illustrated in Fig. 6.3. Each historical era represents an adaptive renewal cycle which starts with exploitation (r) and conservation (K) followed by release ($\Omega$), and reorganization ($\alpha$).

The four historical eras of the longline fishery were assigned based on a complete cycle of exploitation, conservation, release, and reorganization (Fig. 6.3). Pre 1985 (loop 1) was the period of the Cuban longline popularization. Institutionalization and technology development during 1986-1990 (loop 2) was the period of strengthening institutional arrangements and initial improvement in longline fishing technology. The Coastal Fisheries Development Project (CFDP) between 1991 and 1999 (loop 3) was the period of further donor support and technological changes in line construction. Finally, innovation from 2000-2004 (loop 4) was the period of technological innovation. The adaptive cycles within each historical era will be described in detail. For clarity, each stage of the cycle is sequentially numbered. Chapter 5 provides detailed information on changes in boat, gear, and bait technology (Section 5.2.1), thus much of the detail has been omitted in this chapter.

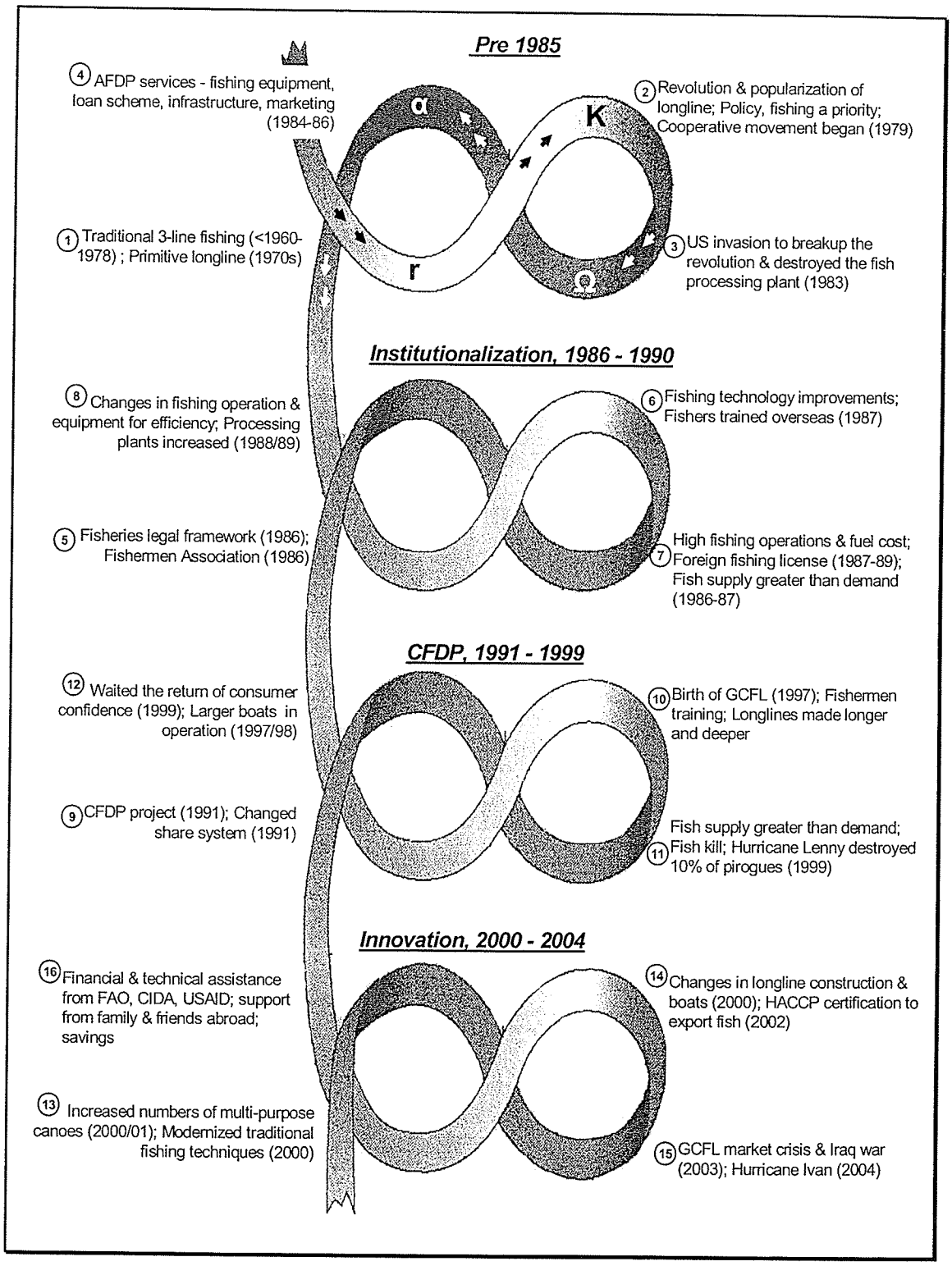



**Fig. 6. 3: Timeline for the development of the longline fishery as represented by successive iteration of the adaptive cycle**

## Loop 1: Pre-1985

(1) **Exploitation 1**:

Traditionally, fishers in Gouyave used mainly the '3-line' handline fishing technique. Later they experimented with a primitive form of longline based on gear observations of illegal fishers (See Chapter 5 for details).

(2) **Conservation 1**:

In 1979, the policy emphasis of the People's Revolutionary Government (PRG) was fishing, agriculture, agro-industries, and tourism (FAO, 1983). To improve fishing, the government embarked on a number of projects. They established a fishing school in St. George's town with technical assistance from the Government of Cuba, where students were trained in academics and fishing techniques such as pole and line, gillnet, fish and lobster traps, and longline. Fourteen multi-purpose ferro-cement training vessels were dispatched from Cuba to Grenada, and Cuban master Fisher trained Grenadian fishers. The government also established a fish processing plant to smoke, fillet, and salt fish for the local and export markets, and the National Fisheries Company to improve the harvesting of fish for domestic consumption (Johnson St. Louis, pers. comm., 2003). They encouraged the development of village cooperatives in farming, fishing, crafts, and light industry (Stanford and Vigilant, 1984).

The fishing industry grew steadily from 1980-1981. The fish processing plant produced canned tuna and flyingfish in tomato sauce for the export market, and fillets and smoked fish for the local market. During this period, processing increased from 18 kg/day to 1,588 kg/day (Aberdeen, 1982). By 1982, the fishing industry started showing signs of stress due to poor organization and management. The National Fisheries Company did not earn enough money to meet its expenses because there were problems with fish shortages and equipment failures. A world recession in 1980-82 also reduced the demand for Grenadian goods overseas (Stanford and Vigilant, 1984; Aberdeen, 1982).

(3) **Release 1**:

In 1983, the United States (USA) invaded Grenada to break up the revolution, and in the process destroyed the fishing infrastructure (boats, agro-industry). Gouyave fishers who were attending the Fishing school, working with Cuban master Fisher aboard vessels and working at the Fish Processing Plant returned to the community and shaped local development of the longline fishery (Johnson St. Louis, pers. comm., 2003).

(4) **Reorganization 1**:

Although, initiated in 1982, the Artisanal Fisheries Development Program (AFDP) (1983-1985) was a tremendous help in reorganizing the industry. It was implemented as a fisheries project funded by the World Bank International Fund for Agricultural Development (US$ 2.7 million) and Venezuelan Investment Fund (US$ 2.7 million), together with a counterpart contribution by the Government of Grenada (FAO, 1985). The objectives of the project were to develop infrastructure, and improve technical and support services. The program operated activities such as: selling fishing gear and equipment (imported engines, fishing gears, and spare parts); operating a machine shop (servicing and repair engines); organizing a fish market program (transported processed and packed fish in refrigerated trucks and sold fish to shops in rural communities); improving infrastructure (upgrade existing and build new facilities which offer fishers a place to land, clean, weigh and sell their fish); improving data collection system (handle boat data, monitor gas rebates and duty free concession); and introducing a line of credit for fisherman, vendors, and boat builders.

## Loop 2: Institutionalization and technology development 1986-1990

(5) **Exploitation 2**:

In 1986, the Fisheries Act #15 of 1986 the most comprehensive fisheries legislation was enacted. With this act, the Chief Fisheries Officer (CFO) had the authority to constitute the Fisheries Division. By 1987, the Fisheries Regulations #9 of 1987 was in place and the CFO was now able to organize a Fisheries Division. When the Artisanal Fisheries Development Project (AFDP) came to a close in 1987, officers on the

project were transferred to the Fisheries Division which took over the administration of the fishing industry and management of fish markets. By 1988, the Fisheries Division was a fully functioning body with six units (administration, biological, technological, aquaculture, extension services, and statistics), to provide services in licensing, concessions, enforcement, and data and information systems. By the end of this era, the Fisheries Division was in local communities talking with fishers, dealing with conflicts, providing training in fishing technology and navigation with emphasis on further developing the longline fishery (James Finlay, pers. comm., 2003).

During this period, the St. John's Fishermen Association was launched in Gouyave with a US$100,000 loan from the Humanistisch Instituut Voor Ontwikkelings Samenwerking (HIVOS) through the Agency for Rural Transformation (ART). This loan was to finance building a gas station to sell marine fuel, a tackle shop to sell fishing equipment, and a meeting room for fishers (Osmond Small, pers. comm., 2003). The objectives of the Association were to buy fishing tackle and equipment from overseas and sell to fishers, arrange processing and marketing of fish, improve the quality and output of fish products, assist members in seeking financial assistance, and make recommendations to government on matters relating to the fishing industry (Osmond Small, pers. comm., 2003; SJFA, 1986). The success of the St. John's Fishermen Association led to the formation of the National Fishermen Association in 1990 (Osmond Small, pers. comm., 2003).

(6) **Conservation 2**:

Institutional strengthening provided the stability fishers needed to move the industry forward. With local longline, training provided by the Fisheries Division and overseas fishing training in Japan, Korea, and Canada, fishers started applying their new knowledge; thus, it was a period of technology innovation. Twisted monofilament plastic was changed to single plastic, and a box used for the deployment of longline was changed to reels (Chapter 3). Improvements in longline technology resulted in the growth of the industry, so that pelagic fish landings in Gouyave increased in 1986 by 73% over 1984 figures (Brizan, 1987).

(7) **Release 2**:

First, the increase in fish landings was so significant it overwhelmed fish markets, and resulted in many fishers burying fish because there was nowhere to store it. Second, high fuel prices increased fishing operational cost (pirogues had two 75 hp engines that consumed ten gallons of fuel per trip) and forced fishers to think about alternative boat and engine options. Third, the government granted fishing licenses to foreign operators with advanced skills and expertise, who marketed their catch outside Grenada. To make matters worse, the government's EC$0.25[5] per kg of fish caught was being evaded by foreign operators (Grenada Guardian, December 2, 1988:16; Roger Gill, pers. comm., 2003).

(8) **Reorganization 2**:

To deal with the above changes, fishers and investors found ways to increase fish sales to local and export markets. To increase sales, investors focused on developing fish processing plants to process fish for export. In Gouyave the NORDOM Seafoods Ltd. became operational and focused on exporting pelagic fish to the USA. In St. George's town, a government owned and operated plant, managed under the AFDP, and the Caribbean Seafoods Ltd, processed fish for the local and export markets (Norbert Simon, pers. comm., 2003; Weidner et al., 2001). Fishers reduced fishing operational costs by replacing 75 hp engines with more efficient 40 hp engines, which consumed less fuel (Roger Gill, pers. comm., 2003). The problem of foreign operators was solved when the National Fishermen Association launched a series of protests to pressure the government to stop issuing foreign licenses. According to one local newspaper, Informer (January 20, 1989):

> Although the Fisheries Act #15 of 1986 provides for prior consultation with local fishermen, local authorities, and the Fisheries Advisory Committee before the issuing of foreign licenses, the Fisheries Minister jumped the gun and issued a number of foreign licenses to the dismay of local fishermen.

[5] 1 US$ = 2.71 EC$

## Loop 3: The Coastal Fisheries Development Project (CFDP) 1991-1999

(9) **Exploitation 3**:

The fishing industry was rejuvenated with larger and more modern longline equipment, loans to fishers, and improved infrastructure with support from the Coastal Fisheries Development Project (CFDP). The CFDP was a grant aid cooperation project between the Governments of Grenada and Japan valued at US$4.68 million. The project aimed to introduce large-size fishing boats to exploit offshore resources and to consolidate support services by improving the fishing industry environment and distribution facilities (JICA, 1989). The government received eight 11 m longline fishing vessels, accessory supplies and longline material, four vehicles for extension including two insulated trucks for transporting fish, and tools and equipment for gear repair facilities. Gouyave benefited from this project with the construction of a fishermen's centre with a small jetty, provision of block ice and plate ice-making machine, cold storage facilities, construction of 25 fishermen's lockers, and other equipment (JICA, 1991; Johnson St. Louis, pers. comm., 2003). Some Gouyave fishers decided to design cheaper large offshore vessels with inboard diesel engines based on their specific needs, as the Japanese vessels were expensive to own and operate. A mould was built in the USA, and by 1997 a larger vessel specific to the needs of Gouyave fishers was fully operational (Norbert Simon, pers. comm., 2003).

High operational costs were still a problem to fishers, thus boat owners decided to change the existing share system. Originally, a boat with two crew members, had the income from fish sales being shared into three parts, the boat and each crew member. The boat share was used to cover operational expenses and the income of boat owners. With higher operational costs, this meant that many owners were not able to profit from their investment as the benefits went to the crew. A new share system was devised to ensure the owners benefited from the business. Operational expenses were first deducted from the income of the boat. Of the remaining, the boat share was half and the remainder was shared among the crew. If the boat was not successful at catching fish, crew members still had to contribute to boat expenses (Roger Gill, pers. comm., 2003).

(10) **Conservation 3**:

With an increase in large offshore vessels, captains were trained and certified in safety at sea and navigation using GPS. Longlines were made longer and deeper from 46 hooks in 1983 to over 250 hooks in the late 1990s. Large overnight vessels with longer gears meant increased fish landings. To market the increased fish landings, the Grenada Commercial Fisheries Limited (GCFL) a fish processing plant in the town of St. George's town was organized in 1997. It was a state-owned corporation and an off-shoot from the AFDP. The GCFL plant was financed under the CFDP, with the company processing fish fillets, steaks, and salted shark for the local and export market. The company purchased fish directly from Gouyave fishers via a buyer. The fish was later transported by insulated trucks to GCFL in St. George's town (Weidner et al., 2001).

(11) **Release 3:**

Landings from the longline fishery peaked between 1993 and 1995 at 474,000 kg (Fig. 4.4). November 1999 extreme storm surges, a direct result of category 4 Hurricane Lenny hit the west coast of Grenada. The storm surge was accompanied by surge flooding of 3-5 m above normal tides and dangerous waves (McConney, 2003). The surge damaged coastal roads, homes, and the jetty. In Gouyave, fishing boats and equipment were also destroyed, including 10% of pirogue boats and all seine boats and nets. The estimated cost to local fishers and vendors was EC$513,700 (Jessamy and Turner, 2003). Also in 1999, there was a mysterious fish kill, believed to be caused by bacterial agent, resulted in significant death to demersal reef fish (Phillip and Issac, 1999; McConney, 2003). The effects were a decline in fish supply and consumers who stopped purchasing or eating fish. By the end of this period landings were down to over 100,000 kg (Fisheries Division fish landings data). Losses to boats and consumer confidence left fishers unable to repay loans (Christo, pers. comm., 2003).

(12) **Reorganization 3**:

To reorganize the government quickly provided financial assistance to fishers. In 1999-2000 a local NGO, GRENCODA applied to CIDA and received grants and loans which totaled US$15,000 to help rebuild the fishing industry in Gouyave (GRENCODA,

2000). The experience made fishers re-evaluate their fishing operations. Many used the grants and loans to reinvest in smaller canoes that were easier to maintain and had lower operational costs. They evaluated the benefits of a canoe versus a pirogue boat, and concluded that canoes were better because the distance covered by both during a fishing trip was similar, the economic returns were similar, during rough seas and bad weather they could haul canoes to shore, and in terms of capital investment a canoe was more affordable (Christo, pers. comm., 2003).

## Loop 4: Innovation 2000-2004

(13) **Exploitation 4**:

Storm surges, unusually rough seas, decline in fish catch, increasing numbers of fishers, and indebtedness to the bank were all factors that forced fishers to change fishing operations and strategies. Fishers gained a greater share of the profits from fishing by upgrading from being a crew member to being a boat owner who captained their boat, forcing many boat owners to leave the industry. In the past, many of the boats were owned by investors who knew nothing about fishing, but had a greater share of the boat income and contribution to fisheries management. Later, captains and crew wanted to purchase their own boats; the most affordable were small wooden canoes (Dr. Dunstan Campbell, pers. comm., 2003).

The longline fishing season usually lasted six months per year, and for the rest of the year fishers docked their boats and lived on their savings. However, with a decline in fish catch during the last era (1991-1999), fishers' savings and their ability to save had eroded. Thus, fishers started to modernize traditional fishing activities so they would be able to diversify fishing activities during the longline fishing off-seasons. One such example was the modernization of the handline fishing technique. The traditional handline technique which required a line, sinker, and hook with a strip of bait. The new handline technique involved pinning live jack bait to the hook, then throwing the line with bait into the water simultaneously with additional live jack from a bailer. The thought behind this new technique was that the fish would get confused as to which bait had the hook. The line was retrieved periodically, the bait replaced and the process

repeated. Other innovative fishing techniques included the '*common tur*' line which was a longline specifically constructed to catch blackfin tuna (Chapter 5).

(14) **Conservation 4**:

Larger offshore fishing vessels, diversified fishing, modernized traditional fishing techniques, along with further technological innovations increased the fish catch in Gouyave to over 500,000 kg in 2001. Increased fish catch meant marketing was again important to the survival of the industry. To increase the export of fish to wider regional and international markets, particularly European countries that required European Union fish health safety standards, the Fisheries Division in collaboration with the Ministry of Health developed national Hazard Analysis and Critical Control Point (HACCP) and Sanitation, Standards, and Operating Procedure (SSOP) training programs. According to St. Louis (2002:1):

> The competent authority [Ministry of Health] has committed itself to doing all within its powers to make the necessary corrections and implement changes, which will be acceptable to all countries and regulatory commissions in order to promote Grenada's image as a sound exporter of quality fish products.

The aim of the program was to ensure all fish products consumed by the population and for export were safe and disease free. To ensure safe fish products, the Fisheries Division and the competent authority, the Ministry of Health, embarked on the following activities (St. Louis, 2002; Francis Balwant, pers. comm., 2003):

- enacting legislation governing the storage, export, import, processing, testing and inspecting of fishery products and vessels
- inspection system for all processing plants
- all fish processing plants and fish trading vessels operating under HACCP and SSOP
- all export certificates for the certification of fishery products for export should be designed in French and English
- codes for constructing and reconstructing fish processing plants
- fishers, processing staff, fish market workers, and vendors trained in fish handling and preparation

- equipping a chemist's laboratory to assist the industry conduct the necessary microbiological and chemical analysis. The issue of the laboratory was still unresolved in 2003 although the EU promised assistance in organizing the chemist's laboratory for fish testing.

In 2002, after intensive training and changes to fish processing standards, two of five processing plants in Grenada received EU compliance status and all five (including NORDOM Seafoods Ltd. in Gouyave) received HACCP compliance status. Grenada was now able to export fish to the world. The process took four years and resulted in 350 persons throughout the island being trained, and two of five processing plants certified to export fish to the EU. Unfortunately, NORDOM Seafoods Ltd. failed to meet the required standards, thus this processor could not export fish to European markets. However, this company began a process to improve infrastructure, to later reapply for certification to export fish to Europe (Johnson St. Louis, pers. comm., 2003).

(15) **Release 4**:

In January 2003, the GCFL was forced to stop purchasing fish from fishers because EC$600,000 worth of fish went missing. In March 2003, the peak month for pelagic fish landings was short-lived as many fishers had to reduce fishing activities. Then later that year the war in Iraq triggered a price reduction for exported fish, forcing one processing plant to stop exporting. On September 7, 2004, Hurricane Ivan ripped through the island. In three hours 89% of the island's homes were destroyed or damaged, leaving 50% of the population homeless. Government buildings, prisons, hospitals, schools, and churches were extensively damaged. The population on the island of Grenada was left without electricity, water, and telecommunication. Tornadoes caused extensive damage to crops, livestock, and the fisheries sub-sectors. It damaged boats, equipment, engines, hulls, gears, safety equipment, communication facilities, seines, and fishing infrastructure valued at over EC$5,733,550 (Government of Grenada, 2004).

(16) **Reorganization 4**:

To secure boats and equipment, prior to the start of the hurricane season small wooden boats were hauled ashore between buildings and in the road, while pirogues and

larger boats were anchored by Lagoon Road and the Coast Guard in St. George's town. After the hurricane, the first priority in Gouyave was to rebuild houses and clear roads and the beach of debris. Community members took three days to completely rebuild roofs and clear roads (Deslyn McKenzie, pers. comm., 2005). She summarized the clean-up efforts, "The morning after the hurricane, the entire community came out to help each other. People did not take any money for work, they just helped to put back roofs. Even during the hurricane they were replacing galvanize zinc. Later, when people passed through Gouyave, they said nothing happened to us."

Attention was later focused on the fisheries sector to repair damaged boats and equipment. Only the boats that went to St. George's town were hard hit by the hurricane, suffered extensive damage. Days after the hurricane, the following sequence of events occurred. There was an abundance of blackfin tuna with fisher catching over 100 fish in one day. Over 20 small wooden boats were active in catching fish (average 50 fish/boat/day). According to a fisher, "This fish [blackfin tuna] prevented plenty people in Gouyave from starving." Beachseine fishers cast nets at least one to two times per day to feed the community. Once food was available to the community, beachseine fishers focused on providing bait to fishers. However, due to low bait catch, rough seas, and very strong currents, fishers were not able to go longline fishing as often as they wanted (Garvey McPhie, Cebert Bernadine, Roger Gill, pers. comm., 2005). Once the roads were cleared, the airport re-opened, and air transportation resumed commercial activities, NORDOM Seafoods Ltd. was the first processing plant to export 480 kg of fish after the hurricane on October 10, 2004 (Norbert Simon, pers. comm., 2005).

On November 2004, the Fisheries Division was able to secure financial and technical assistant for short and medium term support to rebuild the industry, namely:

- Government/FAO/CIDA – provided finance to refurbish, expand, and upgrade the Gouyave Fish Market
- FAO/CIDA – gave special assistance to repair boats, replace engines and equipment
- FAO – finance and technical support for a 24 hours ship-to-shore communication system
- USAID – finance to fishers to access small grants to assist in the recovery and business reactivation

- GRENCODA/USAID – financial assistance to replace engines and equipment (Government of Grenada, 2005).

The Agency for Reconstruction and Development (ARD) was established by the government as a monitoring and coordinating body to facilitate and implement long-term recovery and rebuilding processes following Hurricane Ivan. The aim of the agency for fisheries is to develop sustainable value-added products, e.g., salted and processed fish with a market of its own. The focus will be on research and development, and training of fishers in business management. Financial and technical support, however, will depend on pledges made by countries after the hurricane (Mr. Terrence Moore, pers. comm., 2005).

Nationally the country resumed fish export in December 2004 (two months after NORDOM Seafoods Ltd.), and by March 2005 they were exporting up to 60% of fish landed. Although the fisheries sector resumed activities (i.e., boats repaired and improved, destroyed equipment replaced) four months after the hurricane, rough seas, lack of bait, strong current, and low catches still hindered the full recovery of the fisheries. A prominent boat owner and captain in Gouyave described the effects of the hurricane on the marine environment.

> The hurricane changed the ocean; we have to learn the ocean all over again. That sun was so hot after the hurricane [more than three weeks of very hot sun], it changed the ocean. The sea was as hot as the land. The water was too warm for the fish, they moved to other areas. The ocean is different now. Fishermen are afraid to set his line. The current real strong now, a fisherman sets his line 15 miles out, the line drifts to about 56 miles, that's a lot of miles to cover (Fisher, pers. comm., April 2005).

To conclude, reorganization of the longline fishery was attributed to innovation, lessons from past experiences, and support from regional and international organizations. Improvements in gear technology and knowledge of the marine environment resulted in increased fish catch and eventually marketing problems. Initial increase in fish catch prompted improvements in local sale, export, infrastructure improvements, and by 2000 an institutional framework to expand the export market. Fishers and investors relied on themselves and regional and international assistance to deal with changes in the fishery.

### 6.2.2 Responding to change

Throughout the development of the longline fishery the main agents of change were issues related to (1) gear technology, (2) boat technology, (3) bait, (4) foreign licenses, (5) marketing, and (6) physical crises (See also Chapter 5). Fishers, community members, and government used local knowledge, experience, learning, innovation, and at times no action to respond to these critical changes. This section analyzes how groups (fishers, community, and government) responded to crisis, the response that was accepted, and multiple level interactions in response to crisis. Community includes individuals, private enterprises, local institutions (groups, NGOs), and private investors.

#### 6.2.2.1 Response to change: who responds and how

To increase fish catch, fishers, community (investors, fishing support services), and the government in some way responded by improving gear technology (Table 6.1). The popularization of longline technology began when the Fisheries Division promoted the Cuban technology. After the crisis of the US invasion the Fisheries Division continued promoting the technology in communities. Fishers were trained locally and abroad and worked aboard foreign vessels, so had the basics on which to further improve longline. Innovations by fishers were based on fast, locally specific, continuous social learning, which were most significant in 2000 - 2004.

The community (private investors and enterprises) was the catalyst for gear improvement; they sourced the required fishing equipment and made it available to fishers. As fishers continued to improve on the gear, meaningful contributions from the government lessened. Fishers wanted lighter and diverse types of longline; the Fisheries Division wanted longer and heavier hydraulic operated lines for offshore fishing. By the mid-1990s fishers rejected gear technology suggestions and contributions from the government, and created their own reorganization/renewal through innovation. Gear improvements had positive benefits; it led to increased fish supply and income for fishers, and employment for community members.

Boat technology changed to support changes in gear technology. The fishers, community (private enterprises - boat builders), and the government responded to improving boat technology as the longline fishery expanded (Table 6.2). Initially fishers

adapted small wooden canoes which the government and community supported; later fibreglass pirogue boats were introduced. By the third era, the CFDP provided large Japanese-built vessels (>12 m) which the government promoted. However, Gouyave fishers designed their own boat which was specific to their needs. In 2000-2004, based on fishers' previous experiences with rough seas, hurricanes, and high boat operational costs, they wanted smaller, cost and operation-efficient, multi-purpose boats. The Fisheries Division wanted fishers to move to larger boats that could fish further offshore and be safer at sea (Roland Baldeo, pers. comm., 2003). Many fishers believed that larger boats required higher capital investment and operational costs, and with unpredictable fish catch and weather conditions they were not going to take the risk of losing everything. Thus, boat technology suggestions from the Fisheries Division were rejected. Fishers opted for small, nationally built (Grenville) and locally maintained (Gouyave) wooden canoes (5-9 m), and locally maintained fibreglass boats (22 m) with fuel-efficient four stroke engines.

In recent years the amount of flyingfish for use as bait declined which led fishers to seek alternative sources of bait. The fishers sought local options, while the Fisheries Division considered other possible options (Table 6.3). By the late 1990s, fishers started experimenting and substituting jack for flyingfish. The Fisheries Division believed that imported squid could solve the bait problem. Fishers disagreed as they believed importing bait only added to their operational costs. Jack was available from the local beachseine fishery although supply was seasonal. Thus, fishers wanted the government to assist their efforts to build a cage or an enclosure at sea to store jack when available, thus bait would be available when needed. Again, fishers rejected the government's response and continued experimentation in different bait storage techniques.

The crisis in the number of foreign boats that were given fishing licenses in 1987-1989 angered Gouyave fishers. Their outcry resulted in the Fisheries Division withdrawing all foreign licenses and a national policy that no foreign vessels would be granted fishing licenses. The fishers' revolt resulted in a policy change; one that is still in effect.

Marketing was a continuous problem. Improvements in gear and boat technology, the availability of bait year-round, and fisher ecological knowledge of when,

how, and where to fish increased fish landings. In many instances, there was nowhere to store the fish, which forced fishers to stop fishing. Fishers, community (private enterprises – fish processing plants), and the government responded to improving sales to the local and export markets (Table 6.4). The change from traditional handline to longline fishing led to an increase in the quality and quantity of fish landed. Initially, the industry was plagued with problems such as fish supply less than local demand, limited freezer storage, and poor market management to deal with a growing fishery, which led fishers to protest the conditions. The protest resulted in improved fish market facilities and rules to govern fish market operations. By the second historical era, fishers learned to stop fishing when the cold rooms were full. Local community members decided to establish NORDOM Seafoods Ltd. to export fish overseas (Box 4.3). During the third era other national processing plants developed to market fish locally and for export. At the same time the government decided to build a processing plant, the GCFL. Yet marketing problems persisted, as continued improvements in boat and gear technology resulted in further increased fish landings. The government wanted to maintain export trade to the French Caribbean Island and USA, and increase exports to other countries in the world. In order to export fish to European countries, Grenada had to implement the European Union (EU) seafood health and safety requirement. Regionally the Caribbean Regional Fisheries Mechanism (CRFM) provided technical and financial assistance to support the government in its efforts to develop a fish health and safety program.

Crises due to hurricanes and storms occurred mainly in the third and fourth historical eras (Table 6.5). Prior to Hurricane Ivan the last major hurricane was Janet in 1955. Fishers, community members (local institutions – NGOs), and government usually respond to hurricanes and storms by providing financial assistance (Table 6.5). Fishers were used to yearly cycles of sea and weather conditions: hurricane season, June to December; winter storm surges, December; rough seas, October to March. Fishers learned to secure boats, and the government over time learned to source the necessary technical and financial support locally (Ministry of Finance) and regionally/internationally. The intensity and impact of hurricanes and storms were unpredictable, thus it was difficult at times to prepare for such crises. Hurricane Janet

had more rain, Gouyave received a direct hit, and the population had to rely on slow government assistance via regional and international organizations.

Table 6.1: Gouyave fishers, community members, and Fisheries Division **gear technology** response to critical changes in the longline fishery

| Historical eras | Fishers' response | Community's response | Fisheries Division's response |
|---|---|---|---|
| 1978-1985 | Adopted Cuban technology | No response | Training to promote Cuban technology |
| 1986-1990 | Trained in Gouyave longline technology; supplied fishing equipment | No response | FD staff & fishers trained abroad; changed from Cuban design to Gouyave design; gear concession |
| 1991-1999 | Innovation | No response | Little response |
| 2000-2004 | Innovation | Supplied gear | No response |

Table 6.2: Gouyave fishers, community members, and Fisheries Division **boat technology** response to critical change in the longline fishery

| | | | |
|---|---|---|---|
| 1978-1985 | Wooden canoes | Local wooden boat builders | Wooden canoes |
| 1986-1990 | Pirogue boats | National pirogue boat builders | Pirogue boats; concession for boat building material |
| 1991-1999 | Large boats (local design made in the USA) | No response | CFDP - large Japanese built boat |
| 2000-2004 | Small locally built wooden canoes | National large and small boat builders | Large locally built boats (in Petite Martinique) |

Table 6.3: Gouyave fishers, community members, and Fisheries Division **bait** response to critical change in Gouyave longline fishery

| | | | |
|---|---|---|---|
| 1978-1985 | Catch flyingfish with 'bazor' | No response | Catch flyingfish with 'bazor' |
| 1986-1990 | Catch flyingfish with gillnet | No response | Catch flyingfish with gillnet |
| 1991-1999 | Flyingfish with gillnet; jacks with beachseine | No response | Catch flyingfish with gillnet |
| 2000-2004 | Locally available jacks with beachseine | No response | Consider importing squid |

Table 6.4: Gouyave fishers, community members, and Fisheries Division **market** response to critical changes in the longline fishery

| | | | |
|---|---|---|---|
| 1978-1985 | Protested, buried fish | No response | AFDP – improved management of fish markets |
| 1986-1990 | Stopped fishing | Local processing plant | Little response |
| 1991-1999 | Stopped fishing | National processing plants | CFDP – infrastructure; Govt. processing plant established |
| 2000-2004 | Stopped fishing | Two of five plants met EU standards | HACCP & SSOP |

Table 6.5: Gouyave fishers, community members, and Fisheries Division response to crisis due to **hurricanes and storms** in the longline fishery

| | | | |
|---|---|---|---|
| 1991-1999 | All boats hauled to shore; personal savings | Bank loans; GRENCODA/CIDA grants and loans; financial assistance from family, and friends abroad | Financial assistance |
| 2000-2004 | Hauled small boats to shore; pirogues and large boats anchored in St. George's; awaited the usual assistance from the government; personal savings | Assistance from family and friends overseas (money, barrel-food, clothes); GRENCODA/USAID financial assistance | Financial and technical assistance from regional & international agencies (FAO, CIDA, USAID) |

Hurricane Ivan was more like a tornado with no rain. Gouyave was not directly hit, more buildings were destroyed, but the community was able to reorganize faster with assistance from family and friends overseas, and government aid. Diverse fishing practices helped fishers secure food and income for their households; banks and NGOs were always willing to assist by providing financial assistance. The government provided financial and technical assistance at times through regional and international assistance.

#### 6.2.2.2 Response to change: who makes for effective response

Over the years, response to critical changes evolved from fishers/community accepting the decisions of the Fisheries Division (1978-85); to fishers/community involved in reorganization strategies (2000-2004). This section focuses on the latter, the participation of fishers/community in problem solving and decision making.

An analysis of the 2000-2004 time period revealed that government, fishers, and community responses were important to sustaining the longline fishery. In the case of gear technology the fishers/community approach was accepted. Similarly, the fishers preferred smaller, cost effective and locally maintained boats, to the Fisheries Division vision of larger boats. Fishers preferred locally available bait to the alternative and more expensive imported ones. Fisher/community's choice of response was based on local knowledge. This knowledge was based on the interaction of fishers with the marine environment and local industry (Table 6.6).

Fishing communities cannot solve all their problems on their own; sometimes they need assistance from outside the community. Fish marketing was a major problem for the community. The government's long-term solutions took four years to implement: but was it the most feasible? After major events, such as hurricanes and storms, financial support from regional and international organizations through the Fisheries Division helped fishers reorganize. The Fisheries Division's response to marketing and hurricane crisis was based on biological and technical knowledge of the fishery and obtaining financial assistance from international agencies.

**Table 6.6: Who responds and the response in effect to deal with critical changes in the longline fishery for historical era 2000-2004**

| Critical changes | Fishers/community response | Fisheries Division's response | Response in effect | Basis of response |
|---|---|---|---|---|
| Gear technology | innovation | little or no response | Fishers/community | LK/FD |
| Boat technology | smaller, locally maintained | larger boats | Fishers/community | LK/FD |
| Bait | locally available jack | import squid | Fishers/community | LK |
| Foreign license | strongly oppose | no foreign license | Fishers/community | LK |
| Marketing | stop fishing | HACCP/SSOP | FD | FD/int. |
| Hurricanes & storms | saving; family and friends abroad | financial support | All | LK/FD/int. |
| KEY: LK- local knowledge; FD- Fisheries Division; int. - international | | | | |

Fortunately, Gouyave fishers were able to provide the reorganization necessary to keep the system going. They did not believe the government was doing enough to manage the longline fishery, as some of the problems highlighted were not being addressed. However, they knew the survival of Gouyave depended on the sustainability of the fishing industry, and the Fisheries Division's ability to support local efforts in their response to critical changes in the fishery.

### 6.2.2.3 Multiple level interaction and response to critical changes in the fishery

The nested adaptive renewal cycle of the longline fishery in Fig. 6.4 represents three management levels: the fishers/community, Fisheries Division, and regional/international community. The fishers/community level cascades critical change ('revolt') to the intermediate Fisheries Division level, which can also cascade change to the upper regional/international level. When the upper level (e.g., the Fisheries Division) provides support to a lower level, this is termed 'remember'.

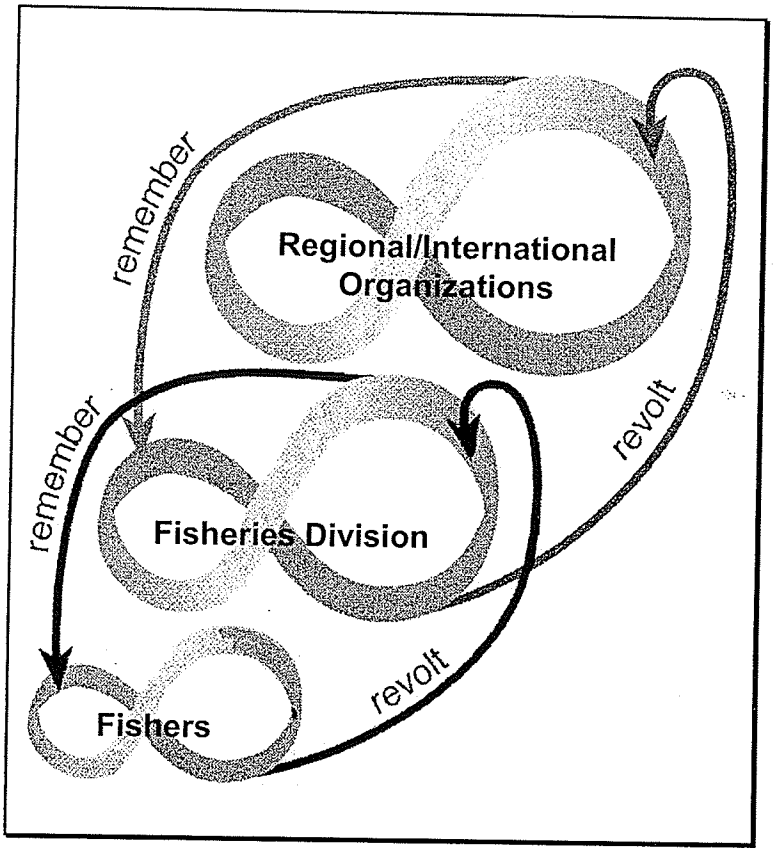



**Fig. 6. 4: Nested adaptive renewal cycles of three levels/scales interacting to manage the longline fishery in Gouyave**

The fishers/community members represent the lower, smaller and faster adaptive cycle with the following characteristics a dynamic knowledge system which co-evolved with the ecological system, and their knowledge is up-to-date, dynamic, continuously changing as conditions change. The Fisheries Division represents the intermediate size and speed adaptive cycle with the following characteristics: fishery managers depend on statistical results which do not reflect the changes and complexity of ecological systems and the effects on social systems; learning is slow and in many instances none at all; many officers neither listen nor communicate with fishers and local people; and, managers do not understand the local experiences and how these can impact the management of the resource. The regional/international community represents the larger and slowest adaptive cycle with the following characteristics: an even slower response to changes at the community level; bureaucracy sometimes slows the process; support to

communities is via a middle organization such as government or NGOs, making the process even slower; and policies are far removed from the reality of local people.

When there was critical change at the fishers/community level two things happened: (1) the fisher/community level reorganized; and (2) this change cascades up ('revolt') to the Fisheries Division drawing on accumulated potential (Fig. 6.4). In other words, if fishers had a problem/issue that needed to be resolved, they relied on the government to use its resources to assist them. If the government was able to assist, then there would be changes at the Fisheries Division level to deal with the problem. This is the 'revolt'. If the government could not assist, then the fishers would try to solve the problem themselves. This is reorganization. If this was a reoccurring problem which the government already had plans to deal with, this is 'remember'. It is the communication between the levels, and the ability of the levels to respond in a timely manner to change that is important to the sustainability of the fishery.

Reorganizing after a crisis in the fishery involved the response from fishers and community, government, and regional/international organizations. Some crises were dealt with by fishers and community members (reorganization), while others required input from the government and regional/international organizations (revolt and remember). Table 6.7 summarizes fishers/community and the Fisheries Division's final response to critical changes in the longline fishery during the 2000-2004 historical era. Although both groups had suggestions on how to respond to critical changes, only one option was generally selected.

**Table 6.7: Summary of final response to critical changes in the longline fishery (2000-2004)**

| Critical changes | Final response | Phase in the panarchy |
|---|---|---|
| Gear technology | innovation | Reorganization |
| Boat technology | smaller, locally maintained | Reorganization |
| Bait | locally available jack | Reorganization |
| Foreign license | no foreign license | Revolt |
| Marketing | HACCP/SSOP | Revolt |
| Hurricanes & storms | financial support | Remember |

In all cases of disturbances (Table 6.7) fishers complained to the Fisheries Division for assistance. Where there was none or an inappropriate response based on little recognition of local knowledge from the government, fishers were forced to seek solutions themselves (reorganization), e.g., gear and boat technology, and bait. In some cases, the Fisheries Division changed policy or operating procedures to respond to the crisis (revolt), e.g., the issue of foreign licenses and health standards for export. In other cases, they already had the policy in place to deal with the crisis ('remember'), e.g., financial support.

## 6.3 Conclusion: resilience and fisheries management

What can fishery managers learn about building resilient fishery systems? Supporting the reorganization potential of the fishery system enhances resilience. That is, the transition from change/release to reorganization is critical to enable social-ecological systems to increase resilience (Seixas, 2002; Berkes and Seixas, 2005). Cycles of exploitation, conservation, release, and reorganization are inherent in social-ecological systems. If these systems are able to reorganize, learn, and adapt after a change or crisis, then over time they become resilient. In this case, fishery managers need to improve institutional capacity to respond to critical changes.

Problem-solving skills and participating in decision making are important in building resilience. Fishers' capability and knowledge of the fishery increased due to initial efforts by the Fisheries Division to popularize longline fishing. Their knowledge and capacity triggered social learning, as opposed to depending on the Fisheries Division for continued renewal. This resulted in fishers learning from critical change, reorganizing, and developing problem-solving skills necessary in sustaining resilient systems.

Communication between fishers and government is critical to dealing with change. In this case, many of the decisions for reorganization are fishers/community local knowledge decisions and did not include the views of the Fisheries Division. The Fisheries Division need to understand the importance of local knowledge, i.e., local fishery systems dynamics, the needs of users, and how the system functions; then,

provide the necessary support to help sustain the fishery. With little or no communication between local people and the Fisheries Division, this could make the longline fishery vulnerable to collapse. Conversely, fishers and community members should also understand they can not solve all their problems and may need assistance from external sources such as government or international agencies. When the Chief Fisheries Officer was asked what led to the successful response of the Fisheries Division to the crisis of Hurricane Ivan, he identified the following:

- the Fisheries Division's knowledge of the industry (number of fishers, gears, fishing communities, infrastructure)
- consultation or information sessions with fishers from February to April 2004 led to a greater understanding of fishers needs
- the close working relationship between the Fisheries Division and FAO. The FAO provided assistance in understanding and providing information regarding their aid procedures and guidelines, while the Fisheries Division officers provided reliable information on damages and needs.

Locally grounded response to critical change results in successful reorganization. How fishers and the community work towards sustaining the longline fishery may have been different from the macro views of the Fisheries Division. What they need and when they need it depends on a community perspective. The Fisheries Division might have thought the future of the industry in Gouyave was in larger vessels, but fishers knew they would not be able to maintain these vessels. The Fisheries Division wanted to repair boats after a storm, but fishers wanted the money to do their own repairs. What works on the ground depends on how the community chooses to reorganize after a crisis. Thus, fishery managers should note that rehabilitation after a major crisis requires response that takes into consideration the local perspective. A clear understanding of needs of local people would generate quick and appropriate responses from regional and international organizations.

Donor technical and financial assistance are the main approaches used by the government to reorganize, but these are largely short-lived and, in many instances, unsustainable. For example, giving local fishers large longline vessels with state-of-the-art equipment required continuous technical and financial support from government. If

these supports are not continuous, fishers would moor vessels or the government would continuously seek aid. Conversely, knowledge of boat and gear developed from local knowledge and material, with support from a local system could build the resilience of the local fishery system.

Dealing with change in social-ecological systems requires multiple levels (local community, national, and regional/international levels) working together (Adger et al., 2005), to understand the nature of the disturbance, brainstorm possible solutions, and choose the most appropriate solutions. The longline fishery relies on slower, smaller cycles (fishers/community) and larger, slower cycle (Fisheries Division) to respond to change. If the smaller cycle experiences a critical change which it is unable to handle, it would rely on the larger cycle to provide renewal. Changes at the local level may require policy changes at the national level, while for others the response is almost immediate as protocols reside in the memory of the institution.

# CHAPTER 7:

## Institutions for managing the commons

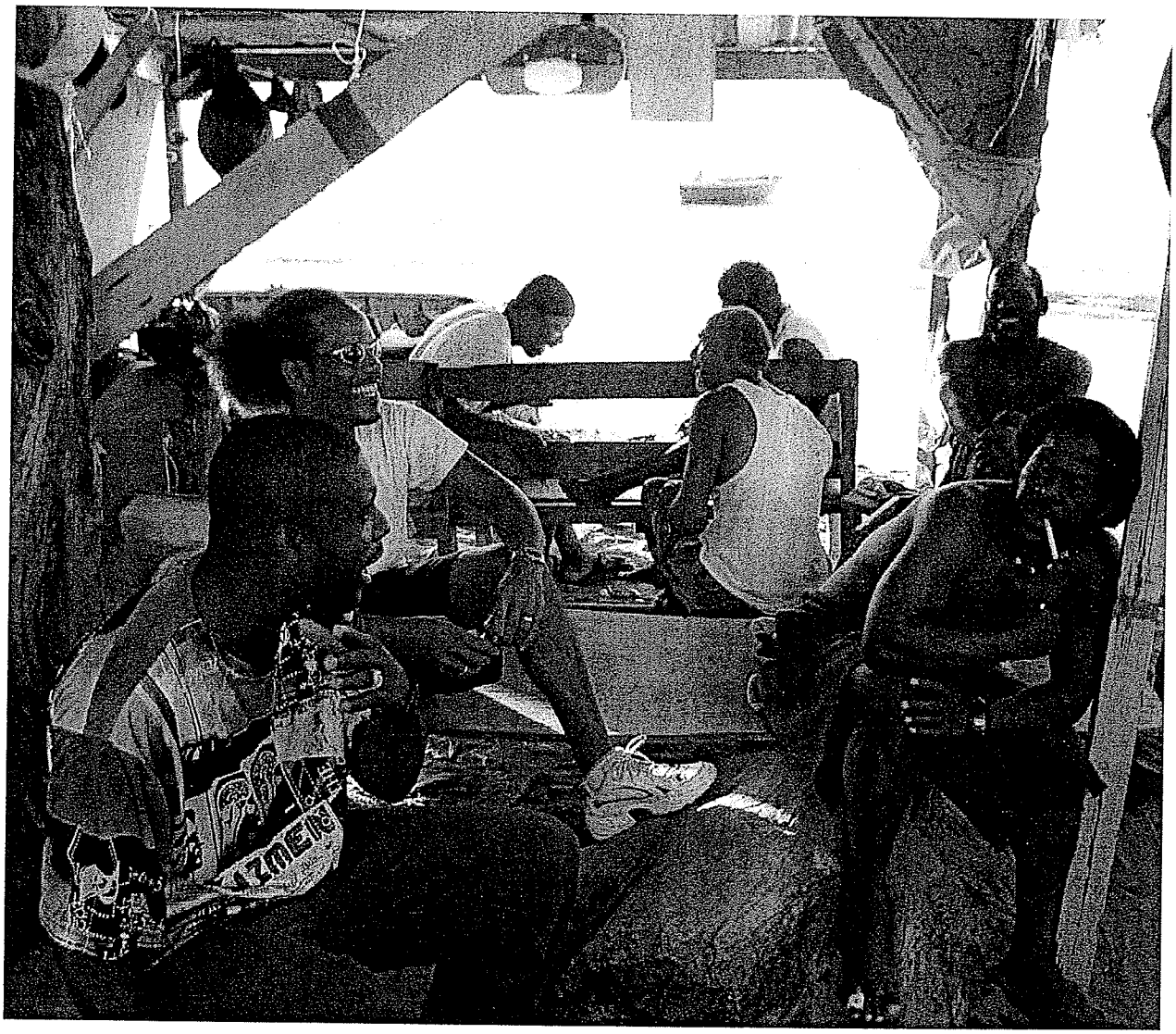


Photo: Sandra Grant – 'Barbados' social group (2003)

# CHAPTER 7: Institutions for managing the commons

The objective of this chapter is to evaluate community-based institutions related to the longline fishery, with a view for local level participation in regional and international management. The lessons from this evaluation are useful for fisheries management and will be applied to the MOD fishery planning approach in Chapter 8. The chapter begins with a literature review of the common property theory concept, focusing on the core issues of successful and sustainable community-based institutions to govern the local commons; and the challenges of scaling management to the regional commons. Second, it evaluates local fishing-related institutions (formal and informal) and highlights the problems facing self-organized resource management institutions, and the most significant factors critical to the sustainable functioning of commons institutions. Third, it argues for a possible strategy that could bridge the divide between cross-scale institutions in the management of shared stocks.

A few terms will be defined as they are used throughout this chapter. Ostrom et al. (1999) define **common-pool (or common-property) resources** as those in which exclusion of beneficiaries through physical and institutional means is costly, and exploitation by one user reduces resource availability for others. **Institution** refers to socially constructed codes of conduct that define practices, assign roles and guide interactions, and the set of rules-in-use for collective action (North, 1990; Ostrom, 1992). It can include any formal constraints (rules, laws, and constitutions) or informal constraints (norms of behaviour, conventions, and self-imposed codes of conduct) that mold interactions in a society (North, 1994). A **collective action** strategy is one that helps obtain greater joint benefit and reduces joint cost (Berkes et al., 2001). Cash and Moser (2000) define **scale** as the "specific geographically or temporally bounded level at which a particular phenomena is recognizable." **Cross-scale linkages** are relationships between different levels of governance from the local community level to the international level, as presented in this case.

## 7.1 Marine common resources and cross-scale management

Until about the 1970s the prevailing management thinking was that fishers could not self-regulate (McEvoy, 1986), as in the classic example of Hardin's (1968) classic "tragedy of the commons". Making the marine commons work and solving the "tragedy of the commons" begins by addressing the exclusion (control access to the resource) and subtractability (enforce rules among users) characteristics of the commons

To deal with subtractability, it was widely believed that government management agencies had to enforce various regulations on fishers as the only way to avoid a 'tragedy' (McCay and Acheson, 1987; Pinkerton, 1989). It is now known that fishing communities under certain circumstances are capable of using their resources in a sustainable way by making and enforcing simple and practical systems of resource use (Johannes, 1978; Pinkerton, 1989; Berkes, 1999). In other words, resource users are capable of self-organization and self-governance (Ostrom, 1990; Baland and Platteau, 1996). Individuals will rationally choose to cooperate under various conditions and situations, although cooperation may be conditional, one-shot, or continuous (Ostrom, 1998; Ostrom et al., 1999; Meffe and Carroll, 1997; Smith and Berkes, 1993; Ostrom et al., 2002). However, the outcomes in managing commons resources are highly variable. Not all fishing communities have the capability to make their own rules or regulate themselves. Yet some have traditions of social institutions and autonomous decision making for resource management, and others have their own resource use areas and a system for making rules of conduct (Ostrom et. al., 2002).

In recent years, the theory of the commons has evolved further to the governance of regional and global commons (Ostrom et al., 2002; Dolsak and Ostrom, 2003). The on-going debate in commons research is the scale related question: can findings from local-level institutions be scaled up? Researchers have now come to the realization that, to understand the global commons they have to look beyond the community-based resource management paradigm to consider a new range of issues. According to Berkes (2002), migratory marine resources challenge the commons theory and common property resource management by making the exclusion problem and the subtractability problem more difficult to deal with. This complicates commons governance arrangements, as the spatial scale, heterogeneity, and resource users increase. One promising argument is to

consider global commons as multiple levels of management that considers the problem of fit, interplay, and scale (Ostrom et al., 1999; Young, 2002a; Young, 2002b; Berkes et al., 2006). To deal with multiple levels of management new institutional arrangements have developed. Such arrangements include co-management, polycentric organization, epistemic communities, policy networks, boundary organizations, and institutional interplay (Berkes, in press). The latter is of importance to this research.

**Application of the theory to the case study**

This chapter uses theoretical insights from the commons theory to explain empirical realities in Gouyave. The problem in Gouyave is to engage local people to participate collectively in fisheries management and planning that would regulate the exploitation of migratory fish stocks which are threatened by overexploitation. The main argument of this chapter is that local and national institutions are faced with two sets of challenges. The first is the sustainability and success of local institutions, and their ability to participate in national management and planning. The second is to engage the community, national, regional, and international levels in cross-scale management of migratory fish stocks.

Regarding the first challenge, Agrawal (2002:62-63) in his comparative studies on the commons, highlights the most significant enabling conditions that scholars identified as being critical to the sustainable functioning of commons institutions (Box 7.1). His study concludes that for commons institutions to be sustainable, the resources being shared should be predictable and with well-defined boundary. Groups that are involved in managing the commons should have high social capital, small size, and low poverty. Institutional rules and sanctions should be enforced. Finally, the state should support the efforts of the group. Local institutions in Gouyave will be reviewed and checked against enabling conditions 2 and 3 presented by Agrawal (Box 7.1) to determine how best suited they are for managing the commons.

**Box 7.1: CRITICAL ENABLING CONDITIONS FOR SUSTAINABILITY ON THE COMMONS** (Agrawal, 2002:62-63)

**(1) Resource system characteristics**
(i) Small size (RW)
(ii) Well-defined boundaries (RW, EO)
(iii) Low levels of mobility
(iv) Possibilities of storage of benefits from the resource
(v) Predictability

**(2) Group characteristics**
(i) Small size (RW, B&P)
(ii) Clearly defined boundaries (RW, EO)
(iii) Shared norms (B&P)
(iv) Past successful experience – social capital (RW, B&P)
(v) Appropriate leadership – young, familiar with changing external environments, connected to local traditional elite (B&P)
(vi) Heterogeneity of endowments, homogeneity of identities and interests (B&P)
(vii) Low level of poverty
(1 and 2) Relationship between resource system characteristics and group characteristics …

**(3) Institutional arrangement**
(i) Rules are simple and easy to understand (B&P)
(ii) Locally derived access and management rules (RW, EO, B&P)
(iii) Ease in enforcement or rules (RW, EO, B&P)
(iv) Graduated sanctions (RW, EO)
(v) Availability of low-cost adjudication (EO)
(vi) Accountability of monitors and other officials to users (EO, B&P)
(1 and 3) Relationship between resource system and institutional arrangement …

**(4) External environment**
(i) Technology: (a) low-cost exclusion technology (RW); (b) time for adaptation of new technologies related to the commons
(ii) Low levels of articulation with external markets
(iii) Gradual change in articulation with external markets
(iv) State:
  (a) Central governments should not undermine local authority (RW, EO)
  (b) Supportive external sanctioning institutions (B&P)
  (c) Appropriate levels of external aid to compensate local users for conservation activities (B&P)
  (d) Nested levels of appropriation, provision, enforcement, governance (EO)

SOURCES: RW, Wade (1988); EO, Ostrom (1990); B&P, Baland and Platteau (1996).

The second challenge is the cross-scale management of migratory fish stocks. Shared fish stocks may be used by coastal and offshore fisheries, by small and large-scale harvesters, and by more than one nation. This makes establishing rules and regulations amongst users more complicated. First, migratory resources pose enforcement issues in that the movement of fish stocks makes it difficult to develop shared values and mutually agreeable rules among the users who can monitor each another's behaviour and impose sanctions. Second, migratory resources pose cross-boundary issues. It may be necessary to have commercial fishery quotas enforced by government authorities, as community-based solutions would not be effective. In the case of resources fished by several nation states, international institutions are needed. Such resources create cooperation and enforcement problems that cannot be solved at the local or national levels. Finally, migratory resources pose spatial scale, heterogeneity, and resource user issues. Scales become critical, the community's ability to limit access and regulate their own resource use becomes limited, international common resource management becomes more complex, and institutional mechanisms that can connect the local level with regional and international levels become very important. Consequently, participatory management involves linking community-based institutions to international organizations, harmonizing policies with countries sharing the resource, and extending participation to individuals and countries with their own set of rules (Berkes, 2002; Young, 2002a; Berkes, in press).

Therefore, migratory fish stocks needs to be managed at multiple scales (Berkes, 2002). As the density of institutions operating in a social space increases, the likelihood of interplay also increases. The result, institutions will interact horizontally (at the same level of social organization) and vertically (across levels of social organization) which will increase their ability to deal with resource and environmental management (Young, 2002a; Young, 2002b). Therefore, institutional interplay and the conceptual tools of vertical and horizontal institutional linkages is one way to deal with cross-scale interaction. Can findings from local-level institutions be scaled up, or solutions from higher levels scaled-down to solve problems of cross-scale management? This case study illustrates how Gouyave fishing community can deal with the issue of scale.

## 7.2 Local fisher institutions

A review of the literature reveals that participation in management occurs through community-based organizations, where local people organize (whether by self-organization or external forces) to deal with resource issues and collaborate with government to find solutions. However, very little is discussed about informal institutions and their experience with a collective. This section evaluates local formal institutions and highlights the problems they encounter, and reviews informal institutions and extracts critical factors important to their success.

### 7.1.1 Formal fisher institutions

There were four formal fisheries-related institutions in Gouyave (Table 7.1).

**Table 7. 1: Objectives and rule systems of formal fishing-related institutions in Gouyave**

| Institutions | Objectives and rule systems |
|---|---|
| St. John's Fishermen Association (SJFA) | ▪ The SJFA was launched in 1986 to promote the social, cultural, and economic interest of its members. More specifically to sell fishing tackle, arrange for the processing and marketing of fish, encourage self-help, and formulate recommendations to government on matters related to the fishing industry.<br>▪ Constitution enforced by elected executives.<br>▪ Group inactive. |
| Gouyave Improvement Committee (GIC) | ▪ The GIC was established in 1998 to take on the organization of the annual Fishermen Birthday celebration on June 29. Later it was given the mandate of community development. The activities included the renovation of abandoned public toilets and bathing facilities, church renovation, improved infrastructure, and organized Christmas activities.<br>▪ Rules enforced by elected executives.<br>▪ Group not as strong as previous years. |
| Gouyave Sailing Club | ▪ The sailing club was established in 2000 to train and develop the sailing skills of children and adults in Gouyave to compete nationally, regionally, and internationally (the Olympics). With financial assistance from individuals they built a clubhouse equipped with sailing vessels for adults and children.<br>▪ Rules written and enforced by committee members.<br>▪ Club not as active as it could be. |
| St. John's Fishermen Cooperative Society (SJFC) | ▪ The unregistered SJFC held its first meeting in 2003 to give grassroot fishers a voice in the fishing industry and the affairs of fishers. The cooperative only lasted a few months.<br>▪ Constitutional rules enforced by elected executives.<br>▪ Group not active. |

'Formal institution' refers to organizations with written constitutions or codes of conduct, and an elected executive that oversees the activities of the group. The following section will only cover in detail two of four institutions directly involved in fisheries management, namely the St. John's Fishermen Association (SJFA) and the St. John's Fishermen Cooperative Society (SJFC). This section briefly describes the institutions and discusses the main problems faced by the groups.

#### 7.1.1.1 St. John's Fishermen Association (SJFA)

After two previously failed cooperatives, namely the St. John's Fishermen Society (1930s-50s) and the Fishermen's Cooperative (1970s), fishers wanted a group where they were in full control of the rules and administration. They decided to launch an association with an article of memorandum and register under the cooperative law. "If this organization was going to be destroyed, let fishermen destroy it" (Osmond Small, pers. comm., 2003). In 1986, the SJFA was launched with an EC$169,645 loan from HIVOS through the Agency for Rural Transformation Ltd. to build a gas station to sell fuel to Fishers, a tackle shop, and meeting room for fishers. By 1989 the association had 140 members, a constitution, and an elected management committee comprising a president, vice president, secretary, treasurer, and public relations officer (AFDP, 1992; HIVOS, 1990).

The objectives of the association were to promote the social, cultural, and economic interests of its members. More specifically, to sell fishing tackle, arrange for the processing and marketing of fish, improve the quality and output of fish products, assist members in seeking financial assistance, and make recommendations to government in matters relating to the fishing industry (SJFA, 1986). The association was active in representing fishers at the government level in such issues as illegal foreign boats and poor fish market conditions. They helped form Sauteurs, St. Mark's, Soubise, and the National Fishermen Association. They also supplied all longline fishing equipment throughout Grenada.

In 1996/1997 the SJFA started its decline from a vibrant group of over 100 members to a dysfunctional group of a dozen individuals in 2003. According to past association members, there were different reasons for this decline.

> Fishermen did not have the time to manage the affairs of the association, they had to go fishing. They didn't have the time to supervise the books. One had to leave the work of the association in the hands of non-fishermen (Alton Alexis, pers. comm., 2003).

> I am ashamed to say that some fishers didn't have the capabilities to do the job. For example, if you were having an annual general meeting and put a committee in place, some people nominated a person to do a specific task for popularity and not because they can do the work. Instead that person is honest enough to say he can't do it, some people like popularity, fame and name, they take the position and when it comes time for them to do the work, they can't do it... The biggest problem in the association (SJFA) is that people cannot read or write; that was a big setback (Osmond Small, pers. comm., 2003).

By 2002 the SJFA was almost non-functional. Fishers called the association a "*one man show*" because there were no regular meetings, no annual general meetings, and the president operated the tackle shop and gas station. Stocks at the tackle shop were low, the price of goods were higher than other fishing equipment supply stores in Gouyave, and the gas station attendant kept irregular hours which forced fishers to purchase gas from the local Texaco station. In September 2003, committee members were forced to get the association back on track, mainly due to the threat from a new Fishermen Cooperative. To resuscitate the association, they had to convene a general meeting to elect a new committee, as the last annual general meeting was held in the 1990s. The Association was in violation of its own rules, which stated that (Constitution of the St. John's Fishermen Association):

> (a) The annual General Meeting of the Association shall be held as soon as possible after the annual audit, but in any event not later than two months of the close of the financial year.
> (b) General meeting may be summoned by the President or the committee of the association...
> (c) General meeting will be held every month so that members will be informed of the progress of the Association...
> (f) The quorum for a General Meeting shall be half the members of the Association...
> (h) The President or in his absence, the Vice-President, or in the absence of both, any other member elected by those present shall preside at general meetings...
> (k) The election of a full committee or the filling of vacancies due to retirement shall be done at a General Meeting.

Neither the president nor the committee members were able to mobilize members to convene the annual general meeting vital to the reorganization of the association. The committee underestimated the willingness of its membership to participate in the reorganization process.

This once strong association was unable to sustain the momentum of the late 1980s. Past members identified three main reasons for the failure. First, poor leadership - the president and committee members did not lead the association effectively as there were no regular meetings, and when there were, very few members attended. Second, issues/problems to organize around - in the 1980s it was problems with poor market management and foreign fishers, in the 1990s it was the Fishermen's Birthday celebration, which was later handed over to the newly formed Gouyave Improvement Committee. Finally, the association was not able to enforce its own constitution.

#### 7.1.1.2 St. John's Fishermen Cooperative Society (SJFC)

In January 2003, the St. John's Fishermen Cooperative Society was initiated by Jonah Maynard and Kenson Phillips. According to these two young men, they wanted to give guidance to young fishers, organize them, and register them with the National Insurance Scheme (NIS). When asked why they started the cooperative, their responses were:

> Fishers needed to come together so when they get old they can get something from fishing. The Gouyave Improvement Committee utilized the funds from 29 June Fishermen Birthday celebration; fishermen not benefiting from them. So we get fishermen organize and get them to join the National Insurance Scheme (Jonah Maynard, pers. comm., 2003).

> The present SJFA is a 'one man show', one man control the financial aspects. We wanted to form a cooperative, because it is much different than an association. With a cooperative the members get a share, and the Department of Cooperatives monitors activities of the cooperative. We want to change from an association to a cooperative. Gouyave is the fishing capital of Grenada, other communities have cooperative and we don't. With our cooperative we will have our own tackle shop, then we don't have to buy from the association, we can buy from ourselves (Kenson Phillips, pers. comm., 2003).

The first meeting of the SJFC was convened on January 30, 2003. Soubise Fishermen Cooperative Society made a presentation on the success of their cooperative to

Gouyave fishers. Over 45 fishers attended the first meeting, with many just observing what was happening. After six meetings the average attendance was down to 19. The members nominated their steering committee and completed the bylaws of the SJFC. Later, after little agreement amongst it members, the steering committee was disbanded. During these meetings, the cooperative had visits from officials with the Department of Cooperatives and the Fisheries Division. With the bylaws in place, they were now ready to register as a cooperative society, except they did not have an office or meeting place where they could hold meetings. A meeting place was one of the many requirements of the Department of Cooperatives. With the difficulties of finding a meeting place and internal bickering, the group fell apart by December 2003.

#### 7.1.1.3 Problems with formal institutions

Formal fishers' institutions in Gouyave have not been successful in terms of functioning effectively as commons institutions. Why was there not an effective community-based institution in Gouyave? Institutions did not act as a unified voice for the fishers and stakeholders in dealing with outside institutions and national policies. The main problems faced by these formal institutions included capacity building, trust, perception, effects of marketing and technology, representation, institutional support, and power relations.

**Capacity building**. The skills required to manage a formal institution were far more than the capacity of its members. To organize and manage a formal group required skills in reading, writing, conducting meetings, negotiating skills, bookkeeping, preparing financial reports, receipts and disbursement of money, supervising staff, leadership, and attending to the needs of its members. Although training was available from the Department of Cooperatives and the Fisheries Division, many fishers did not have the basic reading and writing skills from which to benefit. The group also lacked the ability to sustain good successive leadership. During one term in office, the Association had a good leader with all the necessary skill sets, but by the next term in office there was no one with the desired skill set to succeed the previous leader.

**Trust**. There is an underlining culture of distrust in the community. Trust issues were related to social relationships and money issues. Although fishers had some level of

social trust amongst immediate family and close friends, there was little trust towards other community members and the government. They always had an overarching fear that someone was going to swindle them out of their money, a fear that came from their experience working with fishers' groups and the Fisheries Division. The fishermen cooperative of the 1970s went 'bust' because members credited equipment and did not repay, and money in the bank went missing (Joseph McDan and Alton Alexis, pers. comm., 2003). The St. John's Fishermen Association made ongoing investments in fishing equipment yet they had not been audited in six years, and members were not paid shares in years. Selwyn Mitchell (past member) blamed bad management and asset stealing as the main problems with the association. The St. John's Fishermen Cooperative members accused each other of stealing bait and fishers' money. Fishers accused staff of the Fisheries Division of not giving them aid money and equipment, and not having their interests at heart. This distrust of others was passed from fathers to sons who now refused to be part of any fishers groups or collaborate with the government.

**Perception**. There was the problem of fishers' perception and the truth. For example, a fisher commented, "I was supposed to go on an engine training course in Trinidad. They [Fisheries Division] lost my application form. Next thing I know the other two guys went, but I didn't go." When this issue was investigated it turned out the Fisheries Division asked interested applicants to apply, but they only had the funds to send two participants. Somehow this was not communicated to this fisher and he was left with the perception that something 'fishy' had occurred. This was one of the many cases where activities were not clearly set out to fishers, leaving them misinformed. In the short term the perceptions did not seem a big problem, but in the long term these perceptions built a wedge between the government and fishers.

**External markets and technology**. Increased export markets and improvements in fishing technology changed the fishing industry from subsistence to commercial fishing (Chapter 5). Increased income from fishing resulted in crew members investing in fishing by purchasing their own boats. The new wealth and responsibility entitled new boat owners to a greater voice in the development of the fishery. Further improvement in fishing technology was catalyzed by these new boat owners who had a greater knowledge of the fishery than previous investors, many of whom had either not fished 'a day in their

life' or for any length in time. The face of the industry had changed, but not the SJFA. The association was still dominated by old investors who did not welcome the new boat owners. This action forced the new boat owners and fishers to form their own fishermen cooperative which later failed. As a result, fishers developed a stronger sense of individualism. They did not feel the need to become members of a group, as they were 'busy' dealing with the demands of their new role in the fishery.

**Representation**. Who did these fisher groups represent? Fishers said the association represented the old face of the fishing industry, the original investors. Members of the SJFC said they were grassroot fishers with many recently acquiring the status of boat owners, yet they were not represented by the SJFA. These differences divided fishers into three groups. The original investors were described as having investment responsibility in fishing for what they could get, with some level of education. Many returnees were from England with money to invest in fishing, but knew very little about actual fishing. New boat owners had equipment responsibilities, they were committed to their boat, many captained their boats, but they were not sure of their new role in the industry. Fishers were without equipment responsibilities, not committed to any group or boat, did not see themselves as part of/or defending the fishing industry, and viewed themselves social outcasts. The cooperative tried to fill the niche by representing the new boat owners and fishers, but was unsuccessful due to problems with capacity building and trust. The end result was only the original investors had representation through the association.

**Institutional support**. The original investors group, the new boat owners and fishers group, and the Fisheries Division were competing for resources (technical/biological knowledge and finances) which were used to strengthen institutions (Fig. 7.1). The Fisheries Division received resources from regional and international organizations and distributed them to the different groups, including itself. In Gouyave most of the resources went to the investor group and very little, if any, to the fisher group. It was widely believed that the investor group represented the entire body of fishers and thus, most of the resources were given with the understanding that they would pass on to fishers; this was not the case. The investor group also had the means to apply for additional resources from international organizations.

Over the years the Fisheries Division focused on fishing and technological development, and nothing was done to provide structures to socially support and empower fishers. Institutional support is needed to assist the Fisheries Division deal with social issues in communities (Dr. Dunstan Campbell, pers. comm., 2003). For example, the CFRAMP and the FAO held numerous workshops on group organization and co-management with Fisheries Officers in the region. Yet a sustainable program has not been implemented in Gouyave. More work is needed at the community level to mediate activities between the Fisheries Division and the fishing community.

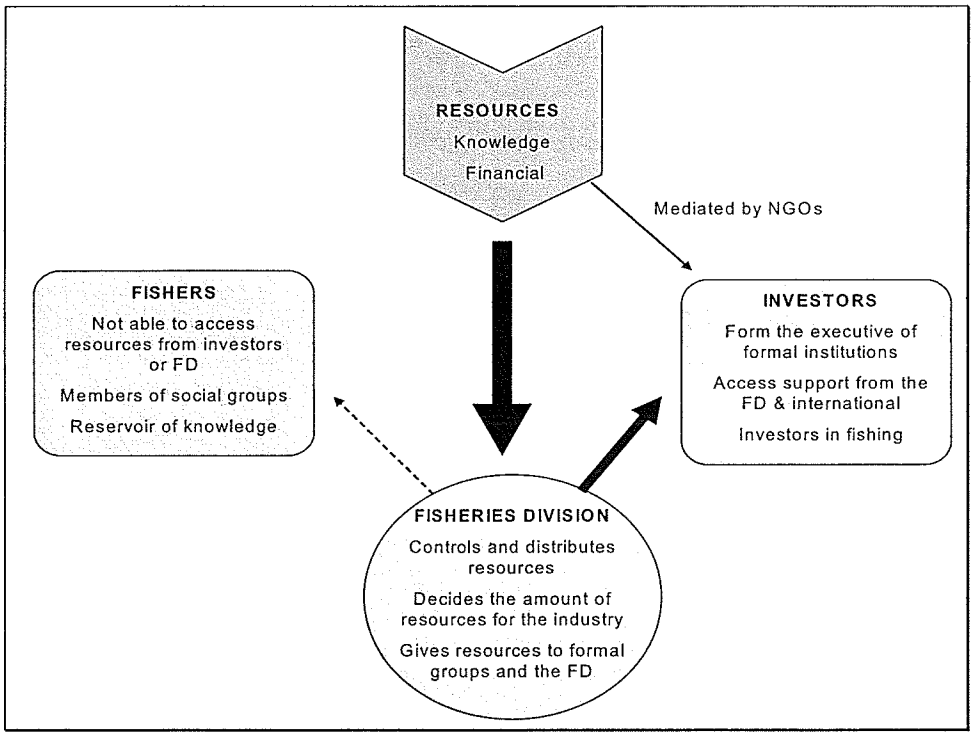



**Fig. 7. 1: The flow of resources between the Fisheries Division, boat owners, and fishers. The width of the arrows shows the amount of resources, and the broken line indicates very little resource movement.**

**Power relations.** In Gouyave, individuals and institutions with more resources had more power. The Fisheries Division and the owners group had more resources and hence more power, which they used to their benefit. The cooperative representing the fishers was unable to find an office space to complete their requirements to register the group. Some fishers said they lacked the ability to organize a space, and others said the

group was doomed to fail because of leadership and trust issues, and other commented that other powerful groups were preventing the formation of the group. Whatever the reasons, power relations issues were at play in the community. Although the new boat owners had some power, they were not able to change the local power relations in the community. The original investors held onto their power by gaining more resources from the government and 'squeezing' the new boat owners out of any further gains.

### 7.1.2 Informal fisher institutions

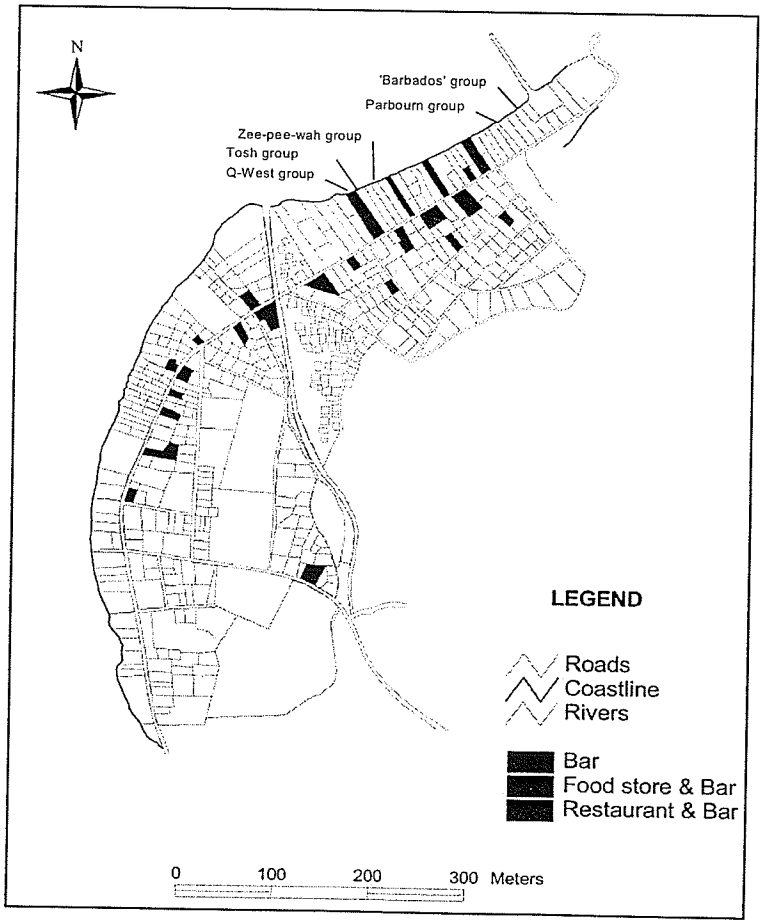
Small groups of informal institutions existed in Gouyave. 'Informal institution' refers to rules-in-use of social and fishing operations that govern the activities of community members. This section reviews informal fishing-related institutions to determine their institutional design and identify factors that make them sustainable.

#### 7.1.2.1 Social groups of fishers

There were many social groups of fishers in Gouyave. This review will focus on five groups on the L'Anse (Fig. 7.2) to show the structure and organization of social groups. For ease of reference, the researcher assigned names to groups. There was the 'Barbados' group with about 25 fishers and non-fishers, between the ages of 25-45 years mainly from the Barbados area (Fig. 3.3). This was a very cohesive group. Group members fished from Stressman's beachseine boat and other longline vessels moored near the shed where members socialized. The second group, Parbourn, had about 20 fishers between the ages of 30-65 years. This was not a very cohesive group, and consisted of fishers who hung out by Parbourn work shed because they moored their boats in the area. Most of its members were longline fishers. The third group, Zee-pee-wah, had about 15 members between the ages of 17-30 years. Mainly younger males, some still in secondary school, were members of this group. They were a cohesive group and some members fished part-time on Bourbon's beachseine boat. The group had no fixed location but was sometimes on the beach or by Zee-pee-wah's house. The fourth group, Tosh, had about 12 members between the ages of 20-50 years, that met by a boat

on Tosh's land by the beach. The fifth group, located behind Q-west, had about 20 members between the ages of 35-50 years. Most of its member fished beach seine boats.

The main rule of social groups is that you have to be invited to join. If an individual was interested in becoming a member, he/she would 'hang out' with a group. If that individual was not accepted, the group would ask him to leave. An individual was accepted based on how well he would fit in with the group, which could be based on age, personality, or a friend of a friend. Social groups were for men to meet and gamble, play cards and dominos, smoke marijuana and cigarettes, repair and maintain boats and lines, watch the weather, receive emotional support, and discuss fishing, current events, politics, and women. Groups did not have formal meetings, they came together spontaneously. Fishers were allowed to move between groups, and information on fishing transmitted by word of mouth. If an activity was planned, e.g., organized group cooking, the issue was raised, discussed, members say what they are willing to do, and it is done.




Apart from meeting as a social group, many fishers patronized the 32 bars in Gouyave Town (Fig. 7.2). Even bar socialization had its rules. Gouyave fishers were very particular about who they drank with. Main activities fishers engaged in at bars were discussions, playing card games and dominos, gambling, emotional support, and, most importantly, drinking alcohol.

**Fig. 7. 2: Map showing the location of bars and social groups in Gouyave**

#### 7.1.2.2 Fishers' own rules and practices

According to fishers, social rules-in-use evolve over time and eventually become a cultural norm in the community. Rules were in place to achieve a desired outcome and sanctions for rule breaking was enforced (Table 7.2).

Rules 1-3 (Table 7.2) were an extension of the reciprocity rule: 'you help me, and I will help you', associated sanction was if "*you don't, I don't.*" Rule 1, help others haul boats to shore. Wooden boats are heavy and require up to 12 men to pull the boat to shore. Once a fisher positioned the boat towards shore, fishers emerged from the beach to assist. If a fisher did not help, the next time he came to shore others would not assist, leaving the individual to handle the situation on his own. To justify their unwillingness to assist, fishers would repeat the rule several times within the hearing of the selfish fisher. This rule ensured fishers always gave and received assistance to haul boats to shore. Rule 2, '*badge of honour*' or respect for excellence in fishing. Individuals in any organization need to be recognized for their accomplishments; fishers are no different. They need to be acknowledged and respected for their accomplishments, such as catching the biggest fish, or catching 11 tuna in a day. This was one way to set fishing standards in the community. Rule 3, ensured fishers received fish without having to ask for it. It was also a way to ensure that old and retired fishers received fish in the future.

Rule 4, "*watch the ocean for changing currents, drifting, and sinking boats*". Fishers know that the ocean is unpredictable; they also know they are not able to watch their boats constantly as many do not live on the fishing beach. Thus, it was important that a fisher on the beach watched the ocean and boats for changing conditions. Whenever there was a problem, he immediately reported it to the owner or captain, or placed the boat out of danger. A fisher unwilling to participate in such activities would be outcast.

Rules 5-7 outline the rights of the boat owner and crew. The worst thing a crew member can do is challenge the authority of a boat owner or captain, whether verbally or with a weapon. Such cases are immediately tried by '*customary justice*' (Box 7.2). Customary justice is the community member's way of dealing with fishing-related and social disputes in the community. It is a process by which disputes are presented to community members, and they pass judgment. This was one way to enforce social and

fishing-related rules. Sanctions for violating these rules could range from fishers asked to leave the boat or not be allowed to fish for months.

**BOX 7.2: An example of customary justice**

On September 9, 2003 at 9:30 am, 'Papa' (boat owner/captain) returned from sea with 5 sailfish, 1 yellowfin tuna and 2 blackfin tuna. One crew member took the two blackfin tuna and gave them away. Papa got angry and a dispute erupted between him and the crew member.

A crowd gathered - customary justice court was now in session. The case was presented: Did the crew member have the right to give the fish away? And if he did not, what sanctions should be applied? Papa angrily presented his side of the story to all who gathered. He argued that he owned the boat and equipment, purchased gas, and the crew worked for him, thus any fish caught on the boat belonged to him and only he had the right to do whatever with the fish, not the crew.

The crew member in his defense said that, yes he gave the fish away, but he had a right to give the fish because he caught it and if he feels like giving it away that was his right. The argument went back and forth for hours, with both men shouting and cursing, using threatening verbal and bodily language, and a few 'choice words'.

The crowd eventually took side with Papa. Although, a few fishers secretly wanted the crewman to win; they believed the rule should be changed to give crew members more rights aboard vessels. Thus the rule stands, crew should not challenge boat owners, and fish caught on a boat belongs to the boat owner. As punishment, Papa fired the crew member with a strong warning. Everyone agreed the punishment was generous, as it could have been far worse. The group dispersed, but as they walked away the debate regarding the sanction continued.

Rule 9, leaders in the community are not formally elected, they have to prove themselves worthy to be the leader. One could identify the leaders based on how the community interacted with them (giving praise and respect), they had the best fishing equipment, and they were the most skilled fishers. For example, 'Papa' and 'Zee-pee-wah' jostled for leadership position for months, until Papa outperformed his opponent. Papa, with assistance from family, introduced a new type of boat and engine. He purchased a lightweight fibreglass boat from Colombia and two 50 hp four stroke engines, and in a week caught more fish than any other fisher in Gouyave.

**Table 7. 2: Fishers' own social rules-in-use and sanctions developed by the fishing community in Gouyave**

| Rules-in-use | Sanctions | Outcomes |
|---|---|---|
| 1. Must help others haul boat to shore | • Other fishers will not help haul your boat to shore<br>• Fishers will discourage crew working on owner's boat | • Help others, or you will not get help<br>• Rule is strictly enforced<br>• No compromise for age or illness |
| 2. Fishing '*badge of honour*' or respect for excellence in fishing | • Not giving you the respect as a reputable fisher<br>• Gaining the respect of others is important | • Standard of excellence is set and reset by fishers<br>• If the FD doesn't honour fishers' achievement, fellow fishers will acknowledge them |
| 3. Giving of fish to community members | • Others will not give fish to him | • Ensure your pension in fish. Fisher might not have money, but he will always have fish to eat |
| 4. While on the beach, you should 'watch the ocean' for changing tide, drifting boats, sinking boats | • Not allowed to go fishing for a while (depending on the issue)<br>• Not allowed to socialize with fishers | • Fishers able to sleep better at nights knowing that others are looking out for them.<br>• Boats are secured on the beach. |
| 5. The right of captains and crew to move freely from boat to boat | • n/a | • Crew are independent<br>• One way crew show their dis-satisfaction with owners |
| 6. Crew cannot challenge (words, action, weapon, or fight) the authority of a boat owner or captain aboard a fishing vessel | • Case will be tried by customary justice<br>• BO can ask the sailor to leave the boat | • Rule is being challenged, crew are rebelling; they want the right to defend themselves<br>• BO has power; it is their investment.<br>• Potential conflict between BO and crew |
| 7. Crew only work with captains who are successful at catching fish | • Poor performing captains will not find stable or reliable crew. | • Captains work harder at catching fish |
| 8. Leaders in the community emerge not elected | • Will be ignored, shunned | • Ensure the emerged leader has the full support of fishers<br>• Decisions and ideas of leaders is accepted |
| 9. Respect is gained by fishers' ability to 'make fears', catch a lot of fish, strong fishing family, and generosity | • Fishers and community '*bad-mouthed you*'.<br>• Fishers become an outcast in the community. | • '*Respect is the only thing a man has*', he does not have wealth, or property, but if he has the respect of his peers he has everything |
| 10. Work within the rules of the community | • Fishers are told not to work with BO<br>• If the fisher is involved in non-fishing activities e.g., bar, other will stop supporting such activities | • Community abide by the rules<br>• The rules are enforced |

### Fishing rules

Fishing operations rules-in-use are only now being defined (Table 7.3). Fishers were beginning to define rules around entangled longlines, what to do when other boats are in the same vicinity, and stealing fish from the lines of other fishers. Most fishers agreed with open access fishing, where anyone can go fishing. They were, however, aware that the sea was getting crowded with small boats. They think the 'first come' rule should be in effect for fishing, and others should position their boats up to 5 km away depending on the current, to prevent lines being tangled. If lines did tangle, both boats should work together to untangle the lines. If a fish was on the line, then the fish belonged to the line on which the fish was caught. However, if it was difficult to make the distinction, then the captains should make the decision. As the conflict between boats and longlines become more commonplace, fishers will define these rules more clearly.

**Table 7. 3: Operations rules-in-use for longline fishing, still being defined over time. There are no sanctions yet ascribed to these activities as many of these experiences are new to fishers**

| Themes | Possible rules as defined by fishers |
|---|---|
| **PROPERTY RIGHTS**<br>Nobody owns the sea | • Can not stop anyone from fishing a particular area. |
| **FISHING**<br>'First come' rule holds | • Boats reaching an area have 'first rights'.<br>• Give boat fishing at least 0.3-5 km spacing, to prevent lines tangling; Give room and space to prevent line from tangling; Check current, location of other boats, how boats setting their lines, before setting your line.<br>• When fishers meet another line, pick up your line and change position.<br>• Call (via radio) boats nearby and checks distance and direction.<br>• Call out coordinates of marker buoy to prevent tangled lines. |
| **TANGLED LINES**<br>(rule being defined) | • When line gets tangled, cut the line (sometimes it is hard to try and unravel 50 hooks at sea), remove the tangle and re-join the line.<br>• When longline tangle alter your course.<br>• Both captains should investigate and clear their lines.<br>• Best thing is to call out coordinates of marker buoy, share with other boats, so they do not get tangled |
| **FISH ON LINE**<br>(rule being defined) | • If fish is on the line, who gets there first should take it; or if you know how the line is made up and the beads, then you can give the fish.<br>• Call the other boat, if the other captain says it's not theirs, take the fish. If not, decide who owns the fish.<br>• If fish is on the line and the owner is not around, no one has the right to take the fish. |

### 7.1.3 Building successful institutions to manage the marine commons

It was common to find small groups of fishers in the streets, by the fishing beach and in bars. It was also common to see them self-organize to accomplish a task or enforce a sanction when rules are broken. For example, within three days after Hurricane Ivan, the wider Gouyave community came together to rebuild the town with debris that littered the streets, without the assistance or coordination from government or international agencies. How were they able to self-organize and self-regulate in an informal setting but not a formal one? Table 7.4 provides some insight into this dilemma.

**Table 7. 4: Factors necessary for the successful management of local commons applied to institutions in Gouyave (adapted from Box 6.1)**

| Factors | Conditions | |
|---|---|---|
| | Formal institutions | Informal institutions |
| Group characteristics | • large and medium size<br>• leaders are elected<br>• heterogeneity of interest | • large and small size<br>• clearly defined boundary<br>• shared norms<br>• social capital among members<br>• leaders emerge from the group<br>• homogeneity of identity and interests |
| Institutional arrangement | • rules are complicated by formal written systems<br>• rules rigid<br>• rules poorly enforced<br>• high cost adjudication<br>• low accountability to governing organizations | • rules are simple and easy to understand<br>• locally derived rules<br>• rules are flexible<br>• ease in enforcement of rules<br>• graduated sanctions<br>• low cost adjudication |
| External environment: government | • supportive of constitution, codes of conduct, and memorandums of understanding<br>• does not undermine local authority | • not supportive of community rule system<br>• not supportive of community sanctioning system<br>• no compensation for conservation activities |
| External environment: technology & markets | • high levels of interaction with external market<br>• low cost technology<br>• high adaptation to new technology related to the commons | |
| Resource system characteristics | • large size<br>• boundary difficult to define<br>• high species mobility<br>• not possible to store benefits from the resource<br>• unpredictable | |

Table 7.4 shows that informal institutions would be more successful than formal ones at managing the local commons. Yet more resources were given to building formal institutions for managing the commons. When these formal institutions were successful, everyone is happy. However, when they fail (and most did) fishers were left with the scar of not measuring up to the capacity required (they were stupid and illiterate), trust issues (mismanagement of money), and no support or representation (what to do when help was needed).

Capitalizing on the institutional structure of informal groups might be an option for managing the local commons. The community had the necessary group characteristics (size, boundary, social capital, leadership, and homogenous group) and institutional arrangements (flexible rule structure, sanction, and enforcement) for the most part consistent with Agrawal (2002:62-63); although, they lacked the support and recognition of government. Nevertheless, there needed to be a way to communicate the issues to the community and allow them to integrate the issues into their local system. Likewise, the structure of formal institutions has to change to allow for more flexible institutional arrangement, less reliance on the vast amount of skills set, better communication among its members, and equity in power sharing.

In conclusion, formal fisher's institutions to manage the commons in Gouyave have not been successful, and co-management arrangements between fishers and government have not yet matured. The only successful institutions are the informal ones, where rule structures have been well-established and sanctions enforced by the community. To organize a co-management arrangement in the community would take many years, and even then success cannot be guaranteed. The current case of the International Commission for the Conservation of Atlantic Tuna (ICCAT) management and conservation measures needs the immediate attention of fishers. The question is: how can fishery managers obtain the support and participation of fishers, and their institutions, in managing the marine commons at multiple levels? This next section discusses this issue.

## 7.2 Cross-scale linkages

Resource management characteristics of migratory fish resources do not fit those that would result in successful management of the commons (Table 7.4 and Box 7.1). Migratory species are shared by multiple communities within the territorial waters of countries, region, and hemisphere, which increase the complexity of management across scales. The current case of the International Commission for Conservation of Atlantic Tuna (ICCAT) measures to coordinate the management of tuna and tuna-like species in the Atlantic Ocean and adjacent seas, including the Caribbean Sea, provide an opportunity to demonstrate the complexities of managing migratory stocks across multiple scales. This section describes briefly the context of Grenada and ICCAT mainly from secondary information sources, documents fishers' response to the ICCAT's regulations, and discusses the most appropriate institutional arrangement that could be used to link local and regional levels in managing shared pelagic resources in Grenada.

### 7.2.1 Context of Grenada fisheries and ICCAT

Almost all the species harvested by the longline fishery in Gouyave are migratory and fall under the ICCAT conservation and management regulations, except dolphinfish which are being considered for regional management (Mahon and McConney, 2004). The ICCAT was established in 1969 with the following responsibility:

> ... for the study of the populations of tuna and tuna-like fish (the Scombriformes with the exception of the families Trichiuridae and Gempylidae and the genus Scomber) and such other species of fishes exploited in tuna fishing in the Convention area as are not under investigation by another international fishery organization. Such study will include research on the abundance, biometry and ecology of the fishes; the oceanography of their environment; and the effects of natural human factors on their abundance (ICCAT, 1985).

ICCAT is directly concerned with over 30 fish species. The Commission's work includes: coordinating the collection of fisheries statistics among harvesting countries; maintaining a centralized database; coordinating biological, ecological, and environmental research; and proposes, adopts, and coordinates the implementation of agreed stock management measures (www.iccat.es). Recent ICCAT assessments of several large tuna and billfish stocks show that yellowfin tuna stocks are fully exploited,

blue marlin stocks are over-exploited, white marlin stocks are severely over-exploited, sailfish stocks to be fully exploited, and swordfish stocks are over-exploited but have improved in recent years (Table 7.5). Thus, "new entrants to the fisheries are faced with stringent catch limits imposed by ICCAT to arrest stock declines or fish stock rebuilding, allowing no room for additional access" (Singh-Renton et al., 2003).

**Table 7. 5: Summary of stock rebuilding program**

| | |
|---|---|
| **1. Atlantic yellowfin tuna – stocks fully exploited** | |
| MSY | 144.6 – 152.2 MT ('000 MT) depending on models and assumptions |
| Current (2001) Yield | 157 MT |
| Management measures | • 3.2 kg minimum size regulations<br>• effective fishing effort not exceeding 1992 level<br>• closed area/season for fishing on fish aggregating devices<br>• maintain present catch levels |
| **2. Atlantic blue marlin – stocks over-exploited** | |
| MSY | 2,000 MT (2,000-3,000) [assessment results are uncertain] |
| Recent (2000) Yield | 3,394 MT |
| Management measures | • Reduced pelagic longline and purse seine landings to 50% of 1996 or 1999 levels, whichever is greater |
| **3. Atlantic white marlin – stocks severely over-exploited** | |
| MSY | 964 (849-1070) MT |
| Management measures | • In 2001 and 2002, purse seine and longline fisheries limit landings to 33% of max (1996, 1999) level |
| **4. Atlantic sailfish (ocean gar) – suspect stocks fully exploited** | |
| MSY | Not estimated, but thought to be sustainable |
| Management measures | • Maintain present levels |
| **5. Atlantic swordfish – stocks over-exploited, but have improved in recent years** | |
| MSY | 14,340 MT (11,580 – 15, 530) |
| Management measures | • Country specific quotas<br>• 125/119 cm lower jaw fork length minimum size regulations |
| Source: ICCAT Report 2002/03 | |

The ICCAT is made up of about 34 Contracting Parties[6] and other Cooperating Parties[7]. In addition, a number of international organizations, including CARICOM, are invited to participate in ICCAT meetings as observers. The CARICOM member states of Trinidad and Tobago, Barbados, and Belize became contracting parties in 1999, 2000, and 2005 respectively and joined to defend their expanding operations of large pelagic fisheries. The benefits of participating as a contracting party include: the ability to directly influence and modify ICCAT management regulations before they are adopted and enforced (i.e., a country can defends its needs and interests); the ability to directly negotiate for its catch quotas; and, the ability to secure further development of national and international trade in tuna and tuna-like products. As a cooperating party, countries have to comply fully with all ICCAT conservation and management measures, but will not be able to directly influence the process by which these regulations are agreed (Singh-Renton et al., 2003; Mahon and McConney, 2004).

Since 1991 CARICOM, through the CRFM, has been participating and representing the region as an observer at ICCAT meetings. The CRFM has played a critical role in guiding the development of CARICOM strategies for dealing with issues such as: action strategies for Belize, and St. Vincent and the Grenadines to deal with sanctions for allegedly carrying out illegal fishing activities; response strategies for countries handling queries concerning fishing operations; strategies to improve fisheries statistics and compliance; the development of regional positions; and facilitating catch quota negotiations (Singh-Renton and Phillips, pers. comm., 2004).

Regardless of membership in ICCAT, all CARICOM countries are obligated to report their tuna and tuna-like species and comply with ICCAT management measures (Table 7.5). Thus, Grenada has to comply with ICCAT regulations. Susan Singh-Renton and Paul Phillips (Pers. comm., 2004) strongly recommend that Grenada become a Contracting Party to ICCAT and make the necessary budgetary allocation for membership. They justify this position by stating:

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[6] A Contracting Party is a county or organization that has formally indicated its adherence to the ICCAT Convention. The Convention is open for signature by any government which is a member of the United Nations. The instrument of adherence is usually deposited with the Director-General of the FAO, and membership in ICCAT is effective from the date of such deposit.

[7] A Cooperating Party is a country, organization, fishing entity or entity that is not a contracting party, but which fully complies with ICCAT conservation and management measures.

At present, Grenada is neither a Contracting Party nor a Cooperating Party to ICCAT and thus, pursuant to recently agreed new ICCAT criteria for granting catch quotas, Grenada is not eligible to negotiate or to receive catch quotas for species managed by ICCAT. In effect, this means that Grenada's current level of large pelagic fishing operations and harvests do not enjoy international recognition, and also makes Grenada very vulnerable to international trade sanctions if ICCAT determines that we are not complying with its Resolutions and Recommendations. In this regard, it should be noted that two years ago, Grenada was threatened with ICCAT sanctions for allegedly not doing enough to comply with ICCAT's Stock Rebuilding Programme for the Atlantic Swordfish.

In addition to catch quota negotiating power, other important ICCAT membership (Contracting Party) benefits include: direct input into the formulation of ICCAT management resolutions and recommendations that require compliance by all countries harvesting the resources concerned, and defense of national large pelagic fisheries development interests and concerns.

Bearing in mind the importance of the fishery sector to Grenada and in particular the pelagic fishery, it is pertinent that the MALFF seriously consider becoming a Contracting Party or a Cooperating Party to ICCAT.

### 7.2.2 Fishers' response to ICCAT regulations

The introduction of ICCAT management regulations is justified as an institutional innovation to manage the resources of large pelagic species on a sustainable basis. However, it has created management problems for the fishing community in Gouyave. This section will identify problems at the community level and discuss ways to resolve them.

Anyone walking into the Gouyave Fish Market and reading posters on the wall would find two small posters (letter size paper), insignificant but with major consequences, informing fishers of the ICCAT regulations regarding swordfish and marlin stocks. The first poster concerned ICCAT's swordfish rebuilding (2000-2009) programme, to increase biomass by reducing Total Allowable Catch (TAC) to 1996 levels, and protect small swordfish (125 cm lower jaw fork length). The second poster concerned recommendations to rebuild blue and white marlin populations by maintaining or reducing landings levels to 1996 or 1999 (whichever is greater). Based on 2001 Gouyave fish landings data, these regulations translates to a reduction in swordfish catches by 93% (1996 level), and marlin catches by 23% catch (1999 level) (Fig. 7.3).

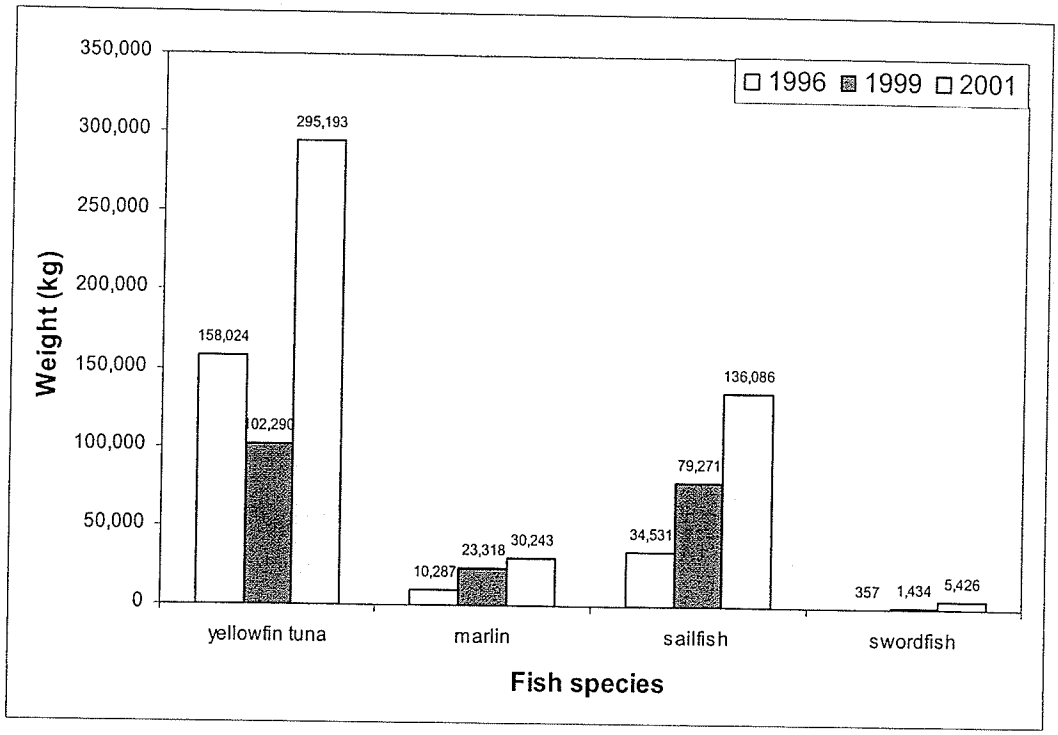



**Fig. 7. 3: Landings of yellowfin tuna, marlin, sailfish, and swordfish in Gouyave in 1996, 1999, and 2001. The figure shows the extent of catch reduction required under ICCAT management regulations. (Source: Fish landings data from the Gouyave Fish Market)**

A fisher was asked to comment on ICCAT management measures and policy adopted by the Fisheries Division. His response was:

> Right now swordfish is a bigger money. If we don't get sale for marlin and them rest of fish e.g., dolphinfish, but if we getting sale for swordfish, then we will look to hold swordfish more. Them have to come together and get a market for fish selling, so man don't have to divert and put all the priority on swordfish and marlin alone. If I get all my fish sell, and I hold a marlin, I say I won't let it go. Say for the whole month I not holding, you think if I see a marlin I will let it go? I wouldn't let it go. I will hold it. They have to try and find some diversity thing [alternative livelihood] to amend. They have to deal with the poorer countries first, they have to deal with Grenada first. So when a man sees a marlin he would say, boy! we let it go. Man won't fight to go out on a full moon, when them know swordfish running and kill them. Forget that! Forget that! [forget about ICCAT's regulations].

To determine if this was the general attitude of other fishers, the researcher discussed the regulations and implications with fishers at length. Fishers' responses are summarized in Table 7.6.

**Table 7. 6: Fishers' responses to the ICCAT's regulations, including sample comments**

| Themes | Fishers' comments | % owner (N=16) | % crew (N=6) | % group (N=3) |
|---|---|---|---|---|
| Fishers have no control over what the line catches | "Hard for us to save the stocks because we fish with lines we don't use nets. We meet fish dead sometimes. When the hook take them they dead. If we use net we could save the fish. We have no control over catching the species. Once hook take the fish, we have no control… " (Interview 19) | 56 | 33 | 100 |
| Fishers do not directly target marlin and swordfish | "Hardly hold marlin and swordfish, only certain times. Last time I spend some nights at sea didn't hold a swordfish. Marlin is a everyday thing. Can't stop it, once you set bait and it come, you have to hold it …" (Interview 11). | 50 | 33 | 33 |
| Other countries are the cause of overexploitation | "Big international countries are responsible for the failure of fish and they just want to get us involved in it." (Interview 16) | 44 | 17 | 0 |
| Option of catch and release not possible to reduce catch | "Don't have the gear to catch and release the fish. We fish small-scale. For sport fishing, they can release fish. For commercial fishing no. For bigger countries that would work" (Interview 16) | 38 | 17 | 33 |
| Policy will have an effect on livelihoods | "Tough for fishermen in Grenada. When doing this type of thing for your livelihood, we the fishermen in Grenada is not independent to catch fish and let it go. We catch any fish as long as it has a price to make money; that's our livelihood. We have children to see about, rent, telephone…" (Interview 22) | 62 | 0 | 33 |
| The regulation will not work | "Not going to work, catching we hell with that." (Interview 6) | 38 | 17 | 0 |
| Who will locally enforce the regulations? | "To reduce the catch to let it go, I would let it go but another man won't let it go. Fish is money. They have to bring a law like conch and lobster. Closed season certain times you hold and other times you don't hold."(Interview 11) | 25 | 33 | 67 |
| Compensation for reducing catch | "What work will the organization [ICCAT] get for us? We have family and bills to pay. We have to work to pay the bank. We must work. They have to pay us and the bank (for the boat owners). How many fishermen will leave boats on shore? Only salary from government or the organization is suitable enough for the fishermen." (Interview 13) | 19 | 33 | 33 |
| Agree that fish stocks are over-fished | "Good thing, what they say about overfishing is true. All the marlin fishers hold now are young marlin, and it affects me in a way. Sometimes it's the only thing you hold. When you catch it and it dies, depending on where the hook hold the fish (gill or side of the mouth …" (Interview 15) | 19 | 50 | 67 |
| Support for the policy | "It is a very good plan. In order to have fish years to come, you must make fish grow, create, build up more. Years to come we are going to be overfishing. Too much boats in the water. Grenada is the best place to do those things, it will work in Grenada. I will cooperate." (Interview 25) | 19 | 17 | 0 |

Note: multiple responses were allowed

It was clear from the discussions that many fishers and individuals in the industry had not heard of the regulations. Fishers' main concern was the design and fishing ability of the longline gear; they could not control the type of fish caught, except swordfish. Over the years they improved on the gear and fishing operations that would significantly reduce swordfish catches yet increase that of other large pelagic species (Chapter 5). It now puzzled fishers, as to how they were going to use the same gear to catch less marlin. Many said swordfish and especially marlin were economically important to the fishers, although the catch was low when compared with other large pelagic species. Some fishers concluded that Grenada is a small country and the little they took from the overall Atlantic catch was small, thus they were not the problem. Countries with larger fishing fleets and larger nets were causing the over-exploitation. The option of catch and release did not 'sit' well with the fishers. Many claimed that hauling fish from such depths would kill them. The need to feed their families and the community was always foremost on the minds of fishers. However, even if they did support the regulation, who would enforce them? Neither the coast guard nor the Fisheries Division had the capacity to enforce such regulations. Overall, the regulations would be hard on the community. If they agreed to abide by the rules, then compensation or alternative means of making a living would be required.

A breakdown of the comments of boat owners and captains revealed that they were more concerned with gear, blaming other countries for over-exploitation, and so were less inclined to support the policy. Crew members, on the other hand, agree that fish stocks were over-fished and were less inclined to blame others. Differences in outlook were due mainly to investment responsibility. Boat owners were more likely to protect their investment by arguing that they cannot support the policy due to gear, regulation, livelihood, or other countries' levels of exploitation.

Fishers argued that ICCAT regulations were shortsighted, as they focused mainly on conservation. The regulation addressed stock rebuilding, but did not deal with other issues related to the fishing industry or the community's needs. A closer review of international, regional, and national management objectives for large pelagic species revealed their similarities (Table 7.7). The overall goal was stock conservation. ICCAT's management regulations were based on conservation using robust scientific

assessment to allocate catch quotas. Regional goals were to assist CARICOM countries negotiate for a fair share of the resources and build capacities within countries for scientific assessment of fish stocks. National objectives were to support regional and international efforts to manage the stocks.

**Table 7. 7: International, regional, and national management of large pelagic species**

| Level/Institution | Objectives for Management |
|---|---|
| **INTERNATIONAL LEVEL**<br>ICCAT | ICCAT Swordfish Stock Rebuilding Programme (2000-2009)<br>Increase swordfish biomass by:<br>• reducing Total Allowable Catch (TAC), i.e. reduce catches to 1996 levels and<br>• protect small swordfish; minimum size limit 25kg or 125cm LJFL<br><br>ICCAT blue and white marlin Stock Rebuilding Programme (2000-2009)<br>• Landings maintained or reduced to "landing levels for 1996 or 1999 (whichever is greater)"<br>• Stock assessment to be conducted in 2002 for white marlin, and 2003 for blue marlin |
| **REGIONAL LEVEL**<br>CFU/CRFM | "To ensure a fair share of resources, without contravening the agreement measures by international bodies, and to take part in negotiations with other fishing nations to determine how the resources should be allocated" (Singh-Renton, et. al., 2003). |
| **NATIONAL LEVEL**<br>Grenada Fisheries Division | Management policies and objectives<br>• Acknowledge and make use of avenues existing for modest expansion in this fishery in order to increase fish production while at the same time reducing fishing pressure on the highly impacted demersal stocks.<br>• Ensure equitable sharing of resources and sea space among local fishers and for protection of the waters from foreign illegal fishers<br><br>Management strategy<br>• Support the principle of regional approach at management of stocks, which are shared and straddling jurisdictions.<br>• Promote regional/sub regional mechanism for decision-making and action<br>• Commit to follow-up guidelines provided through regional stock assessment generated by agencies such as ICCAT, UN, FAO, and CFU<br><br>Management and development constraints<br>• No single island can by its own control measures sufficiently provide for scientific management and at the same time convence its local fishers to follow strict scientific prescriptions<br>• Many species in the fishery are already determined as at or beyond MSY. Local industry depends heavily on exports to North America, which can in turn apply compliance control measures. |
| Sources: ICCAT, 2003; Singh-Renton et al., 2003; Grenada Fisheries Management Plan (unpublished report) | |

Fishers and stakeholders wanted a holistic management approach which included economic, biological, technological, and social considerations. They suggested the following:

1. Maintain economic viability of the fishery (biological and economic concerns)
   a. ***Fishing effort***: There is an urgent need to reduce or control fishing effort. Options included reducing the number of fisher and/or boats and improving the efficiency of fishing operations. The number of wooden open pirogue boats tripled in the last few years, which had the potential to increase conflicts amongst users and reduce catch per boat.
   b. ***Eliminate illegal fishing***: Fishers complain there are still illegal fishers in Grenadian waters, principally from Barbados and Trinidad. These illegal fishers helped reduce the amount of fish available to Gouyave/Grenada fishers.
   c. ***Increase local sales of fish***: To increase local sale of fish, some fishers agree that government should step in to reduce the price of fish. Local consumers are unable to pay the high price for fish, and instead buy cheaper sources of protein (chicken). Fish prices also dependent on gas prices which should be reviewed.
   d. ***Export more by-catch***: Presently mainly tuna is exported. Some marlin and dolphinfish are exported when there is a demand. If more by-catch is exported, it would help take the pressure off local sales.
   e. ***Export more tuna***: Government needs to put a better market management system in place, such as a better managed GCFL to increase fish exports.
   f. ***Improve efficiency***: Improve fishing operations by reducing fish waste, improving fish quality with better storage, and improving financial management of fishing business.

2. Provide alternative income generating activities (social concerns)
   a. ***Create employment opportunities***: In the past, agriculture and fishing were the economic backbones of the community. Today the community is supported mainly by fishing. Many fishers are involved in gardening/agriculture, and they can easily switch between fishing to agriculture. The problem is the country's failing agricultural and land policies. Tourism, in particular the cruise-ship industry, has yet to have a huge economic impact on Gouyave.
   b. ***Education and training***: academic and vocational training.

3. Monitor bait fishery (biological and technological concerns)
   a. ***Monitor jack landings and storage of jack***: With the decline in flyingfish stocks and the increased demand for small jack from the beachseine fishery, the abundance of jack may decline in the future. Further investigation is required.
   b. ***Rebuild flyingfish stocks***: Flyingfish numbers have reduced significantly over the years. Some fishers think the gillnet method of catching flyingfish does not allow

them to spawn before they are removed from the net. Other fishers say the Barbadian fishers set nets and catch most of the flyingfish. It is said "only flyingfish that escape the Bajan nets make their way to Grenada". Whatever the reason, further investigation is needed on the status of flyingfish stocks.

c. ***Storage of bait***: The longline fishery for large pelagic fish depends on the availability of bait. Fishers would like to implement better technology to store bait.

4. Maintain quality control (economic concerns)
In order to export fish to the European Union, Grenada has to maintain fish health safety standards. This means better handling of fish from the time it is caught until export. To achieve this level of quality control, fish handling and processing spaces in the community need to be streamlined. Also, improved fish quality could result in better export prices and reduced fish spoilage.

### 7.2.3 Bridging the divide between local and international levels

Based on the above results, the management of large pelagic species in Gouyave involves the interaction of four management scales/levels (Fig. 7.4). At the international level there are organizations involved in the management and conservation of large pelagic stocks. The main organization is ICCAT in their effort to coordinate the implementation of agreed on stock management measures. At the regional level are several arrangements that coordinate research and management of large pelagic stocks, such as CRFM (formerly CFU), the Organization of Eastern Caribbean States (OECS), and FAO. Their tasks are to provide financial and technical support to member countries, in their effort to assess and manage pelagic stocks. At the national level are government departments directly and indirectly involve in fisheries administration. Such departments include the Ministry of Health (food safety compliance), Coast Guard (enforce fisheries regulations), Department of Cooperatives (regulation of cooperative groups), Ministry of Finance (financial support to the Fisheries Division), Ministry of Foreign Affairs (directives on trade, international policies, and grants from foreign donors). Finally, at the local level there are Gouyave and other fishing communities involve in longline fishing. In Gouyave there are formal and informal institutions, fish processing plants, and other private enterprises that are directly and indirectly involved in the longline fishery. Apart from Gouyave, six other fishing communities are involved in longline

fishing. Each has their own rule systems, institutional involvement, and technological development. These communities are not part of this study.

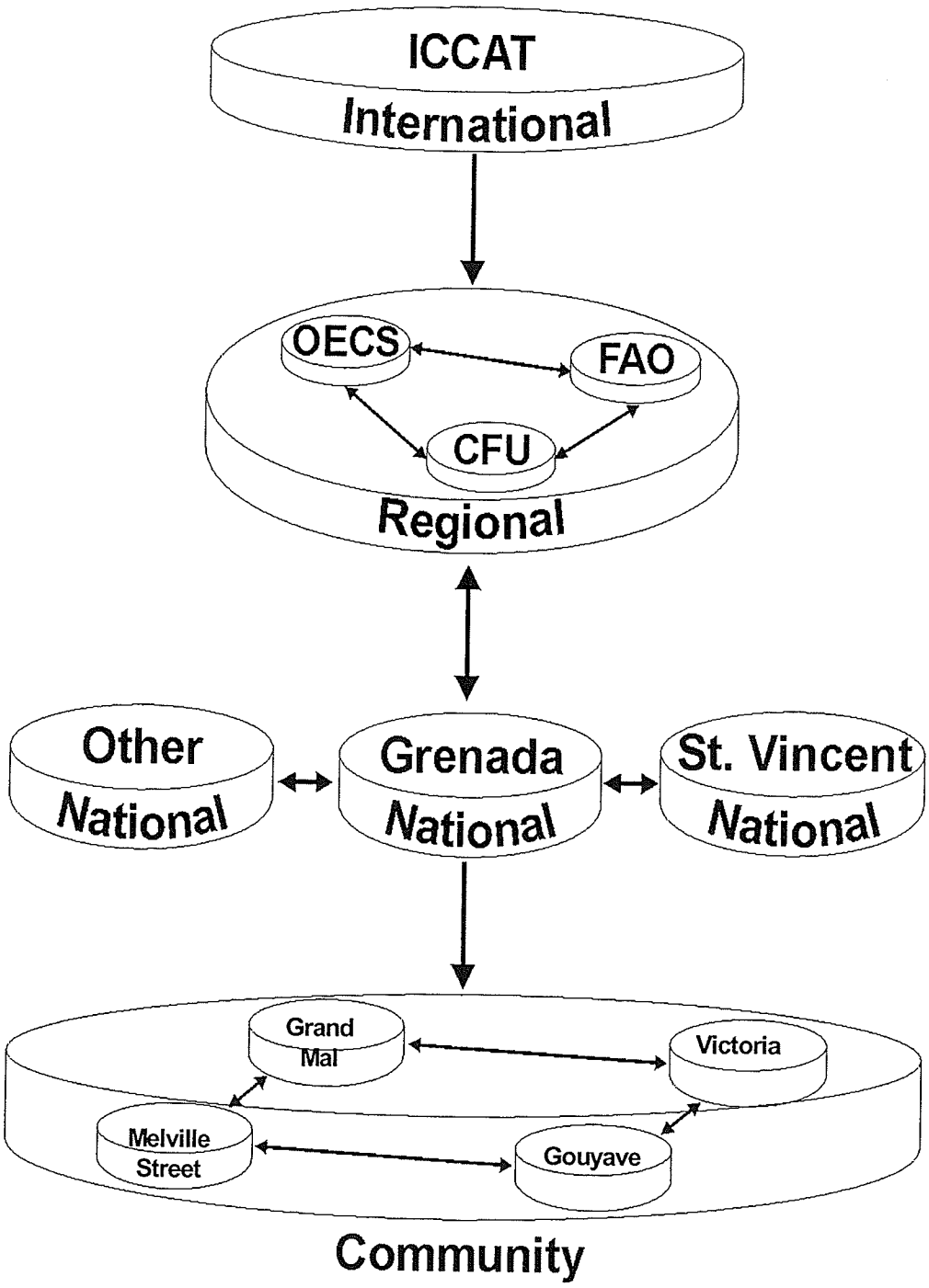



**Fig. 7. 4: Scales involved in the management of large pelagic stocks in Grenada (The CFU was replaced by the CRFM)**

What does participation in fisheries management and planning entail now that there were multiple vertical and horizontal institutional interactions, all having a stake in large pelagic stocks? The place to begin is to connect the levels, both vertically and horizontally. There was an urgent need to connect the local (fishers/community) and the national (Fisheries Division) levels to manage the longline fishery. At the local level, fishers understood the need for conservation, but they were also aware of the economic and social impacts of fishing on the community; thus, they argued for a holistic approach. It was clear that fishers had a wealth of local knowledge of the fishery, and they understood what needed to be done for management. But there was a disconnection between fishers/community members and the Fisheries Division. This disconnection was based on different views of how the fishery should be managed, complicated by issues of trust and poor communication. In this type of environment, fishers were not willing to listen or participate in management planning. Thus, the groups were at an impasse.

Connecting institutions and organizations horizontally was also a problem. At the national level the Fisheries Division has to work with at least five Ministries to deal with various issues. Each Ministry has its own mandate and priorities, and fisheries issues might be a low priority. At the local level, the issues were cultural diversity, needs of the community, and strength of local institutions. There had to be a way to link all the players involved to manage the fishery.

One way to connect the levels was with two-way communication both vertically and horizontally. In terms of the flow of information on regulations and policies regarding the management of large pelagic stocks, ICCAT regulations flowed one-way to the regional level. There was two-way flow of information between the regional and national levels. The CRFM communicated effectively with member countries, such as Grenada and St. Vincent and the Grenadines, and passed information from the countries to ICCAT. Grenada Fisheries Division in turn informed the fishing industry, taking a top-down one-way flow of information to communities. On the whole, top-down information flow was effective for the most part, but bottom-up flow was poor or non-existent. There was also horizontal information flow at the local level, as information regarding longline fishing operations was shared among fishers from other communities.

A lot of work has been done at the regional level to assist CARICOM countries participate in international management of large pelagic species, thanks to dedicated individuals and organizations. On reflection, Singh-Renton et al (2003:45) stated, "The institutional model that is emerging for the management of trans-boundary living marine resources in the Caribbean region appears to be one of flexibility, network, and adaptation of existing institutions." The strategy used regionally to link national and international institutions was facilitation and networking. Where CFU/CFRM and/or FAO coordinated the necessary technical, financial, and logistical support to network and provide countries with the necessary assistance to manage pelagic stocks. Such assistance included:

- the necessary regional support for coordinating the further development of statistics, research, and management
- a forum for technical discussion and provision of advice
- representation and participation of the region in different international forums
- technical support to develop projects to address specific research questions, and
- technical support to Fisheries Divisions/Departments to inform Ministers of the urgency of ICCAT, and urging countries to become Contacting Parties.

All this was achieved through workshops, working groups (FAO flyingfish working group and the CRFM large pelagic species working group), in-country visits, communications (via e-mail, telephone) with Fisheries Officers, and project activities (CFU, 2002).

Facilitation and networking techniques at the regional level could be adapted to connect the local and national levels to enhance two-way communication or information flow. A bridging individual or organization, acting as a facilitator, working in Grenada could network with the different groups of fishers and stakeholders in Gouyave, in other longline fishing communities, and the Fisheries Division. The facilitator could link the most appropriate groups/individuals to deal with specific issues. To test facilitating and networking strategies at the community level, the researcher played the role of facilitator. To connect local and national levels the researcher, as a facilitator did the following:

- worked with social groups and individuals to inform them and generate discussion on ICCAT's management and conservation measure, and the government's policy regarding large pelagic species
- documented fishers' concerns regarding the issues, asking what message they would like to send to the Fisheries Division
- translated the message into technical language so staff of the Fisheries Division could appreciate the issues, and translated complex technical language to simple language so fishers could understand messages from the Fisheries Division
- linked individuals with a similar knowledge base in the community to ensure the issues were dealt with by the appropriate set of people
- forced action on the part of the Fisheries Division, e.g., meeting with fishers in the community, community consultation
- worked back and forth between fishers, government, and other stakeholder groups using various strategies (focus groups, workshop, and small group discussions) to get the message across, and open the communication line between the two groups.

However, some practitioners might say the job of the facilitator is similar to that of a Fisheries extension officer. Extension officers in Grenada are trained to encourage fisheries development. These officers now need additional social skills to encourage local participation. In an environment of distrust, where officers are viewed as a government representative, cooperation is difficult to achieve (Dr. Dunstan Campbell, pers. comm., 2003). The facilitator should be an independent third party, respecting of institutional rules, and aware of his/her role in building cooperation.

## 7.3 Conclusion: institution and fisheries management

What can fishery managers learn from the findings on local institutions and cross-scale management of the marine commons in their effort to manage large pelagic stocks? Local institutions are faced with two challenges: sustainability, success, and participation of local institutions in managing the marine commons; and the management of migratory fish stocks across multiple levels.

Regarding the first challenge, local institutions can play a vital role in fisheries planning. Institutions in Gouyave represent the voices of fishers and stakeholders, and the practice of resource management and enforcement. A review of institutions revealed that informal institutions are successful because of group characteristics, rule structures, and the external environment. Yet a lot of focus and attention is given to developing formal institutions for participation in fisheries planning and none to informal ones. To gain a wider fisher, stakeholder, and community participation in fisheries planning, more could be done to include the informal institutions, while at the same time strengthen formal institutions to continue their work in the community. There should be space to accommodate all fishing-related institutions in fisheries planning and management.

Flexibility is an essential characteristic of adaptive planning and management, accommodating change and trial and error learning. Informal institutions have flexible rule structures which enable them to add and revise rules based on new experiences and circumstances, sanctions, and enforcement. Fixed rules, for a specific time and place, create brittle institutions in the future. For example, the St. John's Fishermen Association became a brittle system bounded by fixed rules made in the 1980s. Flexibility, as a characteristic of institutions is needed in any new institutional arrangement that is sought to manage the longline fishery.

Community-based institutions tend to focus resource management on well-defined resources. With defined resources e.g., conch and sea urchin stocks, it is easy to observe over-fishing and plan management measures with resource users to improve the situation. Anyone breaking the rules can be identified and sanctions imposed. Managing migratory fish stocks is not easily defined and these stocks are harvested by multiple countries. It is difficult for fishers in Gouyave to understand that their small efforts at reducing fish catch could have an impact on Atlantic stocks. Furthermore, they can not see how such rules would be enforced. Would other countries obey the rules or would they take more than they should? The dilemma in this situation is if fishers in Gouyave adhered to the rules and other countries did not, then it could still lead to the 'tragedy of the commons' anyway. Getting fishers to look beyond the needs of the community to a regional perspective is the challenge for the future.

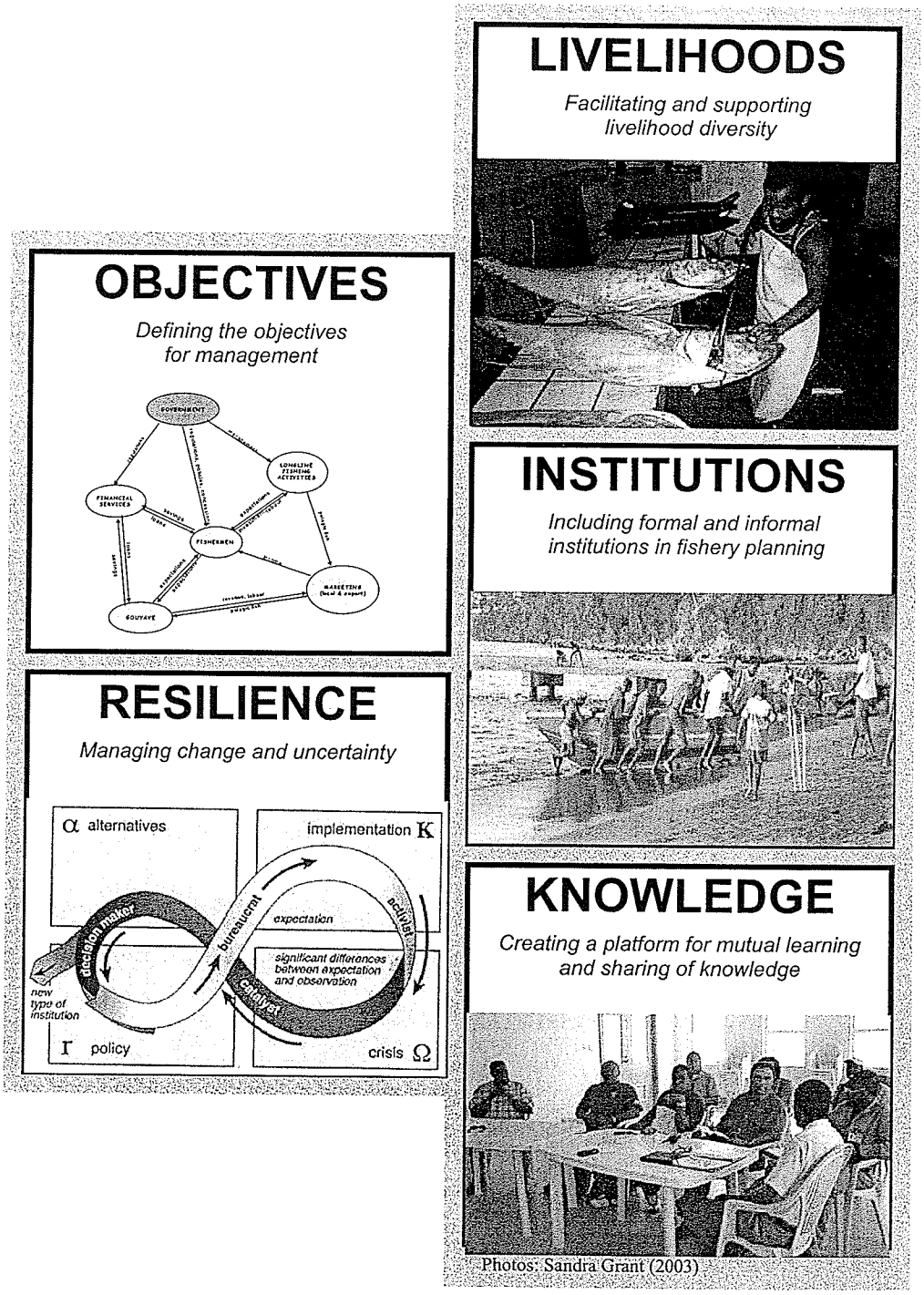
Regarding the second challenge, management of migratory fish stocks in the Atlantic Ocean requires the involvement of new partners. Successful partnerships require two-way communication between local, national, regional, and international institutions. Under the ICCAT umbrella, countries work together to develop management regulations. Regional organizations such as CRFM and FAO work tirelessly to build two-way communication between national and international organizations. However, only one-way communication exists between the local and national levels.

This research recommends that facilitation and networking, used at the regional level, could be adopted at the local-national level to ensure participation of fishers. Networking could involve linking individuals with the appropriate knowledge base to deal with specific problems. Facilitation could inform fishers, regardless of the type of local institutions, of new regulations and policies and inform government of the views of fishers (fisher knowledge), building two-way communication between the two. Fishers, given their self-organizing (own rules and practices), innovativeness (improve gear and boat technology), and adaptable (reorganize quickly after a critical change) nature, could negotiate amongst themselves how to include new regulations and policies in daily resource management decisions. For example, at a group meeting to discuss the ICCAT regulations, fisher Roger Gill asked, "If the government knew limits were coming, why did they make us increase our boat size [number of boats]?" Indeed, this is a very good question. If they were told, maybe the development of the local fishery would have been different. But it is not too late for fishers to begin thinking about the impact of international regulations and begin considering strategies for reorganization in the event there is a critical change as a result of these regulations.

A platform/space for knowledge sharing and learning at the local-national level is important for successful fisheries planning. Institutions and the arrangements they negotiate can provide the platform for participatory management. In Gouyave, the first step in getting fishers and stakeholders participating in management is to secure local institutions and prepare them for management across multiple levels.

# CHAPTER 8:

## MOD – A fishery planning process



# CHAPTER 8: the MOD approach - A fishery planning process

The objective of this chapter is to determine how a Management Objective Driven (MOD) approach may be applied to fisheries management. Using the case of the longline fishery in Gouyave, there is the opportunity to model the MOD fishery planning process to demonstrate how it could be used to develop a draft management plan for the fishery. The original MOD approach (Mahon, 1997) will be modified to include livelihoods, fisher knowledge, resilience, and institutions from Chapters 4 to 7, respectively. This chapter begins with a description of the MOD approach, and then presents a step-by-step plan of how to implement the approach.

## 8.1 The MOD planning process

The MOD approach is a promising fishery planning process (Mahon, 1997). It is an approach in which research, assessment, and management measures are based primarily upon the desired management objectives. To implement the MOD approach (Fig. 8.1), managers, working with stakeholders need to define: (1) the management objectives, i.e., what they want from the fishery; (2) the means to achieve these objectives; and (3) the means to measure successful management. It is then necessary to conduct a preliminary assessment of the fishery. Such an assessment is broader than a stock assessment, as it is a comprehensive, holistic view from which emanates a management policy, a management plan and, if necessary, a stock assessment. This process puts stock assessment in its right place and optimizes the use of funds and expertise available for management of resources in Caribbean countries. It may also be the most effective use of decision-making methods to formulate a management strategy for a fishery (Mahon, 1997). Berkes et al. (2001:40) point out that the

> ... advantage of the MOD approach is that it can be started with little or no quantitative information about the fishery. The process can be started and should be iterative. It can begin with broad objectives and simple short-term measures that will move the fishery in the direction of the objectives. It can incorporate obvious, common-sense improvements or controls. As information becomes available, the plan can be revisited and improved. This approach to

management is consistent with the precautionary principle that is now embodied in most international agreements on fisheries and environmental conservation (FAO, 1995, 1996b). It is also consistent with other elements of the international agreements that state that management should make the best possible use of the available information and should not be delayed while managers wait for better scientific information (United Nations, 1992, 1995).

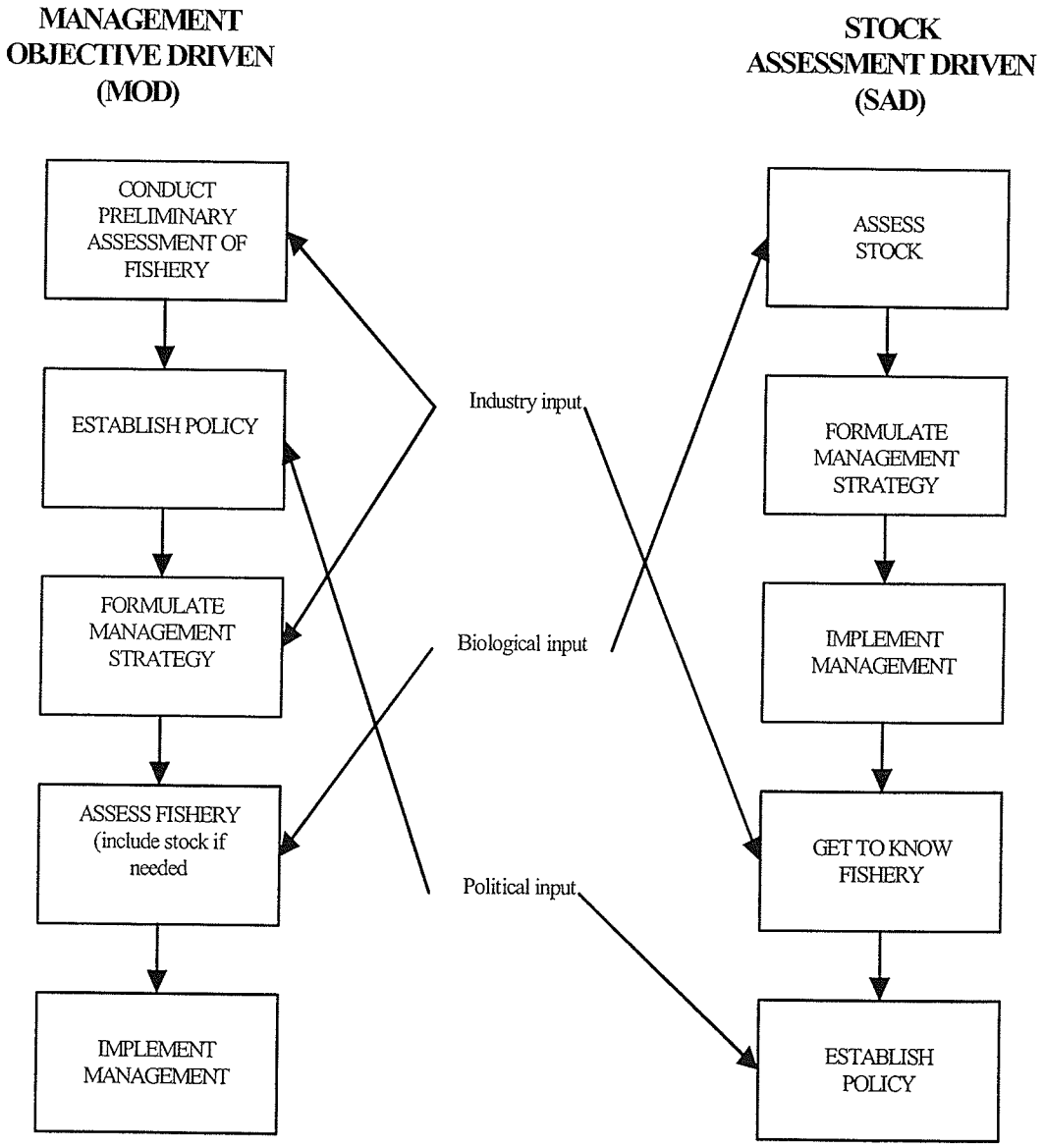



**Fig. 8. 1: The action sequence that should take place when fishery management is Management Objective Driven (MOD) and the sequence that tends to take place when it is Stock Assessment Driven (SAD). Source Mahon (1997:2209)**

Such a fishery planning process is a good fit for the Caribbean where stock assessment data are limited. It begins with broad objectives, addresses complexity and uncertainty, does not rely on stock assessment to develop policy, and treats management policies as experiments from which to learn (McConney and Mahon, 1998; Berkes et al., 2001). The one drawback to adopting this process is that it has never been implemented.

## 8.2 Implementing the MOD approach

What follows is a step-by-step outline of how the MOD approach was used to develop a draft management plan for the longline fishery. Data for this section are drawn from previous chapters.

**Step 1**: Define objective(s)

The framework began with defining the objectives for management. This step included defining the management scope, identifying stakeholders, and defining the management objectives.

First, a systems approach was used to define the scope for the longline fishery for large pelagic species. The process involved identifying parts/components of the fishery system, roles and activities of the components, and linkages between the components. As an example, see Fig. 3.8 of the high-level system representation of the longline fishery in Gouyave. The scope of the longline fishery comprised the following components: the fishing community, the fishers, longline fishing activities, marketing and distribution, financial services, and the government. Table 8.1 describes the main activities within each component. Components are linked by the movement of fish, income, goods and services, labour, expectations, and regulations (Fig. 3.8).

**Table 8. 1: Description of the components of the longline fishery in Gouyave**

| Components | | Description of main activities |
|---|---|---|
| Fishing community and fishers | | ▪ Acceptance, respect, social status, community building<br>▪ Living conditions and expenses – education, family support, health<br>▪ Livelihood activities, surviving, expectations, recreation |
| Longline fishing activities | Marine resource | ▪ Catch, effort, and biological parameters of pelagic species<br>▪ The bait fishery<br>▪ Emerging conflicts over the use of the resource |
| | Fishing activities | ▪ Number of boats, fishers, and gear types<br>▪ Fishing operations – fishing area and practices |
| | Support services | ▪ Suppliers of fishing equipment – engines, lines, boats<br>▪ Construction and maintenance– boat builders, net repair, engine repair |
| Marketing and distribution | Fish processing | ▪ Quality control – HACCP health standards for export<br>▪ Infrastructure development –storage and market facilities |
| | Marketing | ▪ Marketing and distribution of fish – local and export<br>▪ Fixed and operational expenses |
| Financial services | | ▪ Access to financing – loans, grants |
| Government | | ▪ Support – loans, concession, gas rebate, regulations, fishers representation, fishing technology<br>▪ Legal framework – licensing and registration, code of conduct for responsible fishing, fisheries management and planning, government policy, quality control<br>▪ Fisheries administration and management |

Second, identify stakeholders. It was important to identify conflicts of interest and areas of commonality that existed between the various stakeholders. A stakeholder analysis was done to investigate stakeholder interests and characteristics, groups directly and indirectly involvement in the longline fishery, and classify stakeholders by their importance and influence. The analysis generated a list of stakeholders in Table 8.2.

**Table 8. 2: Primary, secondary, and external stakeholder groups that would have an impact on longline fishing in Gouyave**

| Fishing activities | [1]Primary stakeholders | [2]Secondary stakeholders | [3]External stakeholders |
|---|---|---|---|
| Fishing/ harvesting | Longline fishers, boat owners & investors<br>Fisheries Division | Beachseine fishers<br>Consumer/Community<br>Retired fishers<br>Commercial activities (bars, supermarkets, restaurants, fish markets) | ICCAT<br>CRFM<br>FAO<br>Other government departments - Ministry of Health, Inland Revenue Dept., Coast Guard, Bureau of Standard, and Port Authority<br>GRENCODA (NGO) |
| Fishing support services | Fish cleaners<br>Boat helpers | Gear supply in St. George's:<br>Island Water World, D Tuna Hook Ltd., Marine World Ltd., West Marine, Bryden & Minors, McIntyre Brother Ltd.<br><br>Gear supply in Gouyave:<br>Land & Sea Hardware, St. John's Fishermen Association, NORDOM Seafood's ltd., JTRG hardware<br><br>Boat builders and repairs in<br>Spool makers<br>Engine repairs<br>Net makers and repairs | Grenada Customs Dept.<br>Grenada Inland Revenue<br>Forestry Dept.<br><br>Overseas distributors:<br>Gulf & Atlantic, Yamaha International, Commercial Operator (Korea), Commercial Fishing Gear Importer/Retailer (Trinidad), Commercial Fishing Retailer (USA) |
| Marketing and distribution | Local vendors<br>Export vendors and fish processing plants (NORDOM, GCFL, CSL) | Amerijet Airlines<br>Finair Airlines<br>Consumers | Overseas buyers<br>Grenada Customs Dept. |

[1]Primary stakeholders – people who directly depend on longline fishing for a living, and who make direct use of the longline pelagic species caught using this method. [2]Secondary stakeholders – people who do not use longline, but make use of products or services from longline fishing. [3]External stakeholders – have some influence, but not directly involved in longline fishing (Bunce, et al, 2000)

The stakeholders were further grouped according to their importance and influence (Fig. 8.2). For example, ICCAT (an external stakeholder) had more importance and influence than fish cleaners and boat helpers/lambia. Beachseine fishers and support service providers were important but had little influence. The main stakeholders with importance and influence were longline fishers, vendors, fish processing plants, ICCAT, and the

Fisheries Division. Thus much of the work was focused on these stakeholder groups, and others when applicable.

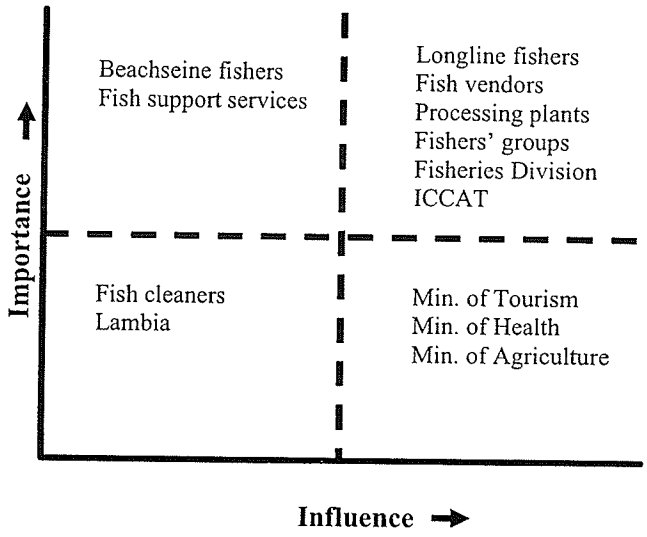



**Fig. 8. 2: Classifying stakeholders according to importance and influence (Adapted from Grimble and Wellard, 1997:176; Brown et al., 2002)**

Third, define management objective(s) with the relevant stakeholder groups. While discussing plans and future directions for the fishery with stakeholders it was discovered that management objectives differed among the groups. The management objectives of the Fisheries Division and ICCAT were similar; they wanted to implement conservation measures (Table 7.7). The management objectives of the Fisheries Division were different from the community (fishers, vendors, and investors), who wanted a holistic management approach that would include continued benefits to the community. Fishers considered conservation objectives limiting, as economic efficiency could aid conservation goals. For example, if all the fish were utilized and waste used to make fish meal, then catching less could yield the same economic value as fishing harder. Thus, a broader management objective was developed, that of '**sustainable fishing and fishing community**'.

**Step 2**: Conduct preliminary assessment of fishery – include the use of fisher knowledge

At this point a preliminary assessment of the fishery was done, based on the type and amount of information available. A preliminary fisheries assessment of large pelagic stock landed in Gouyave was conducted based on available scientific data (from the Fisheries Division) and fisher knowledge (Chapter 5). Scientific data were used to assess fish landings, species composition, and catch per unit effort (Grant and Rennie, 2005). Gouyave had no biological data to conduct a stock assessment, although some data existed for other areas using a different gear. However, they had catch statistics going back several years, but detailed effort information was sketchy. For example, daily fish landings (boat, gear, weight) were recorded at the Gouyave Fish Market; however, changes in gear use and new gear introduced were not documented. Any slight change in gear use is important in stock assessment analysis.

Since the scientific data were not available, the next step was to ask fishers to provide qualitative information on the fishery. Chapters 5 and 6 provide detailed information on the results of fisher knowledge and insights into the status of the fishery. From these chapters it was deduced that fish landings of longline increased over the years due to: increase fishing effort (number of fishers and boats); improved fishing technology (driven by local innovations); and augment knowledge of the ecological environment (knowledge of how, when, and where to catch fish). However, more needs to be done to improve informational exchange and sharing between fishers and managers.

**Step 3**: Conduct preliminary assessment of fishery – include livelihood assessment

One aspect of the overall management objective was to achieve sustainable fishing community. What is known of the livelihood system in the community that could guide decisions on sustaining Gouyave's fishing community? As very little information was available to the researcher on livelihoods in Gouyave, a livelihood assessment was conducted (See Chapter 4). Its important research findings were:

- livelihood issues were important to individuals, households, and the community.

- fishers secured a living for their households by using diversification strategies, taking advantage of fishing and non-fishing seasonal cycles, switching livelihood activities, and social exchanges.
- fishers sustained Gouyave by spending much of their income in the community boosting the local economy, and
- livelihood systems changed with social-ecological changes.

Information on livelihoods added another dimension to the preliminary assessment of the fishery, as it challenged fisheries science management objectives such as effort reduction which controls the number of fishers and boats (sustainable fishing strategies) without considering alternative options for employment (sustainable community strategy).

**Step 4**: Institutional arrangements for management

This step involved engaging stakeholders to participate in planning by identifying the institutional arrangement that best fits the community and consulting with stakeholders.

**Identify institutional arrangements.** The knowledge fishers have of large pelagic species, the livelihood structure of the community and the knowledge of the Fisheries Division on large pelagic stocks need to be integrated in planning. Although stakeholders were involved from step 1, a formalized institutional arrangement could help create the space for mutual knowledge exchange and sharing, or participatory management. This institutional arrangement should depend on what will work for fishers, the community, and government. Based on research findings from the institutional assessment in Chapter 7, the researcher suggests facilitation and networking, through the assistance of a bridging organization that has the capability to translate and decode the "language" of the parties, and to pull together the right people (Folke et al., 2005). This alternative approach will link the different groups by allowing two-way

information flow, engaging fishers in both formal and informal groups, and translating information from fisher to the Fisheries Division and vice versa.

**Consultations.** At this point of the process, consultation meetings should be held with stakeholders and the Fisheries Division mediated by a facilitator, to develop that space for knowledge sharing and trust building. This space will allow stakeholders to revisit and fine-tune the broader management objectives. Also, they could develop policy statements and management strategies for the fishery. The number of meetings and the strategies for management will depend on stakeholder relationships. In the present case, the researcher held two meetings with the Fisheries Division to reiterate the role of fishers and stakeholders in planning and management.

The first meeting was held on February 4, 2004 with staff at the Fisheries Division to present findings on problems in the longline fishing industry and fishers' views on the ICCAT's management measures. After the presentation, the group of eight management staff came to the conclusion that they had to urgently address four problems: communication, bait availability, marketing, and data collection. Regarding the issue of communication, the group members noted it was a difficult one. Not only was it necessary to improve communication between the Division and fishers, but it was also critical to improve communication with politicians (Ministers) responsible for fisheries.

To deal with fishers, the Fisheries Division decided to overhaul its extension services in Gouyave and to have regular community consultations with fishers and stakeholders. Hence, on February 15, 2004, the Fisheries Division held a consultation in Gouyave with over 37 fishers. The fishers were glad of the opportunity to interact with Fisheries Division staff and to express their views of the industry. To deal with the politicians, they decided to meet with the Minister at least once per quarter to deal with the high staff turnover of Permanent Secretaries and Ministers, and to follow-up on promises made by the politicians.

A second meeting was organized with the researcher and Fisheries Division's management staff on March 1, 2004. The aim was to discuss a team approach to dealing with problems and issues raised by fishers at the consultation meeting in Gouyave. The meeting highlighted the importance of taking a systems-thinking approach to problem-

solving, i.e., dissect problems and issues into smaller parts, determine the expertise needed to further understand the issues (include stakeholders), and work as a team to bring about a solution (Senge et al., 1994).

**Step 5**: Establish policy

At this juncture it is timely in this planning process to establish strategies for adaptive policies. This dissertation is not the appropriate forum to write policies, as any policy ought to be negotiated amongst managers and stakeholders. However, this research can help give some direction to policy considerations specific to Gouyave. Policy considerations applicable for Grenada include:

(i) Grenada becoming a member of ICCAT to negotiate for a larger share of the overall catch quota. ICCAT membership could secure Grenada's right to harvest large pelagic stocks in the future.

(ii) The Fisheries Division needs to resolve fisheries development versus conservation issues. The present focus of pushing fisheries development may be detrimental to conservation.

(iii) The Fisheries Division needs to foster dialogue with other government ministries (such as agriculture, tourism) to maintain and improve livelihoods in fishing communities such as Gouyave in particular and Grenada in General.

(iv) Continue the ban on export licenses for swordfish.

**Step 6**: Formulate management strategy

Table 8.3 outlines a first attempt to draft a fisheries management plan with the objectives and activities necessary to achieve the management goals of sustainable fishing and fishing community. The views of fishers, stakeholders, and the Fisheries Division are combined to develop this draft plan. Overall the plan addresses social, economic, biological, and technical needs of the fishery and community. The plan may have limited scope as it reflects only the perspective of Gouyave fishers, but it can be expanded to include other fishing communities. Further discussion is needed in Gouyave to fine-tune the proposed management strategy with government.

**Table 8. 3: A draft fisheries management plan for the longline fishery in Gouyave**

Management goal: sustainable fishing and fishing community

| Objectives | Activities |
|---|---|
| Maintain economic viability of the fishery | ▪ control fishing effort<br>▪ control illegal fishing<br>▪ increase sale of local fish<br>▪ increase by-catch export |
| Monitor large pelagic stocks for sustainable harvest | ▪ participate in regional and international stock rebuilding programme<br>▪ implement a biological data collection programme for critical species<br>▪ provide data for regional and international assessments |
| Monitor the bait fishery | ▪ monitor coastal pelagic fishery<br>▪ monitor flyingfish fishery<br>▪ participate in any regional assessment and negotiation on flyingfish stocks |
| Improve data collection activities | ▪ document fisher knowledge<br>▪ improve landings records at fish markets<br>▪ revise data collection and entry plans to reflect changes in the fishery<br>▪ revise licensing and registration system to include all boats and fishers |
| Maintain and improve quality control | ▪ continue training in quality control<br>▪ provide resources to fish processing plants to meet HACCP standards<br>▪ monitor fish market, processing plants, and vessels for safety standards |
| Improve fishing technology | ▪ encourage safe fishing practices<br>▪ investigate technology to store bait<br>▪ continue improvements of ship-to-shore communication |
| Increase awareness and participation | ▪ regular consultations and networking<br>▪ re-tool extension officers to be more effective in the community<br>▪ improve communication between the Fisheries Division, fishers, and politicians |
| Consider alternative income sources | ▪ participate in economic development planning activities |

**Step 7**: Assess fishery and data needs to implement management

Should this management strategy be adopted, the next step in the process would be to conduct a detailed assessment of the fishery. This will require urgent changes to the data collection activities to improve biological, fisher knowledge, and livelihood data. Other useful information could include updated information from regional stock assessment (CRFM) and ICCAT. In the meantime management strategies and policies would be in place to regulate the fishery (Steps 5 and 6).

**Step 8:** Including resilience considerations in all aspects of fisheries planning

An important addition to the MOD approach may be planning for resilience. Two important features of resilience planning are flexibility and adaptability. As Chapter 6 demonstrates, fishery managers can create management strategies and policies that build a resilient fishery system to reduce vulnerability to disturbances, including physical perturbation, changes in policies, regulations, and markets. This research brings out a number of key points that are important in fishery planning. First, feedback and monitoring should be a key part of the process. Fishery managers need to listen more to resource users, because they can provide the necessary feedback on how strategies and policies are working on the ground. Second, making changes and taking risks to try new tools and concepts. Researchers are always discovering and testing new tools, for example, practitioners are moving towards the integration of local/fisher knowledge (practical data) and scientific knowledge (hard data) (Mackinson, 2000; 2001). Fishery managers need to be informed of new tools, adapt them, and share the outcome with others. Finally, management that includes the input of fishers, stakeholders, the community, the Fisheries Divisions, and politicians leads to grounded decision-making which reduces risk and enhances flexibility and resilience. More inclusive representation is likely to give better decision-making because more aspects of the problem would be discussed. See more on resilience in Chapter 9.

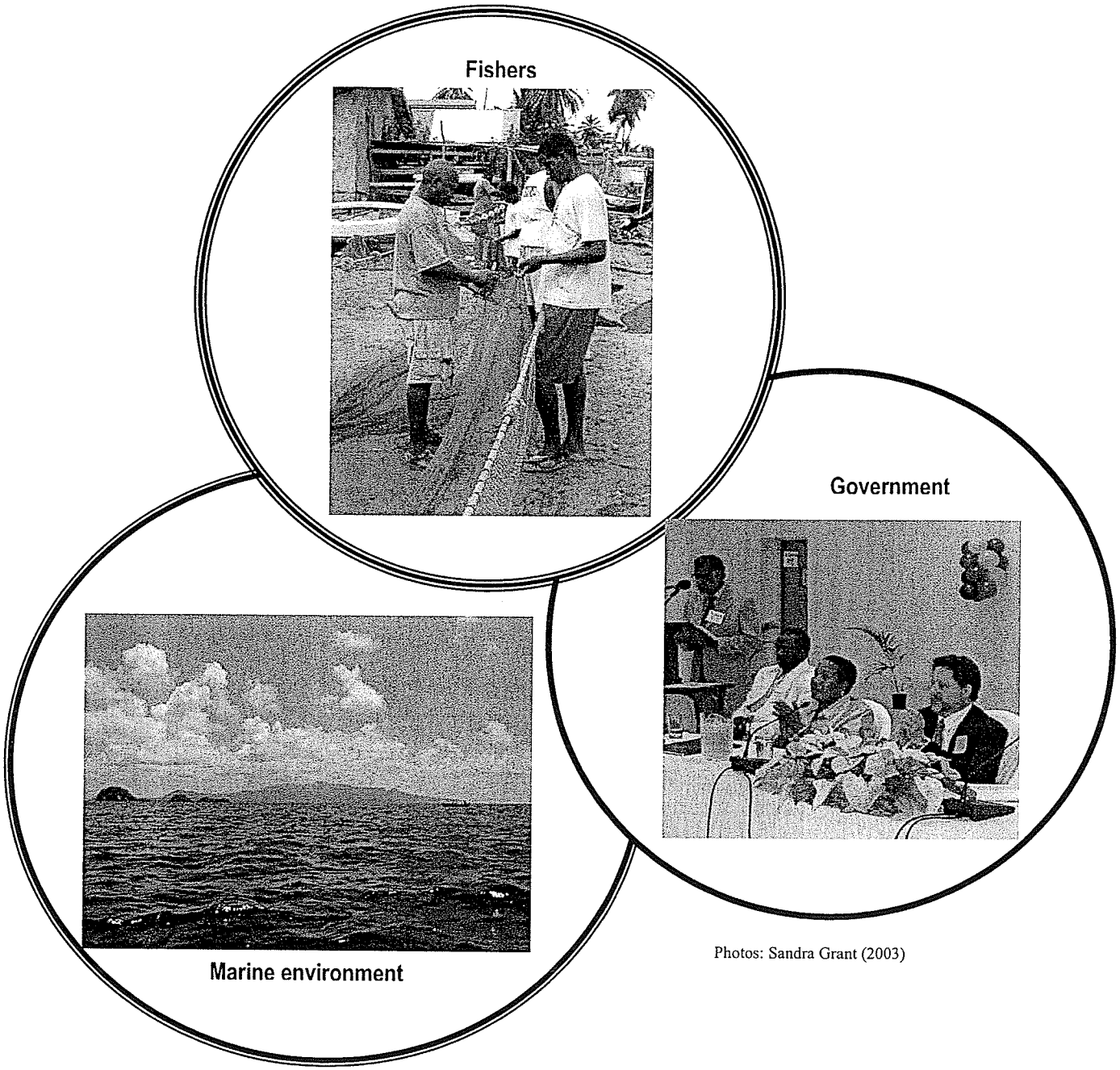
## 8.3 Conclusion: the MOD approach and fisheries planning

Conventional fisheries management tends to rely on stock assessment results to direct management strategies and policies (Munro, 1983). Unfortunately, while fishery managers wait for the assessment to be conducted, oftentimes the fishery goes unregulated. Signs of stress, e.g., slight changes in fish catch, could become a problem in the long-term if not regulated in the short-term. Yet, fishery managers may wait while a newly implemented data collection system matures to provide information on the status of the fishery. Fishery managers should consider planning (Mahon and McConney, 2004b). One such fishery planning process is the MOD approach (Mahon 1997). The MOD approach uses stakeholder knowledge and participation to develop policies and management strategies, to protect the fishery in the short-term. It is holistic, and reflects the objectives of the industry and the needs of the fishing community. The approach ensures that planning is participatory (includes local institutions and stakeholders). It begins the process of co-management with community and government involved in planning. It also considers social, economic, technical, and biological aspects in policy and decision-making.

The MOD approach has the potential to include other local communities that are involved in fishing pelagic stocks, and regional and international stakeholders. To develop a national fishery management plan for the large pelagic stocks, all fishing communities involved in harvesting need to be consulted. This is regardless of gear type (longline and trolling) and scale (from subsistence to medium scale). Fishers and stakeholders should be consulted on objectives from management, and assess the fishery based on scientific and fisher knowledge, and livelihoods. A collation of the information would strengthen the policies and management strategies already developed in this dissertation. To include regional and international perspectives, more has to be done during the consultation process to present the views of external stakeholder (such as ICCAT). Likewise, fishery managers need to represent the views of fishers and fishing communities in regional and international meetings.

# CHAPTER 9:

## Conclusions




Photos: Sandra Grant (2003)

# CHAPTER 9: Conclusions

This research started with the idea that conventional fisheries management has not been effective at managing small-scale fisheries in the Caribbean. Instead, alternative approaches that consider livelihoods, fisher knowledge, resilience, and institutions could lead to better management. Based on information from living and interacting with community members, talking with government officers, reviewing documents, and analyzing observed and collected data, the stage is now set to present some research findings. Principal findings are discussed below, along with implications for managing small-scale fisheries in the Caribbean.

**Key finding 1**: *Sustainable livelihoods mean different things to different communities. In the case of Gouyave, the fishery sector is the major sector that provides livelihood security for individuals, households, and community even though the number of fishers is small compared to the overall community.*

This key finding is based on the study's first objective: to determine how livelihoods issues can be analyzed and included in fisheries planning, as covered in Chapter 4.

In Gouyave sustainable livelihoods means two things: (1) to ensure livelihood security (food, clothing, and shelter) for individuals and households; and (2) to keep the community 'alive'. The term 'alive' means to keep the flow of fish and money circulating in the local economy so that people in the community can benefit. The sustainable livelihoods framework (Allison and Ellis, 2001), deals only with the first aspect of Gouyave community's view on sustainable livelihoods. Chapter 4 demonstrates how the community uses diversification strategies, seasonal patterns, and social support to ensure livelihood security for individuals and households.

With respect to the second aspect, fishers are not only interested in their personal livelihood security, but also the economic and social survival of the community. Fishers rely on the community to provide services (labour, restaurants) and foster cultural context (social threads that bind the community). The community relies on fish and income from fishing to generate employment and procure food. There is a close relationship between

the fishery and the community (Jentoft, 2000). The decisions fishers make regarding the fishing industry have social and economic repercussions in the community. That is why fishers are cautious about any policies (catch quotas) or fishing development (bait importation) that could affect the community. Hence, there should be a role for the community in fisheries planning, as it is a critical component in the longline fishery system in Gouyave. Communities are the missing link in fisheries management (Jentoft, 2000).

The community relies on employment from a number of economic sectors (mainly fishing and agriculture) to maintain a seasonal and diversified livelihood system. Any significant changes to any sector, particularly fishing, could make the community vulnerable by reducing income opportunities. Fishing is the main economic sector in Gouyave (Table 4.1), and as such, any modification in species abundance or composition could cause widespread change that would cascade through all components of the fishery. Any major losses to this sector could force fishers to other sectors and reduce the multiplier effect of fishing. If other sectors are unable to absorb labour from fishing the unemployment rate in the community could increase. It is clear that a strong fishing industry and a diverse economic sector are important to sustaining the community.

**Key finding 2**: *Fishers have extensive ecological and technological knowledge regarding the longline fishery that can provide useful qualitative data for fisheries assessment and planning.*

This key finding is based on the study's second objective: to determine how the use of fisher knowledge can inform institutions at various levels of management, as covered in Chapter 5.

Combining fisher and scientific knowledge can provide opportunities for innovative approaches to monitoring and fisheries management (Seixas and Begossi, 2001; Silvano and Begossi, 2005). There is a rich knowledge system amongst fishers and the Fisheries Division. Fishers have technological and ecological knowledge of fishing, and knowledge of resource management systems that evolved over time. They developed

this local knowledge and practices to suit their needs and the community, with little or no input from the Fisheries Division. The Fisheries Division has international technical, technological, and biological knowledge through regional and international training courses and workshops. Fisher knowledge can provide information for scientific assessments, fisheries management and planning. The problem is there is little to no sharing or exchange of knowledge between fishers and the Fisheries Division, because of poor communication and an estranged relationship.

Removing barriers to open two-way communication is the first step towards improved knowledge exchange. Fishery managers assume that fishers do not want to speak to them and they do not understand their technical language. Conversely, fishers think fishery managers are too "uptight", and they do not understand their colloquial speech. They need to listen more to each other.

Trust and respect are essential attributes in rebuilding the relationship for knowledge sharing between fishers and fishery managers (McConney et al., 2003). To rebuild relationships, fishery managers need to meet fishers in their own "space", i.e., meeting fishers on the fishing beach, at their homes, or in bars where they congregate, listening to their problems and issues. They need to develop a way of showing approval and appreciation for fisher knowledge and their contribution to the national economy. Fishery managers also need to understand the social rules of the community and operate within its boundary. Fishers have a role to play as well; they need to be open to the process by working together with managers.

The benefit of knowledge sharing and exchange between fishers and the Fisheries Division is a participatory management that integrates fisher knowledge in national policy, assessment, and management. Fishers have already created this platform for learning and sharing amongst themselves. The next step is to create a platform at the national level where fishers and fishery managers can develop a shared understanding of problems and potential solutions. Initial efforts at including fishers will build long-term relationships in the future. The successful integration of fisher knowledge in national management could help to integrate this knowledge at the regional level.

**Key finding 3**: *It is important to recognize the need to incorporate resilience-enhancing strategies in all aspects of fisheries management and planning.*

This key finding is based on the study's third objective: to evaluate how social and ecological systems related to the longline fishery reorganize around change using resilience, as covered in Chapters 3, 4, 5, and 6.

Resilience is all about dealing with changing circumstances, reorganizing, and renewing. Managing for resilience is an objective for most kinds of resource management, in this case, the small-scale fisheries of the Caribbean. Gouyave provides examples of how they deal with disturbances -- by diversifying and learning. These resilience-enhancing strategies are also applicable to fisheries policies and management strategies. Key findings 3a, 3b, and 3c expand on these themes.

**Key finding 3a:** *Fishers and community members are always diversifying, which may be construed as a way to enhance resilience.*

Diversity is a critical attribute of resilience (Folke et al., 2003; Chapin et al., 2004; Berkes and Seixas, 2005). Diversity is a way of life for the community; it ensures the economic, fishing, and cultural survival of the community in the midst of an uncertain social and ecological environment. To deal with uncertainty fishers and community members have options to diversify livelihood activities and strategies (fishing and non-fishing sectors), fishing activities (longline and other fishing), sources and transmission of knowledge, and kinship ties and networks.

Diversity in livelihood activities and strategies is evident in multiple sources of income opportunities. In total, 15 occupation groups are identified, with many individuals having more than one income source (Chapter 4). Community members have the flexibility to switch activities seasonally or otherwise to provide food and income for their household.

Diversity in fishing activities is evident in the variety of fish species, different gear types and uses, and role options in fishing. Longline fishers could choose and combine 13 gear types, 24 gear combinations, 10 roles in fishing, 7 fishing occupations, 6 longline types, 5 boat types, and a variety of fish species (Chapter 4). Diversity gives

fishers the flexibility to switch fish species, gear, role, and strategies to provide for their households.

Diversity in sources of knowledge is evident in the data and information from fisher and the Fisheries Division. Fishers have local technological and ecological knowledge of fishing, and the Fisheries Division has international technological, technical and biological knowledge (Chapter 5). For example, fishers need to devise a way to store bait; the Fisheries Division could provide information on enclosures at sea to assist fishers. Diverse sources of knowledge could improve problem solving.

Diversity in transmission of fisher knowledge is evident in the number of fishers and the extent of their knowledge of longline fishing. Fishers rely on their knowledge of the marine environment to determine when, how, where, and with what gear to fish, from which they develop a mental library of information on gear effectiveness, fishing ground productivity, and the availability and movement of fish (Chapter 5). This knowledge is shared amongst fishers within local institutions (formal and informal groups) by apprenticeship, data exchange, and mentorship. Diversity in information transmission ensures the knowledge is shared amongst the community of fishers, not just a few. This is done to ensure information is passed from one generation of fishers to the next.

Diversity in kinship ties and networks is evident in household structure (Chapter 3). To an outsider the multi-mother and multi-father household structure may seem chaotic or unusual. However, it may be viewed as a resilient strategy for the household. Children in a household fathered by more than one male (fishers or otherwise), ensures that if a male dies or stops supporting his child there will be fish and/or financial support from other fathers or visiting male to keep the household going. Likewise, the kinship ties, networks, and sharing systems are much wider and households could seek support from diverse sources. This strategy provides some stability for households.

**Key finding 3b:** *Fishers are always learning from perturbations, and this may help build resilience for reorganization and renewal for future changes.*

*Perturbations such as hurricanes can be opportunities from which to learn.* Natural or man-made disasters can shape the resilience of coastal communities (Adger et al., 2005). Such crises can trigger three possible responses -- no effective response,

response without experience, or response with experience (Folke et al., 2003). In Gouyave, fishers and the Fisheries Division's response to hurricane was from experience, from institutional memory (Chapter 6). The last major storm to hit Grenada was Hurricane Janet in 1955. Between 1999 and 2005, Grenada was affected by a storm surge, a direct result of Hurricane Lenny in 1999, Hurricane Ivan in 2004, and Hurricane Emily in 2005. Before Hurricane Ivan, small crises such as storm surges and tropical storms were opportunities for fishers to learn how to secure fishing equipment and explore options to invest in boats with lower capital investment. Likewise, the Fisheries Division learnt to seek regional and international technical and financial assistance to rebuild the fishing industry. These lessons helped to strengthen institutional memory, which is critical to recovery/reorganization after crises. After Hurricane Ivan the fishing sector was able to reorganize quickly after the disturbance because of experience from previous crises. Conversely, agriculture recovered slowly because it did not learn from past major crises.

The concern for Gouyave is that as hurricanes increase in numbers and intensity, the social-ecological systems will move further towards a threshold. That is, the crisis can be such that the system loses its ability to recover -- it reaches a threshold and flips to another state (Walker et al., 2004). Although institutional memory resides with fishers and government, this may not be enough to recover after a crisis. The government may know what to do and where to ask for assistance; however, resources to reorganize from international donor agencies may be limited. Likewise, damages to non-fishing sectors may be so severe there could be movement of labour to fishing.

*Innovations can also be opportunities from which to learn.* Innovations, which were based on trial and error learning in the longline fishery have resulted in increased fish catch. No one person can be credited for the success of the longline fishery; it was the effort of all the fishers. Some fishers designed the gear, while others tested and provided feedback on the effectiveness. How fishers dealt with changes in the development of the longline gear and boat showed innovative ways of addressing problems as they arose. Learning outcomes were shared amongst fishers in social settings (or social groups). Cuban fishers taught Grenadian fishers how to construct their version of the longline gear. Fishers trained on Cuban and US vessels returned to their

communities to teach other fishers. Staff at the Grenada Fisheries Division, with international training in longline techniques, also taught local fishers. Knowledge of the different designs and experience at sea encouraged fishers to experiment. Fishers learned what worked and what did not, adapted the gear, and changed fishing practices.

**Key finding 3c:** *Policies to enhance resilience may include more inclusive decision-making with stakeholder involvement, management built on flexibility and learning, and developing capacity to anticipate change.*

What are the lessons of resilience enhancing strategies to be learnt from how Gouyave deals with perturbation, which are applicable to fisheries policies and management?

- *Include stakeholder involvement*: Effective communication (mutual sharing and exchange of knowledge) and community, government, and policy makers involved in the design, research, and implementation of fisheries management are ways to include stakeholders in decision-making. Stakeholder involvement could improve decision-making and problem solving.
- *Promote flexibility*: Managing an uncertain social and ecological environment should occur in the context of flexibility related to rule structures, institutional arrangements, and diverse choices for making a living. The idea here is flexibility allows individuals and institutions to adapt and change under most given situations.
- *Facilitate learning*: Perturbations and innovations can be opportunities for learning. Capacity building, that facilitates learning, should occur at all levels involved in fisheries management, including local, national, regional, and international institutions.
- *Strengthen institutional memory*: Institutional memory is important for linking past experiences and future events. An accumulation and diversity of experience allows for innovation and novel ways to deal with perturbation.
- *Anticipate and manage change*: Two strategies can be adopted in anticipating change, (1) recognize that this will occur and (2) plan for it (Chapin et al., 2004). Fishery managers tend to focus on immediate crises (e.g., hurricane), which is difficult to mitigate. Other crises are symptoms of long-term problems that could have been

prevented if initially managed. The failure to manage long-term problems can lead to irreversible changes with societal consequences.

**Key finding 4**: *The management of large pelagic stocks involves coordinating vertical links (local, national, regional, and international levels) and horizontal ones (institutions/organization within levels).*

The key finding is based on the study's fourth objective: to evaluate community-based institutions related to the longline fishery, with a view for local level participation in regional and international management, as covered in Chapter 7.

Sustainable management of large pelagic stocks involves the interaction of multiple scales, that is, creating a complex pattern of institutional interplay (Young, 2002a; Young, 2002b). The emerging features of this case study are the interaction between and among four sets of institutional arrangements:

- international rules governing the management of large pelagic stocks – Grenada's interaction with non-Caribbean countries that share large pelagic stocks.
- several regional arrangements created to assist countries to manage large pelagic fishery – Grenada's interaction with Caribbean countries involved in harvesting large pelagic stocks. Also, regional organization dedicated to providing resources to assist countries.
- national regulatory system to govern the large pelagic fishery – Grenada Fisheries Division's interaction with other government departments, policy makers, and non-governmental organization.
- several local rules to increase benefits from the longline fishery – the interaction of formal and informal groups, communities involved in longline fishing and those that harvest large pelagic species (using other gears).

If these four sets of institutional levels are linked or interacting, then management of the fishery will be enhanced. In this case study, however, ICCAT's management measures have created a range of problems for Gouyave. Much of the problems are caused from

the disconnection between the local and national levels, which becomes a problem at higher levels.

There is the issue of compatibility, the fit between international regulations and social practice (or local rule structure) in Gouyave. The idea of catch quotas and catch reduction is consistent with conservation efforts. However, at the community level, where the fish targeted for conservation is part of a group of species caught by one gear, catch reduction is very difficult. Achieving reduction would involve reducing the catch of other species not under protection. While fishers agree that the resources are declining, and they would like to help, they think the government should consider new and innovative way to achieving ICCAT's regulations.

The task of connecting the local and national levels is of particular interest to this research. This research suggests improved communications with the use of a bridging organization (Folke et al., 2005) or individual will network the various groups to bridge the divide. This approach has many advantages. It can connect stakeholders and resolve the problem of conflicting management objectives. This dissertation is not suggesting that this is the only approach. Instead, in cases where local institutional arrangements are weak, facilitation and networking could begin the dialogue between different stakeholder groups. Also, facilitation and networking may be a good fit between the migratory fishery management problems and marine commons regime.

**Key finding 5**: *The MOD approach (with modifications) is a promising alternative to managing small-scale fisheries in the Caribbean.*

This key finding is based on the study's fifth objective: to determine how a Management Objective Driven approach may be applied to fisheries management, as covered in Chapter 8.

The Management Objective Driven (MOD) approach is an alternative to the dominant conventional stock assessment approach, to managing fisheries (Mahon 1997; Berkes et al., 2001). The modified MOD approach builds on and incorporates fisher knowledge and livelihoods in fisheries assessment. It merges an understanding of the marine ecosystem and people in fishery planning and management. Fishery assessment

reviews available scientific data and fishing activities, and combines fisher knowledge of species and fishing practices. Likewise, the livelihoods assessment analyses the socio-economic context of individuals, households, and community.

This dissertation explores the potential of the MOD approach to deal with multiple scale management of the commons. Management of large pelagic stocks requires joint national, regional, and international involvement; it also requires an understanding of fishing communities and their dependence on the marine resource. This research focuses more on the latter, the need to support all forms of local institutions to participate in management, and the need for effective communication between the local and national levels. Improved communication can lead to greater participation and information sharing in planning.

The need to view fisheries as a complex adaptive system has been advocated (Charles, 2001). But how can management deal with complexity? Management must build or strengthen resilience; essentially build flexible and adaptive systems that can address uncertainty. Managing for resilience considers livelihood diversification, local knowledge strengthened by institutional memory, local rule systems, and change and reorganization as ways fishing communities absorb unexpected perturbation. Furthermore, trial and error learning with stakeholders can lead to grounded, people-driven, government-supported management that adapts and changes. Therefore, implementing the MOD approach must take place in an environment of resilience.

**Key finding 6:** *There are advantages to the use of interdisciplinary research tools and techniques in future Caribbean fisheries management.*

Management of Caribbean fisheries has moved beyond the conventional approaches of fishery based management (Munro, 1983) towards a broader perspective of fisheries that includes the natural ecosystem, management system (national, regional, and international), and human system (the fishing industry, the fishing community, fishers). Such change in management approach requires changes in data collection techniques; thus, the need to consider new tools, concepts, methods, and management and conservation strategies in order to understand and assess the broader fisheries

perspective. This study uses a bundle of tools -- qualitative, quantitative, and PRA techniques -- and selects the most appropriate and culturally fitting techniques to answer the research objectives. This research is rich on data. Oral histories, gender investigation, interviews, and seasonal calendars provide rich narratives and detailed information. This approach gives an outsider, like this researcher, a better understanding of the social system and its relationship with the marine ecosystem.

What does this mean for fishery managers? Initially, implementing the MOD approach or simply including livelihoods, fisher knowledge, resilience, and institutional arrangement in existing management requires a lot of work. The process involves gathering and documenting information from fishers, the fishery, and the community. It also requires knowledge of analytical tools and techniques in fisheries science, social sciences, economics, and anthropology. This is unavoidable; Fisheries Divisions have to be multi-skilled to deal with complex systems problems. In this interdisciplinary environment, fishery managers need to design dynamic data collection systems to store information for assessment. They also need to build capacity or employ academically diverse staff with expertise, not just in fisheries science, but in other disciplines as well.

## Concluding remarks

> As I sat in the yard of [what had been] my home in Gouyave, reflecting on recently completed interview responses, a friend's five year old daughter walked up to me and asked, "Why yu doin what yu doin?" I guess I must have asked myself that question many times over. Why was I doing fisheries research in Gouyave? "I am here to help manage the fishery so that you and your children will have fish in the future," I told myself. I believed in sustainable management of fisheries, and the contribution of fishers in achieving this end goal.
>
> After completing this research I began to appreciate the role of the fishing community in supporting fishers. Now when I am asked why I do fisheries management research, I proudly say, "To help stakeholders protect the fishery for future generations, **and** the survival of fishing communities and their culture -- a way of life, that for many would have it no other way" – Sandra Grant.

What can one learn from investigating migratory marine commons from which fishing communities secure a living, and the need to manage this resource? The findings of this dissertation reveal: the importance of livelihood issues in assessing the fishery; the contribution of fisher knowledge in management and planning; management strategies and policies should enhance social-ecological resilience; the need to include formal and informal institutions in participatory management; and the need to link local, national, regional, and international institutions in cross-scale management of migratory resources. Moreover, the MOD approach is a useful planning tool to develop a holistic fishery management plan that includes social, economic, biological considerations. These management approaches do not rely entirely on stock assessment, but uses available information to create policies and management strategies. Likewise, it requires interdisciplinary research methods and analytical tools to deal with complex marine systems. Such an approach could lead to better management of small-scale fisheries in the Caribbean.

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## PERSONAL COMMUNICATIONS

Alton 'Guate' Alexis, boat owner/captain, February 2003

Anderson 'Papa' Binn, retired Fisheries Officer, March 2003

Carlyle Gleen Sr., former Minister of Education and educator, March 2003

Cebert Bernadine, boat owner, captain, investor, April 2005

Charlie Mollar, cocoa extension officer and farmer, 2003, April 2005

Christo, Gouyave Fish Market staff and vendor, 2003

Daniel Phillips, fisher, May 2003

Deslyn McKenzie, homemaker and accountant, April 2005

Desmond Gill, boat owner/captain, February 2003

Dorset Perrotte, retired fisher, January 2003

Dr. Dunstan Campbell, former lecturer in agricultural extension at the University of the West Indies Trinidad, consultant (agriculture & development sociology), December 2003

Francis Balwant, senior environmental health officer, Ministry of Health, March 2003

Garvey 'Baby' McPhie, boat owner, 2003 and April 2005

James Finlay, retired Chief Fisheries Officer, April 2003

Jonah Maynard, boat owner/captain and leader of the St. John's fishermen cooperative society, August 2003

Johnson St. Louis, Fisheries Officer in charge of quality control and extension, March 2003

Joseph 'One Love' Taviner, boat owner/captain, February 2003

Joseph McDan, retired fisher, January 2003 [died January 2004]

Kenson Phillips, boat owner/captain and leader of the St. John's fishermen cooperative society, September 2003

Matthew 'Guano' Duncan, retired fisher, February 2003

Michael 'Page' Nelson, boat owner/captain, December 2002, May 2003

Mr. Winsborrow, Chief Agronomist, MALFF, April 2005

Mrs. Jacobs, Central Statistical Office, February 2004

Moran Mitchell, Fisheries Officer, November 2003

Norber Simon, owner of NORDOM Seafood's Ltd., boat owner, and investor, March 2003 & April 2005

Oslyn Radix-Thomas, principal of the St. John's Anglican School (primary), November 2003

Osmond Small, former president of the St. John's Fishermen Association, repairs inboard engines, February 2003, September 2003

Paul Phillips, Fisheries Officer, April 2003

Renric 'Tizan' Munroe, retired fisher, January 2003

Roger Gill, fisher, February 2003

Roland Baldeo, Fisheries Officers in charge of fishing technology, November 2003

Samuel Bernadine, boat owner, executive member of Gouyave Improvement Committee and the St. John's Fishermen Association, September 2003

Selwyn Mitchell, former member of the St. John's fishermen association and politician, October 2003

Susan Singh-Renton, Caribbean Regional Fisheries Mechanism, St. Vincent, 2004

Terrence Moore, National Recovery Specialist focusing on Agriculture, April 2005

# APPENDICES

**[A] Research instrument**
**[B] Gear description**
**[C] Approval certificate**

## APPENDIX A – Research instruments

**Interview Introduction**

*My name is Sandra Grant, a student studying at the Natural Resources Institute, University of Manitoba, Canada. I am conducting a survey to understand the different ways in which community members make a living, and how they are able to support their households, fishers' knowledge of the marine resource, and the role of local fishers' institutions in fisheries planning. I would be grateful if you would kindly answer some questions about your household. Everything you tell me will be confidential, I will not ask or mention your name. Any information you provide will be kept anonymous, or otherwise stated. If you feel uncomfortable at anytime during this interview, you have the right to terminate the process or not respond to any question(s) asked of you. I will record information using audiotape and written. If you do not wish our discussions to be audiotape I will not do so. Please note, all audiotapes and written records will be destroyed at the end of this study.*

*The information you give me will be used to develop a draft fisheries management plan and a thesis report. Both documents will be shared with local and regional Fisheries Officers, to help them understand the dynamics of fishing communities. Ultimately the information will be used to improve fisheries planning and management. If you would like a final report, please let me know, however, at the end of my analysis I will be hosting a community meeting to present the findings of my work, which you are invited to attend. Should you have any questions concerning the study please contact me at Upper Depradine Street, Gouyave St. John's, Grenada, e-mail-*

*The Joint Faculty REB has approved the research. If you have any concerns or complaints about this project you may contact the Human Ethics Secretariat, 244 Engineering Building, University of Manitoba, Winnipeg, MB, R3T 5V6, .ca (204) 474-7122. A copy of this consent form has been given to you to keep for your records and reference. Thanks for your cooperation.*

**APPENDIX A-1: History of Gouyave**

Name: Type(s) of recording: Audio/written

Address (location): Date:

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Age:

1. How long have you lived in Gouyave?
2. Describe Gouyave before 1955? (a non-fishing perspective)
   (i) Name all the estates around Gouyave; (ii) Type of agricultural produces; (iii) Markets; (iv) Abundance of food, livestock, etc.; (v) Main commercial areas and activities
3. Describe the effects of Hurricane Janet on the community?
4. Describe the community after Hurricane Janet?
5. Describe the community during the revolution?
6. How has life changed in Gouyave after the revolution?
7. What do you see as the future for the community?

**APPENDIX A-2: History of fishing** (including marketing)

Name: Type(s) of recording:

Address (location): Date:

1. How long have you been fishing in Gouyave?
2. Describe fishing in Gouyave before 1955? - types of boats and gears used; fishing practices; selling and distribution of fish
3. Describe the effects of Hurricane Janet (1955) on the community and fishing?
4. Describe fishing in Gouyave after Hurricane Janet?
5. Describe fishing during the revolution (1979-83)?
6. Describe the effects of storm surge (Hurricane) Lenny (1999) on the community and fishing?
7. How has boat types changed over the years? - Mechanization?
8. Were you a member of any fisher's group? Describe the activities then?
9. If migrated during any of these periods, describe life in foreign country?
   - what type of work were you involved in? When did you return to Grenada? Why did you migrate?
10. How has life in Gouyave changed over the years?

**APPENDIXA-3: History of longline fishing technology**

Name: Type(s) of recording:

Address (location): Date:

Age:

1. Was there longline fishing in Gouyave before the Cubans came? If so, please describe the technology?
2. Describe the Cuban longline technology?
3. Describe the American longline technology?
4. Describe changes to the longline technology since 1983 to present?
5. Describe changes to boat type and size?
6. Describe changes to bait?
7. What do you see as the future for longline technology?
8. Recent changes to the longline technology?

**APPENDIX A-4: Longline Fishing technique**

Name: Type(s) of recording:

Address: Date:

8. What types of fishing activities are you presently engaged in?

| Type of fishing | Boat fished from | Role | Comments |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

[NOTE: specify the types of longline]

9. How did you learn longline fishing?

10. Describe your present longline in use? Type:_____

| Lines | Length (Fathoms) | Strain of the line (lbs.) |
|---|---|---|
| Mainline | | |
| Dropline | | |
| Bouy | | |
| # hooks | | |
| Total length of the line (mls) | | |

11. For multiple lines, when do you use the different lines?

| Longline type | Main & dropline strain | Bait | Hook | Fish Types | Months |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

12. Do you make any changes to the line throughout the year? If so, describe?
13. Describe a typical fishing trip? (From preparation to return to shore) (i) trips per week; (ii) distance from shore
14. How do you know where, when, and how to set your lines? (include your fishing grounds)
15. What are the rules of fishing while at sea?
16. What happens to your catch once you take it to shore? - To whom do you sell your catch?
17. On an average, how much fish/trip is given to friends and family?
18. Do you use FADS in deploying your longline? If so, how?
19. What are some of the problems being faced by the longline fishing industry? (Has catch decreased? and what could be done to improve the situation?)
20. Do you think government is doing enough to manage longline fishery? What ways?
21. What do you think will happen to longline fishing in the future?
22. Educational background: (i) Last school attended:_____ (ii) Training in fishing:_____
23. Age?
24. Why do you fish?

**APPENDIX A-5: Fisher ecological knowledge**

Name: Type(s) of Recording:
Location: Date:
Years fishing:

1. Do you catch more fish now, than say 10 years ago? Explain?
2. How do the following affect fishing?
   (i) Moon – Does the moon affect fishing? If so how
   (ii) Seawater – In what ways does seawater affect fishing?
   (iii)Current – Does current affect fishing? If so how?
   (iv)Birds – How does birds affect fishing
   (v) Weather patterns – Does the weather affect fishing? In what ways?
   (vi)Other – What other things affect fishing? (Temperature; Salinity…)

3. What do you know of the following:

| Fish Biology | Tuna | Marlin | Dolphinfish | Ocean gar | Swordfish |
|---|---|---|---|---|---|
| Diet – type of fish found in the stomach of… | | | | | |
| Reproductive patterns – what times of the year do you observe ripe eggs in … | | | | | |
| Seasonality – What months of the year do you catch a lot of ... | | | | | |
| Fish feeding behaviour | | | | | |

4. Fish migration patterns – Can you say if Tunas travel in a specific direction? Explain?
5. Other contribution to ecological knowledge?

**APPENDIX A-6: Boat expenses**

Boat Name: Date:

Owners name: Role:

Number of boats the owner has (include types of fishing):

**DAILY OPERATIONAL COSTS**

1. On an average, how many longline fishing trips does this boat takes per week/month? Why?
2. What is your average variable cost per trip?

| | Amount | Cost |
|---|---|---|
| Fuel/trip | | |
| Oil/trip | | |
| Ice/trip | | |
| Bait/trip | | |
| Food/trip | | |
| Other | | |

3. Please explain the share system on your boat?
4. Explain the lambia system?
   (How many? and average cost/trip? What do they do?)
5. Apart from your sailormen and lambia, who else do you have to pay for services provided to your operations?
6. How often to you change sailormen? Why?
7. What is the work relationship between sailormen? (What are some of the problems you face)

**MAINTENANCE/REPAIR COSTS**

8. How often do you replace gear?

9. What are your average fixed costs?

| | Cost |
|---|---|
| Replace lines | |
| Engine maintenance | |
| Hooks | |
| Buoys | |
| Rope | |
| Other replacements | |
| | |

**INITIAL INVESTMENT**

10. What are your long-term costs?

| | Numbers | Cost | Life Expectancy |
|---|---|---|---|
| Insurance | | | |
| Original boat cost | | | |
| Engine | | | |
| Lines | | | |
| Buoys | | | |
| Other equipment | | | |
| | | | |

11. Do you have a loan? If so, what is the loan for? And how much?
    Name of organization(s):
    Total loan:
    Monthly repayment:
    Years to repay loan:
12. Are your equipment insured? If so,
    Name of the Insurance Company:
    Total insurance:
    Monthly repayment:
13. When do you get paid for your fish?
14. When do you pay your crew?

**APPENDIX A-7: The Fisheries Division**

Name: Type(s) of recording:
Address: Date:

**OFFICER'S BACKGROUND**

1. How long have you worked for the Fisheries Division?
2. In what capacity? (Post/Job title: Project/Activities: )
3. The position you presently hold, how did you learn your job?
4. How often would you say staffs resign their position at the FD? Why do you think that is so?
5. Give history of the FD? And your involvement in various activities?

**DATA COLLECTION**

6. How often do you go to Gouyave to work with fishers? What type(s) of activities?
7. What types of data does the department collect on pelagic species in Gouyave?
8. Is there a regular data collection programme for pelagic fishery in Gouyave?

9. What type of fishery assessment is done? Who does the analysis? What purpose?
10. Are fishers involved in the analysis?
11. Based on you knowledge, what was the pelagic fishery in Gouyave like 10 years ago?
12. What is the status of the pelagic fishery now?

**MANAGEMENT**

13. Does the Division have a management plan for pelagic? If so, how was it developed?
14. Are fishers involved in fisheries planning? Do you think they should be involved?
15. How is policy created by the Division? Who is involved?
16. Who enforces fisheries policies? How?

**APPENDIX A-8: Fishers' groups and organizations**

Name: Group:
Address (location): Date:
Role in the fishery:

---

**THE GROUP**

1. What is the history of the institution/organization (first established, circumstances)?
2. Why did the group started OR Why was there a need to start the group?
3. What are the goals and objectives of the institution/organization?
4. What are the criteria for membership?
5. How are officers appointed in positions?
6. How are meetings conducted?
7. Benefits of the organization?
8. Structure of the organization?
9. Who does the organization reports to?
10. How long have you been a member?

**RULES**

11. What are some of the formal and informal rules?
12. Who developed the rules?
13. Were you part of the rule making process?
14. What are the penalties if members break the rules?
15. How are the rules enforced?
16. Why are you in/not in agreement with the rules?

**FISHERIES MANAGEMENT**

17. How involved has the institution/organization been towards fishery issues?
18. How has the institution/organization improved the lives of fishers and the community?
19. How is the institution/organization involved (or should be involved) in fisheries planning?
20. How active are women in the institution/organization? Expand?

**RELATIONSHIP BETWEEN GROUP MEMBERS**

21. What are some of the problems being faced by the group?
22. Would you say your members are cooperative?
23. Do you trust the members?
24. Do you like the direction in which the institution/organization is going? Why?
25. What are some of the changes you would like to see?
26. Why do you think more fishers are not members?
27. How do you see the future of the group?

**PERSONAL INFORMATION**

28. What is you position in the institution/organization?
29. Why did you join the group?
30. What are the benefits to you as a member?
31. Have any members of your family ever been members? Who?

**APPENDIX A-9: Fishers' response to ICCAT's management measures**

Name: Recording:
Location: Date:

1. Please give order of importance of Ocean fish? (marketing and eating) Why this order?
2. Introduction:

   *The International Commission for the Conservation of Atlantic Tuna (ICCAT) is an international body in Spain that manages all ocean fish. Based on their research, marlin and swordfish stocks are over-fished.*

   *Internationally, everyone agrees we need to re-build the stocks. But to rebuild marlin and swordfish populations, ICCAT wants Grenada to catch less of these fish.*

   What are your thoughts? Is it possible to reduce marlin and swordfish catches? Explain?

**APPENDIX A-10: Qualitative livelihood questions**

Date:_____ Community: _____

Household #: _____ Fisher/Boat idno: _____

**SUMMARY OF MULTI-OCCUPATIONS**

1. What would you consider to be your main occupation? _____

2. What type(s) of income-earning work do you do over a year? (both cash and in-kind activities)

| Activities (cash and in-kind activities) | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

3. In the last 12 months how would you estimate the amount of time and how much of your income comes from the above activities?

| Activities (cash and in-kind activities) | % of Time | % of Income |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

4. What types of meat to you (and your household) eat? And at what percentage?

| Meat Types | % eaten |
|---|---|
| Fish | |
| Chicken | |
| Pork | |
| Beef | |
| Goat | |
| Manecou (wild meat) | |
| Other (Specify) | |

## MULTI-HOUSEHOLDS SUPPORT

5. How many children do you have? _____
6. How many do you presently support? _____
7. How many are overseas? _____
8. How many households do you now support _____

10. Let us talk a little about all the children you now support & other households you support (e.g. parents)

What is the composition of all the households you contribute to (cash and kind)?

| Household Number | Relation to fisher | Sex | Age | Activity level | Grade left school | Occupation (s) | Hrs./day worked | Percent of income | Rate (income/ hrs.wk) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

Codes: Sex: [1] Male [2] Female; Activity level: [1] Fully active [2] Half active [3] Sickly [4] Dependent [5] child [6] Other (specify) ____; Last school attended: [1] None [2] Primary [3] Secondary [4] College/University [5] Other (specify) ____; Marital status: [1] Single [2] Married [3] Common-law [4] Widowed [5] Divorced/Separated [6] Other (specify) _____

## FISHING

11. How long have you been involved in fishing? _____

12. Describe all your activities/roles in the fishing industry? (include part-time and full-time activities)

| Gear types used | Boat name/boat owner name | Role | Hrs/day | Activity on boat |
|---|---|---|---|---|
| | | | | |
| | | | | |

13. Other activities?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Engine repairs | | Make spools | | | | | |
| Mend nets | | Cut sticks for bazor | | | | | |
| Make shacks | | Build boats | | | | | |
| Make bazor | | | | | | | |
| Make handlines | | | | | | | |

14. What types of fisheries do you deal with on a monthly basis?

| Gear type and Comments | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |

15. Describe your gear operations and combinations on a weekly basis? (how gears are combined)

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|
| | | | | | | |

16. How do you decide which gear to use? _____
17. Comments? _____

## GARDENING

18. Do you have access to gardening land/plot? [1] Yes [2] No ☐
19. Who own the land? _____
20. How is the land used? How much of the land is under cultivation? What are the 3 principal cash crops in the last 12 months? (banana, cocoa, nutmeg, seasoning, fruits)

| Plot # | Size (acres) & Location | Tenure | Distance from house plot (miles) | Land under cultivation (acres) | Frequency of visits per month | Hrs. per day X wk | Types of Tree Crops |
|---|---|---|---|---|---|---|---|
| House spot/ kitchen garden | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |

Tenure: [1] Own [2] Rent [3] Family land [4] Caretaker [5] Squatter [6] Lease to other [7] Glebe land [8] Other (specify) _____

21. Do you ever help others with gardening activities?
22. What do you do?_____
23. If you do not own your own land, what is preventing you from doing so?

_____

24. Describe your monthly gardening activities?

| Months | Activities |
|---|---|
| J | |
| F | |
| M | |
| A | |
| M | |
| J | |
| J | |
| A | |
| S | |
| O | |
| N | |
| D | |

25. Do you sell any of your food crops? [1] Yes [2] No ☐
26. If yes, to whom do you sell your food crops?
    - Export market ☐
    - Local market ☐
    - By the road side ☐
    - Wholesale vendors ☐
    - Government ☐
    - Other (specify) ☐
27. Do you sell your fruit crops? [1] Yes [2] No ☐
28. If yes, to whom do you sell your fruit crops?
    - Export market ☐
    - Local market ☐
    - By the road side ☐
    - Wholesale vendors ☐
    - Government ☐
    - Other (specify) ☐

**LIVESTOCK(S)**

29. Do you keep livestock? [1] Yes [2] No ☐
30. Describe your weekly livestock activities?

| **Livestock(2)** | **Amount** | **Hrs. per day looking after livestock(s)** | **Type of activities involved** |
|---|---|---|---|
| Beef cattle | | | |
| Dairy cattle | | | |
| Sheep | | | |
| Goat | | | |
| Pig | | | |
| Fowl | | | |

| | | | |
|---|---|---|---|
| Donkey/mule | | | |
| Other (specify) | | | |

31. Do you sell any of your livestock?
[1] Yes [2] No ☐

32. If yes, to whom do you sell your livestock?

| | |
|---|---|
| Export market | ☐ |
| Local market | ☐ |
| By the road side | ☐ |
| Wholesale vendors | ☐ |
| Government | ☐ |
| Other (specify) | ☐ |

## OTHER LIVELIHOOD ACTIVITIES

33. Summary of activities? And other skills? Present, past and future activities? What else could you do?

| | **Livelihood Activity** | **Frequency per month** | **Hrs. per day** | **Comments** |
|---|---|---|---|---|
| Present activities | | | | |
| Past activities | | | | |
| What else could you do? | | | | |

Are these activities enough to feed your household(s)? Explain? _____

**KINDSHIP SUPPORT (cash & in-kind remittances)**

34. Do you have family or friends in Gouyave who assist your household?
[1] Yes [2] No ☐

35. Types of assistance?

Cash ☐
Food ☐
Kind ☐
Other (specify) ☐
_____

36. How often do you get support?

Daily ☐
Once/week ☐
Once/month ☐
Other (specify) ☐
_____

37. Do you have family and friends in other communities who assist your household ☐
[1] Yes [2] No

38. If yes, then in which community(ies)? ___

39. Type of assistance?

Cash ☐
Food ☐
Kind ☐
Other (specify) ☐
_____

40. How often do you get support?

Daily ☐
Once/week ☐
Once/month ☐
Other (specify) ☐
_____

41. Do you have family or friends abroad who assist your household? ☐
[1] Yes [2] No

42. If yes, where? _____

43. Types of assistance? _____

**MATERIAL, SPIRITUAL, EMOTIONAL & PHYSICAL ACHIEVEMENTS**

44. After leaving school, have you had any form of training/apprentice? What type? Who sponsored your training?

_____
_____
_____

45. Marital Status? ☐
[1] Single
[2] Married
[3] Common-law
[4] Widowed
[5] Divorced/Separated
[6] Other (specify) _____

46. Have you worked abroad? ☐
[1] Yes [2] No

47. If so, how long? _____

48. What did you do while you were abroad?

_____
__

49. Are you now receiving a pension?

50. Ethnic/racial/cultural group? (observation) ☐
[1] Negro/Black
[2] East Indian
[3] Chinese
[4] White
[5] Other (specify) _____

51. Are you a member (or ever been a member) of any church group? ☐
[1] Yes [2] No

52. If yes, which denomination: ☐
[1] Roman Catholic
[2] Anglican
[3] Methodist
[4] Baptist
[5] Church of God
[6] Pentecostal
[7] Seventh-day Adventist
[8] Other (specify) _____

53. Are you a member of any community group? ☐
[1] Yes [2] No

54. If yes, which group, and in what capacity?

_____

_____

_____

55. Do you attend regular meetings? ☐
[1] Yes [2] No

56. If no, then why not?

_____

_____

_____

57. House construction?

| | | |
|---|---|---|
| Concrete | | |
| Wood | | |
| Makeshift | | |

Commid# _____

| | | |
|---|---|---|
| House | | |
| Number of rooms (incl. kitchen) | | |
| Car/truck | | |
| Bike/Bicycle | | |
| Telephone | | |
| Electricity | | |
| Water [ ] | | |
| Refrigerator | | |
| VCR/DVD | | |
| Gas stove | | |
| Washing machine | | |
| Cable | | |
| Toilet [ ] | | |
| | | |
| Other (specify) _____ | | |

58. Do you have (implying ownership of)?

59. How would you say, you spend your money?

_____

_____

_____

60. Are you able to save? ☐
[1] Yes [2] No

61. How? What institutions? _____

_____

62. In times of crisis, how would you be able to get back on your 'feet'?

| | |
|---|---|
| Gift from government | |
| Self (from saving) | |
| Loan from relatives (local) | |
| Loan from relatives (overseas) | |
| Loan from financial institutions | |
| Gift from relatives (local) | |
| Gift from relatives (overseas) | |
| Other (specify) | |

_____

63. What is your personal aim in life? ☐
[1] Material wealth
[2] Spiritual happiness
[3] Both material/spiritual
[4] Other (specify) _____

64. If applicable, what future do you wish for your children?

| | |
|---|---|
| Fishing | |
| Farming | |
| Become unskilled worker | |
| Become skilled worker | |
| White collar worker | |
| Seek future abroad | |
| Professional worker | |
| Other (specify) | |

_____

**'FAIRS**

65. What kinds of 'fairs are you presently involved in?
[1] Alcohol [2] Smoking [3] Gambling
[4]Women
[5] Entertainment

66. Describe your involvement in any of the activities above? Percent of income spent on these activities?

67. What is your alcohol of choice? _____
68. How often do you consume alcohol?
[1] Used to but not anymore [2] Daily [3] Weekends (Fri-Sun) [4] Don't drink [5] Other (specify)_____ [ ]

69. When you drink how many do you have on a typical day? Explain?

_____

70. Which bar do you frequent? And why? _____

**Additional Comments**

## HEALTH CARE

71. Have you or any members of your household(s) had any illness over the past 12 months?
[1] Yes [2] No ☐

72. If yes, complete table below.

Members of household (all households you support – question 13) ill in the last 12 months.

| Who was ill? (relation to head) | What was the nature of the complaint? | Who did you see about the illness? | Because of this problem how many days were you unable to work? | Where/who did you go for financial assistance? |
|---|---|---|---|---|
| | | | | |

Nature of illness: [1] Cold [2] Flu [3] Pregnant [4] Other (specify) _____
Who did you see: [1] Gouyave Health Centre [2] General Hospital in St. George's [3] Home remedies [4] Other (specify) _____

**APPENDIX A-11: Boat census**

1. Owner name
2. Sex
3. Address
4. Vessel name
5. Vessel number
6. Gear type used
7. Vessel active/inactive
8. Vessel material
9. Vessel length

**APPENDIX A-12: Livelihood survey**

Date: Interview number:

Sex of respondent: Male Female Head of household: Male Female

Where appropriate check (√) the appropriate answer(s). Multiple responses allowed.

1. Where do you presently live?
   - Upper Depradine Block
   - √ Central Depradine Block
   - Lower Depradine Block
   - Central Gouyave Estate
   - Douglaston
   - Maran
   - Loretto
   - Cloizer
   - Florida
   - Other

2. What do you consider your main occupation?
   - Don't work, do nothing
   - Fishing
   - Fish vendor
   - Fish processing worker
   - Lambia
   - Engine Repair and maintenance
   - Gardening
   - Pool Worker
   - Government worker
   - Student
   - Stay home and take care of children & home
   - Get support from male
   - Other

3. How long have you been involved in present activity?

4. What other type of income earning activities have you been involved in for the past 12 months?
   - Nothing else
   - Fishing
   - Give others my boat to work
   - Fish vendor
   - Share from my boat (Hire boat)
   - Gardening
   - Nutmeg farmer
   - Construction
   - Road Work
   - Sell by the road side
   - Other

5. What are the income earning activities of other members of your household?

6. If you were unable to perform your present livelihood activities, what else could you do?
   - Nothing else
   - Don't know
   - Construction
   - Mason work
   - Carpentry
   - Sell by the roadside
   - Other

7. What role do you play in fishing?
   - Was never involved in fishing
   - Do not play any role now but in the past
   - BO/Investor (#s )
   - BO/Captain (#s )
   - Captain
   - Sailorman
   - Other

8. What types of fishing activities were you involved in the last 12 months? (identify main)
   - Not involved in any fishing activity
   - Longline – small boat
   - Longline – fiberglass boats
   - Longline – large boat
   - Beachseine
   - Ground palar
   - Throw bait after common tur
   - Common tur line
   - Bankfishing
   - Other

9. Where you ever involved in longline fishing?
   - Yes
   - No

10. Are you involved in other fishing related activities?
    - No other activities
    - Mend nets
    - Make shacks
    - Make bazor
    - Making spools
    - Other

11. Do you own your house spot?
    - Own land and house
    - Own house only
    - Family land and house
    - Family house only
    - Renting
    - Living free
    - Other

12. Do you have access to gardening land?
    - Do not have access to land
    - I own the land
    - Parents land
    - Grandparents land
    - Other family members land
    - Other

13. What types of gardening activities are you involved in?
    - Don't do gardening work
    - Cutlassing/clearing land
    - Planting ground food
    - Reaping ground food
    - Picking nutmeg
    - Clearing nutmeg field
    - Backyard/kitchen garden
    - Other

14. Whom do you sell crops, fruits, nutmeg to?
    - Don't have to sell
    - Don't sell, personal use
    - GCNA
    - Marketing board
    - Sell by the road
    - Sell in local market
    - Walk and sell
    - Own food store
    - Other

15. To whom do you sell your livestock?
    - Don't have to sell
    - Have but for the home
    - Sell to butcher
    - Sell to food store
    - Kill and sell at home
    - Other

16. How were you able to save last year?
    - Don't save
    - Bank
    - Susu
    - Pool Christmas Club
    - Other

17. In times of crisis, how would you be able to get back on your feet?
    - Money from government
    - From my savings
    - Money from parents
    - Borrow money from the bank
    - Community support
    - Family and friends overseas
    - Family and friends locally
    - Other

18. Have you taken a loan/borrow money from anyone?
    - No loan
    - From the bank
    - From community member
    - Fisheries Division
    - Friends
    - Other

19. Do you have family and friends who assist your household regularly?
    - Nobody
    - Family & friends in Gouyave
    - Family & friends in other communities
    - Family and friends overseas
    - Other

20. How do you help family and friends in the community?
    - Giving fish
    - Giving ground food/provision
    - Cook food and share
    - Wash clothes
    - Barbering
    - Hair grooming
    - Cutlassing
    - Loans
    - Cash
    - Other

21. Have you ever lived & worked abroad?
    - Never lived/worked abroad
    - Yes for a short while
    - Yes for a good while (>5 years)

22. Are you able to adequately support your family with all these livelihood activities?
    - Yes
    - No, but I have to make it stretch
    - No, but what to do
    - Barely

23. Have you or any members of your household been ill in the last 12 months?
    Yes
    No

24. What is your alcohol of choice?
    Never drank alcohol
    Do not drink anymore
    Beer
    Rum
    Stout
    Other

25. How often do you consume alcohol?
    Don't drink
    Used to but not anymore
    Daily
    Only on weekends
    Only on special occasions (birthday, etc.)
    Now and then
    Other

26. How often do you smoke?
    Don't smoke
    Used to but not anymore
    Many times per day
    Now and then
    Other

27. Are you an active member of a church?
    Don't attend church
    Used to attend but not anymore
    Regular attendant
    Only on special occasion
    Other

28. Which church have you been or ever been a member?
    None
    Roman Catholic
    Anglican
    Open Bible
    New Testament
    Seventh-day Adventist
    Other

29. Which community group are you a member?
    Not a member of any group
    Fishermen's Cooperative
    Fishermen's Association
    Gouyave Improvement Committee
    St. John's Cultural Committee
    Church Youth Group

30. With whom do you live?
    Alone
    Mother
    Father
    Both parents
    Grandparent
    Own family
    Other

31. Number of individuals in your household?

FINALLY JUST A FEW PERSONAL QUESTIONS

32. What was the last school you attended?
    Never went to school
    Some primary school
    Finished primary school
    Some secondary school
    Finished secondary school
    College
    University
    Other

33. Had any training after school?
    No training
    Government training on the jetty
    RC Vocational Centre
    NEWLO
    Other

34. Marital Status?
    Single
    Married
    Living with a partner
    Visiting male
    Visiting female
    Other

35. How many years do you have?

## APPENDIX B – Gear description

The main fishing gears used in Grenada were (Mitchell and Gold, 1982; Finlay, 1995; Fisheries Division, 2003; Weidner et al., 2001; key informants):

- ***Beachseine*** or seine fishing – traditional fishing technique in Grenada, usually conducted in coves and bays. The seine fishing unit includes a seine boat with a stowed net, small attendant boat, and six to eight fishers. Once a school of fish is sighted, the net is cast to enclose schooling coastal pelagic fish such as small carangids (*Selar menopthalamus* and *Decapturus sp.*), round robin (*Decapterus tabl*), and rainbow runner (*Elagatis bipinnulatus*). Then it is hauled to shore or to the seine boat at sea. ***Ballyhoo net*** operates similar to a beachseine; however, it is much smaller and requires only two fishers and a small boat. Fishing is done seasonally at nights when the ballyhoo halfbeak (*Hemiramphus brasiliensis*) is most abundant.
- ***Gill net*** – the fishing unit includes nettings, ropes, corks, and weight; average stretch length is 100m; and primarily used to catch pelagic flyingfish (*Exocotidae sp.*), kingfish (*Scomberomorus cavalla*), and rainbow runner. The gear is mainly used on the west and northwest coasts in deep and coastal waters. The net is set at the surface, mid-water, or at the bottom.
- ***Trammel net*** - consists of three panels of netting, an inner panel hanging between two larger-meshed ones, and outer panels attached to common float and lead lines. It is typically set in shallow reef areas where lobster, conch and a wide variety of fish may be captured.
- ***Handline*** – consists of a simple weighted monofilament line with baited hook(s); some line have up to ten hooks equally spaced. ***Bankfishing or bottom handline*** is fished at 20-200 m depth using three to ten hooks. This type of fishing is done on the reef for demersal species such as snapper (*Lutianus sp.*) and hind (*Epinephelus sp.*). Landmarks are used to locate fishing banks.
- ***Seche*** or sec – the seche is an offshore location where the sea bottom falls sharply and pelagic fish gather to feed. Fishers use a handline technique to sink baited hooks to the bottom, then shake the bait off to attract fish (also known as 'shaking the bol'). Seche fishing is done mainly on the west coast, targeting small tuna, snapper, and wahoo (*Acanthocybium solandri*).
- ***Trolling*** – conducted mainly in deep waters along the edge of the continental shelf and around bays in coastal areas. The gear has two outriggers (bamboo poles) mounted on the vessel with hooks, artificial bait, monofilament line, and weight; and is deployed while the boat is drifting. It is used mainly east and southeast of Grenada. Species targeted are small tunas, dolphinfish (*Coryphaena hippurus*), kingfish, and barracuda (*Sphyraena barracuda*).

- ***Longline*** – this method is used throughout the tri-island state. It consists of a mainline, a branch line/dropline, hooks, sinkers and is supported by floats. There are different types of longline such as surface, bottom, vertical, and bottom vertical. The variation in lines depends on line construction and deployment. ***Surface longline*** is fully described in section 3.2. ***Bottom longline*** (Palang) is comprised of a main line, branch lines, and over 1,000 hooks and sinkers. The gear is used mainly south and northeast of Grenada. The gear is usually fished overnight, targeting grouper (*Serranidae sp.)*, red hind, and snapper. ***Vertical longline*** was introduced to Grenadian fishers in 1991 by a Japanese fishing technologist. The gear is operated around the west coastal areas at depths of 50-100 fathoms. Each line is suspended vertically, supported by a buoy, with up to ten baited hooks, and weighted to keep the line vertical. Main species caught are snapper, grouper, blackfin tuna, and red hind. ***Bottom vertical longline*** is a new method introduced by a Japanese fishing technologist in 2001-2002. It is made almost like a bottom longline, except the branch lines have five to eight hooks attached. The mainline is supported by small floats and the branch lines suspended vertically above the sea bottom. This gear is effective at catching all types of demersal species.
- ***Fish trap*** or "pot" - usually arrow-head, Z-shaped, or square shaped with one or two funnels; made with chicken-wire with wooden stakes. Stones are used to weight the pots to the sea floor.
- ***Diving*** – done as a free dive or with SCUBA equipment. Live lobsters are caught using snares, conch are taken by hand, and spearguns are used to catch fish. Diving occurs mainly on the southeast and north of the island.

# APPENDIX C – Approval certificate

Ref. No.
In replying the above
Number and date of the
letter should be quoted

MINISTRY OF AGRICULTURE,
FORESTRY, LANDS AND FISHERIES,
MINISTERIAL COMPLEX,
BOTANICAL GARDENS,
ST. GEORGE'S,
GRENADA, W.I.

February 3, 2003

Sandra Grant B.Sc., M. Phil., N.R.E.M. PhD Candidate
Natural Resource Institute,
University of Manitoba,
Winnipeg, MB R3T 2N2,
CANADA.

Dear. Ms. Grant,

RE: Request for Permission to Conduct Research on Fisheries in Grenada.

Under the Fisheries Act #15 of 1986 (Section 24) and the Fisheries Regulations # 9 of 1987 (Section 21), permission is hereby granted to

*Sandra Grant* (Jamaican National and holder of Passport No.

To conduct research in Grenada on '*Managing small-scale fisheries in the Caribbean: developing a framework for the involvement of fishers in national, regional and international management of large pelagic species in the Caribbean*'.

The research will require 18 (eighteen) months of living in the Gouyave community, to understand the fishery, community activities and local fishery institutions.

The Fisheries Division thinks the studies are interesting and should produce very useful data and a framework for fishers involvement in management.

Special Conditions

1. Results of all studies done and data collected must be made available to the Fisheries Division (MALFF)
2. That Fisheries Officers and Locals be allowed to participate meaningfully in the research programme whenever possible.

Yours Faithfully:

CHIEF FISHERIES OFFICER

FISHERIES DIVISION
MINISTRY OF AGRICULTURE
GRENADA