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Socio-economic profile of fisheries in the Grenadine Islands

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ABSTRACT

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For proper and effective management of fisheries, there is a need to understand not only their biophysical environment but also their demographic and socio-economic environment and dynamics. From June to August 2006, students from the Centre for Resource Management and Environmental Studies (CERMES) embarked on a trans-boundary socio-economic and livelihood assessment of fisheries in the Grenadines. The study was divided into two stages and took place in the Vincentian islands of Bequia, Mustique, Canouan, Mayreau and Union Island and the Grenadian islands of Petit Martinique and Carriacou. The goal of the first stage was to create a basic demographic profile of the fishers and to gather data on their gear and resource-use patterns. This was done through extensive interviews at all of the major fishing villages in the Grenadines. During this stage 267 fishers were interviewed.

The second phase of this project aimed to create a more detailed socio-economic profile of the fisheries. This stage involved acquiring more detail on temporal and spatial features of fishing practices, information on the market orientation of the fishers, revenue, expenditures and material style of life. Over 75% of the fishers interviewed in the study rely on fishing as their major income source and less than half have an alternative livelihood. Due to lack of a reliable source of income, many continue to fish well beyond retirement age. This suggests a possible vulnerability within the fishing community, especially within the older population. Shallow-shelf demersals are the most important species group and also the most overexploited and thus the governments should look to encourage fishers into other fisheries through market incentives, training and loans. The information from this study will help resource managers better understand the social and economic factors that affect the fisheries and may lead to more sustainable and informed decision making. Sectoral and regional linkages need to be strengthened so as to ensure that the industry goes forward sustainably.

Keywords: demographic, fisheries, Grenadines, socio-economic

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1 INTRODUCTION

Resource management involves balancing conservation with sustainable use (Bunce & Pomeroy 2003). Resource users have an immense impact on the environment and are the most vulnerable to its degradation. Managers therefore have to possess an understanding of the resource use patterns and the socio-economic factors that act upon it (CFRM 2004). Through interviews with members of the fishing community, this study seeks to create a socio-economic profile of fishers in the Grenadines. Decision makers can combine biophysical and socio-economic data to better understand the coastal environmental and the human interactions and uses that affect it. This information will help to identify coastal areas that may be at risk of overexploitation and to design appropriate conservation strategies that will not threaten the livelihoods of the fishermen. It will also aid managers in recognising the vulnerability of the fishermen to natural and anthropogenic shocks (e.g. hurricanes, market fluctuations, increased oil prices etc) and to build resilience through informed decision making. Stakeholder interaction and information gathering enhance local participation in management and increase the chance of further participation in conservation activities (Walters *et al.* 1998). Currently there are various on-going initiatives in the Grenadines to which this project is supplementary.

1.1 Sustainable Grenadines Project (SusGren)

The goal of the Sustainable Grenadines Project (SusGren) is to assist in the protection of the social and economic wellbeing of the Grenadine people through the integration of sustainable development (CERMES 2005). SusGren seeks to build capacity through partnerships with other civil society organisations and stakeholders providing them with tools to be more actively involved in managing the resources that they depend heavily on. The information from this study will help to create an understanding of the socio-economic characteristics of fishers which is essential to aid SusGren in fulfilling its mandate of promoting sustainable livelihoods. SusGren commenced this work by hosting a fisherfolk workshop in February 2006 where fishers from around the Grenadines were able to raise and discuss the major issues affecting the industry (CERMES 2006).

1.2 Marine Space Use Information System (MarSIS)

MarSIS is a computerised Geographic Information System (GIS) which is being created to amalgamate social, economic, cultural and biophysical resource information & policy to assist resource managers in effective coastal management (Baldwin 2006). It will identify critical habitats and areas of concern and conflict amongst marine resource users. This project aims to combine scientific data with local ecological knowledge to fill information gaps, promote participation and highlight policy decisions and concerns that should take precedence. The process began at the planning and data scoping phase in June 2005-May 2006. During this process key informants were identified and support was obtained from the governments of St. Vincent and the Grenadines and of Grenada. Information for the initial data scoping was obtained through dialogue with various non-government organisations, community leaders, key informants and observations at the sites of interest.

At present, data are being collected on all the major marine resource user groups in the Grenadines. These include day tour operators, dive operators, ferries, and yacht charter companies. Similar studies have been conducted with the water taxi operators in the Grenadines (Cooke *et al.* 2005 and Lizama *et al.* 2006) and will be compiled with information from this study to create a marine resource user profile. Key marine habitats, conservation and management issues, resource use patterns and stakeholder information were spatially analysed and represented on maps. Subsequent to the data collection, workshops

will be held to obtain feedback from stakeholders and government, to identify information gaps and to plan the next stage of the project.

1.3 Project objectives

The purpose of this project is to acquire socio-economic information on fisheries in the Grenadines for future use in fisheries and integrated coastal management decision-making. Specifically, in connection with the SusGren and MarSIS initiatives, this includes the objectives of collecting information on:

- **Demographics and stakeholder characteristics:** creating a basic demographic profile of fishers
- **Resource use patterns:** acquiring information on the fishing practices (temporal and spatial) of fishers in the Grenadines
- **Market attributes and orientation:** gaining an understanding of the market orientation of the fishers, prices received and patterns by island
- **Material style of life:** acquiring basic information on the income, expenditure and material style of life of the fishers

This information will provide insight on the location of fishers, what resources they have available, fishing practices and usage and their perceptions on the resource. This will be made available to interested parties (government, NGOs, etc) and the spatial socio-economic data will be used to supplement the attribute data for the MarSIS database (see Section 1.2). The report will also include recommendations that are suggested by the fishers to improve the industry.

Although this study involves taking information from stakeholders, it will hopefully facilitate the creation of a climate of participation amongst the fishers and promote linkages between the conservation groups, government, scientific communities (e.g. university researchers) and the fishers. Participatory research methods facilitate stakeholder involvement in the decision making process by providing a means of input into information to be used for management decisions. This process allows for community concerns to be aired and resolved and areas of historical, social and cultural importance to be identified. Through education and involvement, stakeholders can have a better understanding of the resource and their influence on it and this process may help to increase support for and participation in management (Bunce & Pomeroy 2003).

1.4 Socio-economic Monitoring (SocMon) as research approach

The benefits of incorporating local knowledge into resource management are immense. Collection of data on locations of resources, spatial and temporal information and the use patterns is an overwhelming task for small Fisheries Divisions in the Caribbean and therefore they must also rely on the resource users to acquire this information (Walters *et al.* 1998). Spatial & temporal information is required to assess the current space-use patterns in the Grenadines and to develop comprehensive management plans for the area.

A socio-economic assessment is a means to understanding the social, cultural, economic and political conditions of individuals, groups, communities and organisations (Bunce & Pomeroy 2003). Fishers play a very important role in coastal resource management as they directly impact and rely on the sea.

SocMon is a set of guidelines for creating a socio-economic monitoring program at Caribbean coastal management sites (Bunce & Pomeroy 2003). Using a list of established socio-economic variables, *SocMon* allows researchers and managers to help select and prioritise which variables to include in their analysis, based on the goals and objectives of their project.

1.5 Report outline

The next chapter on methodology precedes a description of the study area. The results of rapid and in-depth surveys are discussed in the fourth chapter. Finally there are conclusions with recommendations on priority next steps. References are listed and four appendices provide information on fishes caught and fishing vessels along with copies of the two survey instruments used.

2 METHODOLOGY

2.1 Preparatory activities, planning and reconnaissance

A modification of the *SocMon Caribbean* methodology (Bunce & Pomeroy 2003) was applied in this study. A flow chart outlining the major steps of the process is in Figure 2.1.

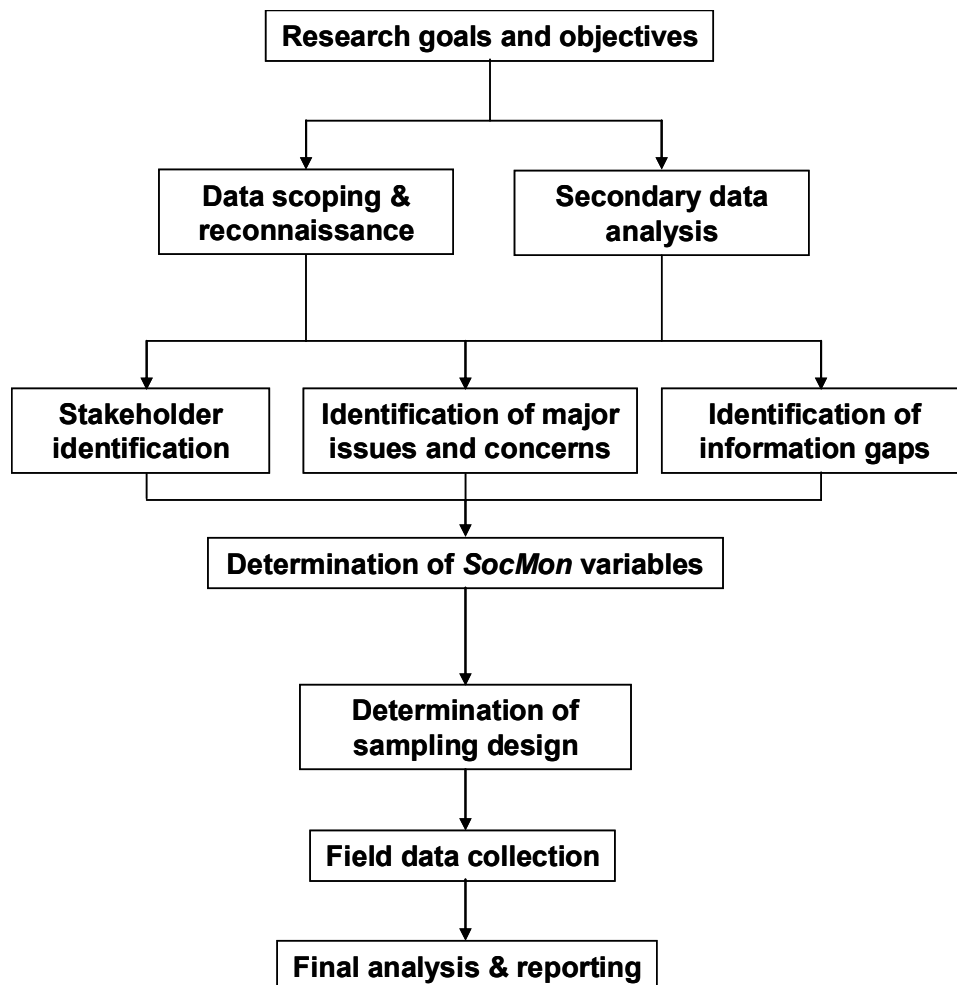


Figure 2.1 Flow chart outlining the major phases of the study

During the months of January to June, Ms. Kimberly Baldwin of the Centre for Resource Management and Environmental Studies (CERMES) conducted an initial scoping of the marine resource users of the Grenadines (Baldwin 2006). This involved secondary data collection, interviews with key informants and other stakeholders and general observation of the study area. Concurrently, secondary data assessment and scoping was also conducted and the data were compiled so as to identify the information gaps required to complete the MarSIS database (see Section 1.2). Based on the gaps identified, the objectives of this study

were created and the *SocMon* variables that were utilised in this study were selected. The list of *SocMon Caribbean* variables can be found in Table 2.1 in which the ones chosen for this study are highlighted.

Table 2.1 List of variables in the SocMon Caribbean methodology with selected variables highlighted in grey

Var. no.	Community or secondary source	Var. no.	Household or individual survey
K1	Study area	S1	Age
K2	Population	S2	Gender
K3	Number of households	S3	Ethnicity
K4	Migration rate	S4	Education
K5	Age	S5	Religion
K6	Gender	S6	Language
K7	Education	S7	Occupation
K8	Literacy	S8	Household size
K9	Ethnicity	S9	Household income
K10	Religion	S10	Household activities
K11	Language	S11	Household goods and services
K12	Occupation	S12	Types of household uses
K13	Community infrastructure	S13	Household market orientation
K14	Coastal and marine activities	S14	Household uses
K15	Goods/services from marine activities	S15	Non-market and non-use values
K16	Types of use of good/service	S16	Perceptions of resource conditions
K17	Value of goods and services	S17	Perceived threats
K18	Goods/services market orientation	S18	Awareness of rules and regulations
K19	Use patterns	S19	Compliance
K20	Levels and types of impact	S20	Enforcement
K21	Level of use by outsiders	S21	Participation in decision-making
K22	Household use	S22	Membership in stakeholder organisations
K23	Stakeholders	S23	Perceived coastal management problems
K24	Tourist profile	S24	Perceived coastal management solutions
K25	Management body	S25	Perceived community problems
K26	Management plan	S26	Successes in coastal management
K27	Enabling legislation	S27	Challenges in coastal management
K28	Management resources	S28	Material style of life
K29	Formal tenure and rules	[New]	Boat painting and engine servicing
K30	Informal tenure, rules, customs and traditions	[New]	Boat cleaning
K31	Stakeholder participation		
K32	Community and stakeholder organisations		

It must be noted however that this study did not employ the entire *SocMon Caribbean* methodology as it was planned as an assessment rather than with the intention of monitoring. To get an idea of some of the possible environmental impacts of fishing (mainly marine pollution) and to gather data to be compared with the water taxi study conducted by Lizama *et al.* (2005), two new variables were created. To examine these variables, fishers were questioned on their boat and engine cleaning/maintenance practices.

2.2 Field data collection: Sampling methodology

The study took place between the months of June and August 2006 on 7 of the inhabited islands of the Vincentian and Grenada Grenadines (see Table 2.2). The design of the questionnaires followed the methods outlined in the *SocMon Caribbean* methodology (Bunce & Pomeroy 2003) and some of the content was adapted from questionnaires created by

McConney (2005), Cooke *et al.* (2005) and Lizama *et al.* (2005) that were used for other resource users in the Grenadines.

Table 2.2 Fishing communities/villages in each island that were surveyed during the data collection phase

Island	Fishing Village
St. Vincent and the Grenadines	
Bequia	Port Elizabeth, Lower Bay, La Pompe, Friendship Bay Paget Farm
Mustique	Mustique Fishing Camp
Canouan	Grand Bay, Charles Bay Canouan Fisheries Complex
Mayreau	Saline Bay, Salt Whistle Bay
Union Island	Clifton, Ashton
Grenada	
Petite Martinique	Sanchez
Carriacou	Hillsborough, Belmont, Windward, L'Esterre, Paradise Bay, Harvey Vale

The sampling design was a census, similar to the one that was used by Cooke *et al.* (2005) and Lizama *et al.* (2005) where each community was intensely surveyed until no new respondents were encountered. At the start of the data collection, however, it was evident that it would be virtually impossible to conduct a census of all the fishers in the Grenadines given the time and the resources available, and the following limitations: (1) the study took place out of lobster season, and subsequently, fishers were either engaged in other occupations or out of the island; (2) some of the fishers were dispersed throughout the islands which would require a much greater sampling effort and time to interview each household on the island; and (3) this study focused on persons who depended on fishing for their livelihoods, as opposed to recreational fishers.

To overcome these limitations, the sampling design of Phase I was restructured from a census to a saturation sample, where all persons located in and around the major fishing villages and markets were surveyed, until the interviewers encountered few to no new fishers. Therefore, the 267 fishers that were identified in the rapid initial survey (Phase I) are in fact an underestimation in census terms. However this is an adequate sample, estimated at 10-20% of all fishers based on key informant and secondary data. Because of the methods, limitations and biases listed above it cannot be claimed that the study sample is statistically representative, but it is likely that results obtained from it reflect population characteristics to a large extent.

2.2.1 Phase I: Rapid initial survey

This stage involved visiting the major fishing communities and interviewing all the fishers encountered in the area, totalling 267 fishers. A simple, one page questionnaire (see Appendix 1) was used to collect:

- Demographic information on the fisher
- Type of fishery he/she is involved in
- Boat and equipment characteristics
- Spatial information on fishing practices

The survey took approximately 3-5 minutes to complete, depending on the details given by the respondent. In very small, compact fishing villages (e.g. Mustique Fishing Camp, Mustique), sampling was completed in one day and almost 100% of the fishers in the area were surveyed. Sampling in large fishing communities such as Paget Farm, Bequia ranged from 2-4 days to ensure that all available fishers were interviewed.

2.2.2 Phase II: In-depth survey

After the initial survey was conducted on each island, the second survey was constructed and tested on select fishers in the field (n=3). The sampling design of this survey was to use the initial survey as a sampling frame and re-interview 25-33% of the fisher respondents on each island visited in the first stage, but without rejecting any new fishers that were encountered (see Figure 2.2). Another aim was to attempt to involve each type of fisher in the study by purposely ensuring that the less common types of fishers were included. However, due to the multiplicity of the types of fishing practiced, it was difficult to distinguish a fisher by a particular fishing technique. Also as the survey depended on the willingness of individuals to participate and their level of interest, not all of the data could be collected in each interview. The surveys conducted in Phase II (see Appendix 2) encountered 64 fishers, most of whom were encountered during Phase I. The interview took an estimated 15-45 minutes to complete depending on the detail given by the respondent.

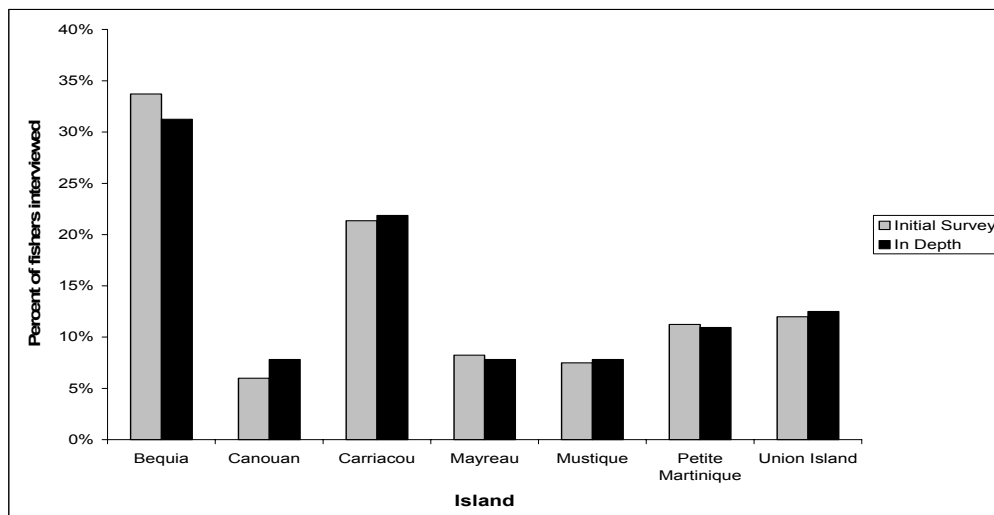


Figure 2.2 Proportions of fishers interviewed by island during the initial and in-depth survey

2.3 Analysis, interpretation and validation

After the data were collected, the key informants identified in Baldwin 2006 (mainly fisheries officers) were consulted to validate the information for their respective islands. The data were compiled and analysed in Microsoft Excel 2003 and Statistical Package for Social Sciences (SPSS) version 11.

During the month of October, community meetings (comprising of mainly fishers) were held in each island. The goals of these meetings were to: 1) present information to the community on MarSIS and the results of this study, 2) conduct a simple fishery resource mapping exercise and 3) to validate some of the major results of the study.

3 RESULTS AND DISCUSSION: STUDY AREA

A major part of any SocMon study is the characterisation of the study area. This provides a critical background to the physical, social, economic and cultural conditions that affect the community under examination. Information in this section comprises both secondary data and results from discussions with key informants and fishers.

3.1 Geography

The Grenadine islands lie on a shallow bank located between the islands of St. Vincent and Grenada (see Figure 3.1). Islands north of the boundary belong to St. Vincent and south of the boundary belong to Grenada. Most of these low lying islands were formed by volcanic activity associated with Grenada (ECLAC 2004) which created an archipelago consisting of over 30 islands (CCA/IRF 1991).

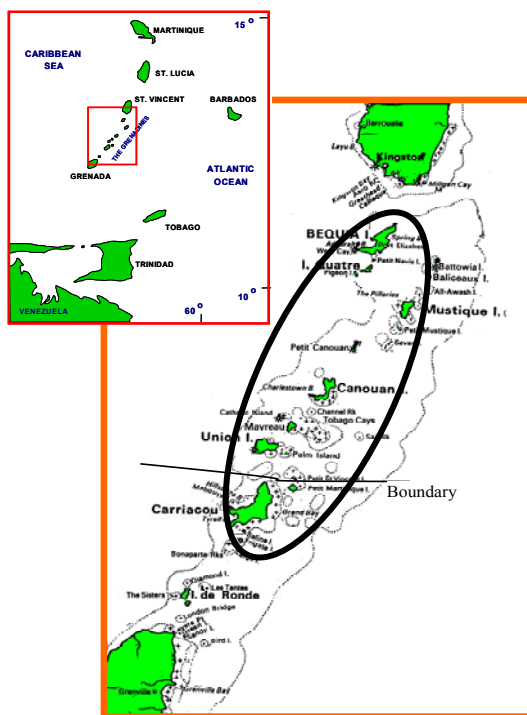


Figure 3.1 Map of the Grenadine Islands showing the study site

The Grenadines are older and more geologically complex than the St. Vincent mainland and the shallow bank hosts a multitude of reef systems, mangroves and seagrass beds which provide habitat for a wide diversity of plant and animal species. Three quarters of the Grenada Bank is less than 50 m deep allowing for extensive bottom habitat for coral reef formation (CCA/IRF 1991) and a productive fishing area. Shallow reefs host species such as echinoderms, hard and soft corals, crustaceans, sponges and a wide variety of reef fish (Price & Govindarajulu 1998, Comley *et al.* 2002). All of these combine with the wide open spaces to create a spectacular picturesque land and seascape that attracts visitors from all around the world.

The many islets and bays in the Grenadines allow for mangrove ecosystems and sea grass beds. These act as nurseries for many commercially important species. In Tyrell Bay,

Carriacou, the Oyster Bed mangrove hosts thousands of oysters which filter feed on the roots on the red mangrove trees and act as a natural harbour to boats during storms. Seagrass beds in islands such as the Tobago Cays and Union Island support a wide diversity of species including rays, turtles, starfish, squid and juvenile fish.

The Grenadines experience very low rainfall (sometimes as low as 460mm) compared to 1700mm on the St. Vincent mainland (Culzac-Wilson 2003). This impacts on the availability of water to the local population that relies in part on storing rain water. This has also led to a greater dependency on the sea for food and income than on the land (Jardine & Straker 2003).

3.1.1 Natural threats: Hurricanes

The Grenadines are located below 13° north, placing them just below the main hurricane belt. However in the last half century, occasional hurricanes such as Hurricane Janet, Allen, Ivan, and Emily have caused severe damage to infrastructure and the natural environment. These hurricanes also severely impacted the boating, fishing and yachting industry on which the Grenadines rely heavily (Cooke *et al.* 2005). In 1982, Hurricane Allen devastated the fishery sector in the Vincentian Grenadines (Mohammed & Rennie 2003). The recent 2004 Hurricane Ivan affected mainland Grenada and its Grenadines to the point that restoration efforts have not yet been completed. After the hurricane, news reports out of Grenada stated that 90% of the houses in Grenada were damaged. Some of the reefs in the southern Grenadines (e.g. leeward side of Sandy Island, Carriacou) suffered extensive damage which may take decades to recover. Fishers (especially those in the Southern Grenadines) stated that Hurricane Ivan has drastically reduced their catch (mainly lobsters and demersals) and have severely altered the bottom habitat.

3.1.2 Society and economy

The population density on most of the Grenadine islands is relatively low and communities are spread apart in towns and/or rural villages. Many of these rural villages are hubs for fishing activities. Around 1991, reports stated that the majority of the male population in the Vincentian Grenadines were fishers or actively involved in a related sector and it is the main income earner for many households (CCA/IRF 1991). This creates vulnerability among a large section of the population as they depend heavily on one industry. Some of the fishers combat this by diversifying their income through other occupations such as: water-taxiing, construction, transportation of goods between islands and small-scale agriculture (Cooke *et al.* 2005).

The Vincentian and Grenada economies have been historically driven by agriculture. In the Grenadines, marine resources play a vital role in food security, sustaining livelihoods and in the cultural and social activities. As the land in the Grenadines is not very productive for agriculture (Jardine & Straker 2003), many made their living from fishing as it was one of the few options for employment, especially after the second World War (Mohammed *et al.* 2003). For example, in the 1960s, the conch fishery became the most significant economic activity on Union Island.

Tourism has been the driving force for the economy of many Caribbean islands and has been increasingly becoming part of the Grenadine economy (Statistical Office 2001). In 1985, St. Vincent & the Grenadines saw a change where the majority of tourist arrivals shifted from the mainland to the Grenadines (CCA/IRF 1991). Due to the attraction of the Tobago Cays, many flock from around the world to this anchorage. It is estimated that 84% of yachters visiting the Vincentian Grenadines make a stopover in the Tobago Cays (ECLAC 2004). Tourism has significantly impacted the people of the Grenadines. In the 1990s, the tourism boom from resorts on Petite St. Vincent and Palm Island attracted many away from fishing in

the southern Grenadines into job opportunities such as construction (Chakallal *et al.* 1994). It has brought foreign exchange, employment and additional revenue from tourist taxes and expenditure (ECLAC 2004). However, tourism has also brought loss of amenities and negative environmental impacts such as reef and sea grass damage from anchors and sewage. Verbal reports of tourists spearfishing illegally within the Tobago Cays were common and this poses a significant threat to the effectiveness of the marine protected area (MPA). Not many of the fishers are involved in or work within the tourism sector. The main interaction between fishers and the tourism sector in the Grenadines is the sale of catch, especially lobster. Here fishers receive a much better price in restaurants, hotels and to tourists directly. With an expected increase in tourism arrivals, the market for fish is expected to increase consequently over the years.

3.1.3 Marine Protected and Conservation Areas

Within the Grenadines there are nine marine conservation areas (Kirby-Straker 2003) all of which are in the Vincentian Grenadines. The Sandy Island/Oyster Bed Mangrove area is a proposed marine park in the Grenada Grenadines which is currently operating informally. Out of the nine marine conservation areas, the Tobago Cays marine park is the only marine protected area in the Grenadines where fishing is completely prohibited within the boundaries. However one of the traditional fishing camps is located within its MPA on Petit Tabac and it appears that the fishers were not consulted when the park was being established. Fishers frequent this area to access the rich fishing areas within the Tobago Cays and it is a known turtle fishing site. Some of the fishers seem resentful towards the establishment of this park and there is also concern over the rumoured establishment of another park in the east coast of Canouan. It is unclear whether or not fishers still utilise the camp in the Tobago Cays. Many believe that enforcement is lacking and that fishing occurs regularly within the park by locals and visitors.

3.2 Island profiles

3.2.1 Bequia

At 8.1 km² (SusGren 2005) Bequia is the most northerly and largest of the Vincentian Grenadine islands (see Figure 3.1). As with all of the Grenadine islands, Bequia was originally inhabited by the Arawaks and then later Caribs before the first European settlement in the early 18th century (Bequia Tourism Association 2006). After the Vincentian Grenadines were handed over to the British, many rich and poor settlers came and set up plantations on the island. By 1828, sugar production peaked and soon crashed afterwards and thus many of the wealthy settlers left the island (Bequia Tourism Association 2006).

Boat building and sea faring are a rich part of Bequia's heritage. As the islands are totally dependent on trade, maritime activities were not new to Bequians (Bequia Tourism Association 2006). Admiralty Bay was the main port on this island, with imports of many supplies and exports of sugar, lime, molasses and cotton. The island's boat building industry was supported by the abundance of white cedar trees which are excellent for boat construction which is still used to this day (Belmar 2006). Many of the island's first settlers were seamen and carpenters and by the 1900s, Bequia led the Grenadines in boat and ship building and whaling (Bequia Tourism Association 2006).

Bequia hosts an annual fishing competition on Fisherman's Day where many of the artisanal fishers from around the Grenadines compete for prizes. This event which is organised by the Rotary Club, promotes the importance of the fishing industry within the Grenadines and it is attended by locals and visitors alike. In July 2006, 46 fishers (19 boats) from around the

islands participated in a competition. At this competition around 530.7 kg of fish were caught and immediately sold due to the large demand of fish. This was a complete opposite to what is usually seen on normal fishing days where the fishers were complaining of lack of demand and market to sell their catch. This event can be repeated elsewhere to promote the fishing industry in other fishing communities.

3.2.2 Canouan

"Cannoun", which is Carib for turtle is located in the middle of the Grenadine archipelago (Miller Publishing Company. 2004a). At 7.8 km² (SusGren 2005), a large portion of Canouan is owned and managed by foreign owners. Eight hundred of the 1830 acres is owned by Italian investors (Canouan Resource Development Limited) and utilised in the tourism sector (Miller Publishing Company 2004a).

Recently there were announcements of proposals for a marine conservation area on the Atlantic side of the island. Some see this more as an attempt to place more restrictions on the movement of locals on the island which will have a negative impact on the livelihoods of fishers, than a genuine conservation initiative.

3.2.3 Carriacou

Carriacou is the largest of the Grenadine islands (33.7 km² (SusGren 2005)). The name Carriacou is Carib for "land of the reefs" (Price & Govindarajulu 1998) and this island has a assortment of sea grass beds, reefs and mangroves, each hosting a great diversity of plant and animal species. One of the island's major mangrove systems, Tyrell Bay, is an important bay for seine fishers. The Tyrell Bay marina currently under construction may have a great impact on mangroves and reefs in the area thus affecting the fishery. Many of the fishers recognise this area as an important nursery area for many commercially important species such as robins, jacks, snapper and barracuda. There is also concern over the Environmental Impact Assessment (EIA) process of this project and locals believe that their views were not taken into consideration and that this project would subsequently negatively impact their livelihoods.

On this island, there appeared to be more job diversity than on the other smaller islands (e.g. agriculture, larger construction and services sector, trade, etc.). The major settlements on Carriacou coincide with the major fishing villages. Here many of the Scottish and Irish were concentrated and it is now made up of mostly fishers. The houses in this area seem to be in very good condition indicating a reasonably high standard of living. In Hillsborough there is a resident fisheries officer with the mandate of supervising fisheries in Carriacou and Petite Martinique. The fish market in Hillsborough appeared to be very active at the time of the survey with fishers selling their catch relatively easy. Although the island is large, there is only one major gas station on the island and fishers have to travel into Hillsborough to purchase fuel. The government is planning to build a fisheries complex in Hillsborough that will be able to process the landings of the fishers with a focus of meeting the international Hazard Analysis Critical Control Point (HACCP) standards.

3.2.4 Mayreau

Mayreau is the smallest of all the Grenadine islands (2.6 km² (SusGren 2005)). The island consists of one main village with a small close-knit community of around 170 persons. In the north, Saltwhistle Bay is a calm leeward bay which is a major stop for yachters travelling to the Tobago Cays. On the island there is one major hotel and a few guest houses and restaurants. Fishers here have few options to sell on the island so many rely on trading

vessels. Hurricane Ivan caused a bit of damages to homes and one fisher was encountered who after 2 years is still rebuilding his home.

3.2.5 Mustique

Mustique, the only inhabited private island in the Northern Grenadines, is 5.2 km² (SusGren 2005). In 1968, the Mustique Company was formed and was developed with the goal of enhancing tourism on the island (Miller Publishing Company 2004b). Persons who purchase property on the island buy shares and become part of the company. Locals however live in specific designated areas in gated communities and access to the island is regulated. Workers who do not live on the island use ferries to come from St. Vincent.

3.2.6 Petite Martinique

Petite Martinique is a small volcanic dome located 4.5 km to the east of Carriacou (Price & Govindarajulu 1998). The island has a population of about 800 and is supported by unregulated marine trade, fishing and boat building (Price & Govindarajulu 1998). Many Scottish and Irish shipwrights and sailors arrived in Petite Martinique after emancipation and helped to establish the fishing industry on the island (Logan 2001). Even now, fishing is the main economic activity on Petite Martinique (Logan 2001). One fisher on the island stated that there are no real resources for agriculture or infrastructure for tourism and thus fishing is the only major option for persons entering the workforce. The island which is only 2.3 km² (SusGren 2005) contributes 15% of Grenada's fish landings (Food and Agriculture Organization 2000) and the majority of trading vessels in the Grenadines are based off this island. Fishers are able to sell directly to the trading vessels most of which export to Martinique. The island has an ice machine which is heavily used by the longline fishers and is much cheaper than ice sold in the some of the other islands. As with Winward, Carriacou, the homes on the island indicate a relatively good standard of living amongst fishers. Many fishers leave island for extended periods of time to engage in the longline fishery based in Grenada which exports to the Unites States.

Petite Martinique is the only island with an active fishing cooperative. Here gear and concessions are sold and the facilities are expanding with locker facilities and a boat docking site. As the co-op was operating at a loss under the government's control, the cooperative was leased to the current president of the co-op. Although many fishers in the Grenadines see cooperatives as beneficial, participation in the Petit Martinique co-op is low (i.e. only 15 members on an island with an estimated 150-200 fishers). Even with a very low fee of EC \$5 per month, fishers are not paying their monthly dues. Due to a lack of funds, the cooperative store is leased to the current president who also stated that the co-op has a considerable amount of debt.

3.2.7 Union Island

Union Island is one of the largest of the Vincentian Grenadine islands (8.3km² (SusGren 2005)) and is located on the southwest edge of the Grenada bank (Price & Price 1998). Fishing was the major economic driver around the mid twentieth century (Mohammed *et al.* 2003) and presently Tourism is becoming a significant contributor to the economy of Union Island. Flights bring tourists to transfer to the nearby private Palm Island and Petite St. Vincent.

The island, similar to Carriacou has a network of sea grass beds, mangroves and coral reefs. The two main fishing villages in Union Island are in Ashton and Clifton. These are also the sites for two large lagoon ecosystems (Price & Price 1998). Clifton is the tourism centre of the island with most the major hotels, restaurants, airport and other amenities. Many yachts

frequent Clifton Harbour and the island has the highest population of watertaxi operators (Cooke *et al.* 2005).

Ashton is a more community based, rural fishing town that is located in the south of the island. Union Island has had a history of unsustainable large scale developments and environmentally unfriendly planning. In Clifton, the development of the airport resulted in the levelling of Red Island (a protected area), destruction of a mangrove, and the reduction in current flow within the lagoon, causing an increase in pollution retention time (Price & Price 1998). In Ashton, the lagoon hosts a multiplicity of ecosystems: coral reefs, seagrass beds, salt marshes, mangroves, etc. Frigate Island which lie on the boundary of the lagoon was designated a marine conservation area by the 1986 Fisheries Act (Price & Price 1998). However, in spite of all of this, the 300 berth marina was scheduled to be built along with a 50 acre golf course and a large condominium complex (Price & Price 1998). This immediately reduced the current flow in the lagoon and thus a reduction in water quality by increased suspended sediment, increased chlorophyll concentration due to nutrient build-up, and consequently reduced coral reef and seagrass health and live cover (Goreau & Sammons 2003). Fishers have stated that this has negatively impacted on fish populations in the area and subsequently reduced their catch rates.

3.3 Fisheries Infrastructure

3.3.1 Canouan Fisheries Complex

The Canouan fisheries complex was constructed by the Japanese government. Similar to the complex in Mustique, this complex consists of sleeping quarters, storage and locker facilities, refrigerators for cold storage and other infrastructure such as compressor (scuba tank refills) and desalination equipment. Almost all the fishers that utilise this complex are from Paget Farm, Bequia and pay approximately EC \$35 per week in rent. A large portion of the fish is sold to the government and stored at the facilities. This fish is then sold primarily to restaurants and hotels on the island. Locals purchase fish at a small stall in Charlestown and not many locals were observed going the fishing complex. Competition among fishers was stated to be one of the main reasons why they choose to leave Bequia.

3.3.2 Clifton Fisheries Complex, Union Island

In 1994, the Japanese built a fishery complex in Clifton similar to the facility in Bequia. Many suspect that the Japanese government is using these contributions as an incentive for voting to lift the ban on whaling (see information on whaling in Section 3.4.2). Although this facility would be more than adequate to cope with landings, the operational costs were too high for the government and thus the facility is not utilised. As a result, fishers in Union Island complain of not having enough amenities available to them. As the complex is not in use, there are no real storage facilities available, especially for fishers with large catches. The intention of the facility was to have storage racks where fishers can keep catch and lockers for gear. Water scarcity is also a problem in Union Island. This impacts on the cost and availability of ice to the fishermen, especially since the ice machine in the fishing complex is not in operation. One fisher reported that the cost of ice in Union Island is times the amount sold in St. Vincent. The island also lacks a gas station and fishers purchase gas from the Anchorage Yacht Club and a local market retailer usually at a higher than normal price. A representative of the government stated that once St. Vincent & the Grenadines receive the license again to sell to the European Union, they will re-open the complex. Offers to lease it to a private operator failed due to the high overhead costs of the facility.

3.3.3 Paget Farm Fishing Complex, Bequia

Paget Farm is the most active fishing village in Bequia. In 1994 the Japanese built a large fishing complex in Paget Farm with facilities for storage and cleaning, ice machine, offices and a research lab. There is also a built-in desalination plant which is necessary to operate such a large facility in a water scarce island. Despite all of this, the complex was not utilised due to high operational cost. The facilities have only been recently opened and leased to a local company called Grenadine Seafood Distributors. The company estimates the monthly overhead costs for the facilities at EC \$7,000 for utilities and EC \$7,000 for rent. The company is currently investigating the use of solar technology for electricity to reduce some of these costs. There are also plans to use the desalination plant to help supply some of the Paget Farm community with potable water. The company was expecting around \$1,000-\$2,000 in fish per day (primarily demersals) which will be aimed at the export market.

3.3.4 Lobster Storage Facilities, Bequia

Due to concern over the European Union ban on the importation of fish from St. Vincent & the Grenadines, a live lobster pool was built next to the docks in Paget Farm. This was to keep the lobsters alive as long as possible, reducing the chance of tissue decay. It is approximately 450 cubic feet and is maintained and operated by a local fisher. A major Barbadian importer purchases lobster from the fisher which are subsequently transported and sold in Barbados at restaurants and hotels. The Grenadine Seafood Distributors were also developing plans to create their own live lobster pools for facilitating export.

3.3.5 Mustique Fishing Complex, Mustique

The Mustique Company owns and operates the fishing complex on the western side of the island. Fishers here have living quarters, cold storage, cleaning area, cooking area a haul up site. Rent at the facility is free; however, the fishers have to pay for utilities. Most of the fishers here are older Bequian fishers from Paget Farm. The company buys from fishers and sells to tourists, private houses. Some tourists come to buy fish for consumption and to use as bait for game fishing (e.g. robins, jacks).

3.4 History and development of fishing

3.4.1 Grenada and its Grenadines

Prior to the 1950s, the main fisheries in Grenada and its Grenadines were the flying fish and offshore pelagic fishery, beach seining and handlining for demersals (Mohammed & Rennie 2003). There was also a significant amount game fishing associated with tourism. It was in the 1940s that researchers started to notice the decline in demersals fish stocks in the Leeward Islands and began to encourage a shift towards offshore pelagics and deep slope species (Mohammed & Rennie 2003). After World War II, there was an influx of inboard gasoline engines at lower costs and these were used on double enders, whalers and pirogues. During this time as well, there were price controls instated on fish to ensure affordability, even when landings were low (Mohammed & Rennie 2003).

Demersals remained the most important species group in the second half of the last century and the influence of fish pots and the mechanisation of the pelagic fleets on the mainland began to spread to the smaller islands. Sloops from the mainland were used with handline and troll lines to fish for demersals in the Grenada and Vincentian Grenadines. Up to the 1970s, traditional fishing gear and small scale fisheries still dominated Grenada its Grenadines. Row boats were used to fish for demersals near to shore and it is expected that this was also practiced in the Grenadine islands as well. There was also a trend towards younger boat

owners buying motorised boats and older fishers using the traditional row boats and double enders.

The Artisanal Fisheries Development Project was established in 1982 as an effort by the government to expand the fisheries sector. The goal of this US\$2.7 million project was also to increase employment, reduce fish imports, expansion of fish markets, duty-free prices on fishing equipment and a marketing mechanism for sale of produce (Mohammed & Rennie 2003). With the donations of vessels from Cuba and other linkages, longlining skills and gear were transferred to Grenadians. There was also a significant change of the use of flying fish from human consumption to becoming primarily a bait fish. By the 1990s, the processing and export market was well established with yellowfin tuna, swordfish and sailfish being some of the major export species. With the increase in infrastructure and market for offshore pelagics, the decline in the demersal fishery and government incentives that fishers in the Grenadines began to switch to longlining (Mohammed & Rennie 2003). Even today, many of the Petite Martinique fishers spend most of their time on longlining vessels based in Grenada.

3.4.2 St. Vincent and its Grenadines

There is the clear distinction between fisheries of the St. Vincent mainland and those of the Grenadines. The Vincentian fisheries focus on inshore and offshore pelagics, with the occasional humpback whaling whereas Grenadine fisheries target mainly inshore and deep slope demersals, lobsters, conch and whales (Mohammed *et al.* 2003).

Due to the size of the fishery and its unreliability, the market for fish and shellfish did not develop till after the 1940s. In addition, as the industry was not developed and most fished at the subsistence level, the majority of the population got their source of protein from salted cod imported from Newfoundland (Mohammed *et al.* 2003). Trade was limited by the availability transport and distance, only a few islands like Canouan exported to the “mainland” (i.e. the island of St. Vincent) and some exported turtle shell to Trinidad. Nearing the middle of the last century, Canouan began to “process” fish by salting demersals. In the 1940s (similar to Grenada), a price control was placed on fish.

After World War II, there was an influx of persons entering the fishing industry due to a lack of other opportunities (Mohammed *et al.* 2003). The trade relationship between Martinique and the Grenadines began around the 1950s. In the period of 1955-1958 about 227 t of fish were traded and this new market led to an increased interest in the industry. Increasing regional demand for species such as conch in Trinidad and Grenada led to the development of the conch fishery in Union Island in the 1960s. By the 1970s as catch and effort increased, all of the conch exports were diverted to Martinique and signs of overexploitation became evident. As time progressed, Bequia became the major exporter of demersals and lobster to Martinique. Canouan exported iced and salted fish to St. Vincent and Grenada and iced fish less frequently to Dominica and St. Lucia.

In the 1960s there was an effort by the government, the Food and Agriculture Organization (FAO) and the United Nations Development Program (UNDP) to advance the industry. Efforts were made to offer duty-free concessions on gear, timber and engines were made but were not successful. Another program was initiated to guarantee prices to French Antilles’ companies for the sale of fish but this also was not successful.

In the 1980s, a combination of Hurricane Allen, rising fuel prices, high cost of engines and scarcity of spare parts caused a severe decline in the Grenadine fishery. Indications of overexploitation of many species also became evident in the 1980s. Low abundance in shallows and smaller sized lobsters increased fishing effort (scuba and faster boats) and deeper fishing for demersals all testified that species were being overfished especially in the

shallower waters. It was recognised by managers that demersals on deeper banks and offshore pelagics could withstand increased effort (Mohammed & Rennie 2003).

Whaling began as the most important fishery in the Grenadines (Mohammed *et al.* 2003). There was a significant number of whalers from the Eastern United States that settled in the Grenadines. In the 1870s, William Wallace Jr. started the first whaling station in Friendship Bay (Bequia Tourism Association 2006). Another whaling station was subsequently set up by Joseph Ollivierre on Petit Nevis (Whale and Dolphin Conservation n.d). The landing of a whale is a significant community event and the majority of the whale meat is distributed amongst the locals and little of the whale by-products are wasted. Whale oil became the fourth most valuable export of the country (Bequia Tourism Association 2006). Between the 1890s-1925, it was estimated that 25,000 to 500,000 imperial gallons of whale oil produced from the six St. Vincent and Grenadine stations (Whale and Dolphin Conservation n.d). Bones and some of the other by products (e.g. baleen) are used in furniture and in home and building décor. Even to this day, whaling in the Grenadines is still conducted using the same techniques that were used when the fishery first began there. Fishers travel out to sea in a small double-ender (previously a dug out canoe) with a small crew and would use harpoons to strike and capture the whales. The majority of whales targeted are humpbacks which migrate south during the Northern Hemisphere winter (see Appendix 3).

In 1987, the International Whaling Commission (IWC) recognised the aboriginal, subsistence use of humpback whales by Bequians (Whale and Dolphin Conservation n.d). Schedule paragraph 13(4) of the International Whaling Commission regulations allows for the “taking of [] humpbacks by Bequians of St. Vincent and the Grenadines, but only when the meat and products of such whales are to be used exclusively for local consumption in the St. Vincent and the Grenadines” (Whale and Dolphin Conservation n.d). Currently there is a quota of 3 whales and the harvesting of sucking calves and females with sucking calves is forbidden. However, it was noted that calves were landed in 1992, 1993, 1998 and 1999 and escorts were killed as they attacked the boat attempting to defend the other whale (Whale and Dolphin Conservation n.d).

3.5 Current status of fishing in the Grenadines

3.5.1 Data limitations

As the Grenadines are many small, dispersed islands with very little government administrative infrastructure, obtaining current and accurate data on landings is very challenging. It is not unexpected to see that most of the fisheries statistics and information are for the mainland and very little is documented separately for the Grenadines. It was also noted that the catches for inshore and reef species were vastly underrepresented in Grenada fisheries statistics as some of the important landing sites are not recorded (Mohammed and Rennie 2003). Similar data gaps exist in the Vincentian Grenadines as well (Chakallal *et al.* 1994)

3.5.2 Economic value

According to a recent FAO report, it is estimated that 1,120 tons is landed in St. Vincent and the Grenadines each year (Food and Agriculture Organisation 2002a). In 2000, exports from fishing in St. Vincent & the Grenadines was valued at US \$961 000 (Food and Agriculture Organisation 2000a). In Grenada and the Grenada Grenadines, the export of tuna to the U.S. market contributes US \$3.5 million of foreign exchange to the economy (Food and Agriculture Organisation 2000a). Fishing contributes 2% to the Gross Domestic Product (GDP) in St. Vincent & the Grenadines and 1.5-2% in Grenada (Food and Agriculture Organisation 2000a, 2002a). This however does not reflect the value of fisheries to the people

of the Grenadines as the total GDP include industry and agriculture on the St. Vincent and Grenada mainland where the majority of the population lies. The proportion of each species group landed in St. Vincent and the Grenadines are as shown in Table 3.1.

Table 3.1 Composition of average annual total landings in St. Vincent & the Grenadines by species group

Species Group	Percentage (%) of Total Annual Landings
Shellfish	5
Demersals	10
Small Coastal (inshore) pelagics	45
Offshore pelagics	35
Other species	5

(Source: Jardine & Straker 2003)

The market for fish in the Grenadines is small and the majority of the fisheries are small-scale using small fibreglassed boats and/or wooden crafts with one or two gasoline powered outboard engines (Chakallal *et al.* 1994). Through observation it is evident that this is still characteristic of the fishery. Overall demersals species are the most important with handlining being the preferred fishing technique (Mohammed & Rennie 2003). In 2005, demersals constituted 94% of the total landings in Carriacou (Statistical Division 2006). There is no fisherfolk organisation for the fishers in the Vincentian Grenadines, Petite Martinique in the Grenada Grenadines being the only island with a fishing cooperative.

3.5.3 Trading vessels

Fish trading vessels visit bays around the Grenadines and fishers sell their catch directly to their boats (Jardine & Straker. 2003). In the period of 1996-2000, 118.6 tons or 13.1% of the average annual landings in St Vincent & the Grenadines went directly to trading vessels. In Petite Martinique, 98% of all the fish caught are exported to Martinique (Logan 2001) mostly by trading vessels. This is supported by previous studies which reported that the majority of the finfish from the Grenada Grenadines were exported to Martinique (Chakallal *et al.* 1994).

Currently, there are a total of 7 trading vessels operating in the Grenadines, most of which operate out of Petite Martinique and Carriacou. The trading vessels are usually sloops with a mast and are around 12-20 metres in length and driven by a ≥ 120 hp engine (Chakallal *et al.* 1994). These vessels usually spend most of their time in Grenadines and 3-5 days to travel and unload their stock. Martinique is one of the major buyers of fish from the Grenada Grenadines with estimates of receiving 85% of all finfish exported to this island in 1990 (Chakallal *et al.* 1994). At around that time as well, 539.8 mt or 70% of total (Vincentian and Grenada Grenadines) landed catch were exported to Martinique (Chakallal *et al.* 1994). During the study, it was observed that the trading vessels accept mainly demersal species as well as offshore pelagics. On some of the trading vessels, it was observed that species such as Doctorfish and Ocean Surgeon (*Acanthuridae sp.*) were not accepted, neither was any fish less than 9 inches in fork length (to ensure compliance to the European Union standards). However, the fork length of each fish was estimated rather than measured.

3.5.4 European Union ban and quality control

In 1999, the European Union began to put restrictions in place on the imported fish into its territories (Logan 2001). These included setting up standards of handling and procession that had to be met and to promote better fishing practices (e.g. rejection of juvenile fish). This resulted in a ban the importation of fish from St. Vincent & the Grenadines. Since then, the

Vincentian government has begun to improve the conditions within the fish markets to meet the international standards. This includes encouraging the use of ice on vessels and in vending stalls, acquisition of devices for monitoring bacteria, heavy metals, etc from the Japanese and European Union and the training of fisheries staff in quality control and assurance (Food and Agriculture Organisation 2002a). It is not clear when the next round of inspections will take place so as to assess the new operating and processing conditions.

According to the Fisheries Division Officer for the Grenada Grenadines, the government has successfully implemented quality control and assurance practices within the fishing industry. With the threat of losing access to this vital market, the government was motivated to put the necessary measures in place to meet the new standards. This was a coordinated effort with the local government, fishers and the private vessels where the Grenada government provided free training for the private trading vessel staff and fishers to reach the widely recognised HACCP standards.

3.6 Fisheries management

3.6.1 Fished species

Around the Caribbean, overfishing has depleted many of the fish stocks, particularly conch, lobster and reef species (Jardine & Straker. 2003). Other factors that are impacting on fish stocks include habitat loss due to development (Price & Price 1998) and the unregulated and illegal fishing from local and foreign vessels (Jardine & Straker. 2003). Demersal fisheries have been the most targeted species group on the Grenada bank for many years and nearshore species have been overfished in both countries (Food and Agriculture Organization 2002b). As the fishing industry in the Grenadines is multispecies and lacks sufficient landing and effort data, it is difficult to determine the sustainable yield of each species or species group (Chakallal *et al.* 1994). However, available scientific data (Food and Agriculture Organization 2000b) as well as anecdotal reports all indicate that demersals have been harvested beyond sustainable yield for many years. Eighty-seven percent of Vincentian Grenadine fishers interviewed in Chakallal *et al.* (1994) stated that they caught less fish then (1994) than 5 years ago (1989). Reasons given were increased fishing effort, yacht pollution and exploitation by SCUBA divers. In response to this, both governments have been promoting the exploitation of the deep slope demersal and offshore pelagic fishery (Mohammed & Rennie 2003, Finlay 1999, Food and Agriculture Organisation 2002b).

Around the region, the Caribbean spiny lobster (*Panulirus argus*) has been fully or over-exploited (McConney 2003a). This is the most highly priced species in both the Vincentian and Grenada Grenadines. Observations by fishers have indicated that the year after Hurricane Ivan was one of the best and the subsequent year was one of the worse lobster fishing seasons. Some believe that the stock was severely overfished after Ivan and is yet to recover.

In the 1980s, the export of conch declined and this was subsequently linked to overfishing (Mohammed *et al.* 2003). The West Indian Sea Urchin (*Tripneustes ventricosus*) was harvested in Grenada and its Grenadines so heavily in the early 1990s that the fishery had to be closed in 1995 (Finlay 1999). Evidence suggests that destructive fishing practices, increased effort and habitat loss have also led to the demise of this important fishery (Fisheries Global Information System 2001).

3.6.2 Legislation and current management measures

3.6.3 A vessel licensing and registration program in St. Vincent & the Grenadines is believed to be 85% complete (Jardine & Straker 2003). However from observation, most of the vessels in the Grenadines were not registered. The table below shows the

relevant legislation as it relates to fisheries in Grenada and St. Vincent & the Grenadines.

Table 3.2. Grenada and St. Vincent & the Grenadines legislation relevant to fishing

St. Vincent & the Grenadines	Grenada
<ul style="list-style-type: none"> ▪ Maritime Areas Act (1983) ▪ Fisheries Act (1986) ▪ Fishing Regulations, 1987 (Amended 1991) ▪ Fish Processing Regulations (2000) ▪ High Seas Fishing Act (2001) 	<ul style="list-style-type: none"> ▪ Grenada Territorial and Marine Boundaries Act (1989) ▪ Fishing Vessel Safety Regulations (1990) ▪ Fisheries Regulations #24 (1996) ▪ Grenada Fisheries Act (1986, amended 1999)


Source: (Kirby-Straker 2003, Food and Agriculture Organization 2000b)

3.6.4 Species and gear regulations

Most of the fishers interviewed during the study seem to be aware of the seasons and the legislation relating to their target species. These regulations include size restrictions on lobsters, conch and turtles (Kirby-Straker 2003). Lobsters are located on the shallow shelf and the deep reef and thus are targeted using traps, gill nets and diving (free and scuba) by hand or with the use of a small wire loop (McConney 2003a). Berried lobsters (females with eggs) and the capture of lobster other than by means of traps, loops or hand is illegal (Kirby-Straker 2003). Mesh sizes for seine nets are to be no smaller than 1 inch and ½ inch for “balahoo nets” and Grenada fishers are required to register their seine net. Tangle (trammel) nets are prohibited and spear guns are prohibited for use in conservation areas. The taking of turtle eggs, handing of nests and corals are also forbidden. Table 3.3 shows the closed seasons for the various species groups in St. Vincent & the Grenadines and Grenada.

Table 3.3. Closed seasons for species groups under management in St. Vincent & the Grenadines and Grenada

Species Group	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Lobster												
Sea Turtle												
Sea Urchin												
Whales												



X Grenada closed season
 St. Vincent & the Grenadines closed season

Source: Kirby-Straker 2003

3.7 Fishing techniques

3.7.1 Handlining

Handlining for demersals is by far the most widely practiced fishing technique in the Grenadines (Chakallal *et al.* 1994). The major target species are parrotfish, hinds and groupers on the shallow shelf and groupers and snappers on the deep slope (Food and Agriculture Organisation 2000a). Wooden bow and stern vessels are used within this fishery which is focused on the shallow shelf and deep slope area (see Appendix 2). This technique involves the use of a long monofilament line, weights and bait. The average landings are between 11.4 -31.8 kg and are usually fished 5-6 days per week (Chakallal *et al.* 1994) with a crew of 2-6 fishers.

3.7.2 Traps

Traps or “pots” utilise hexagonal wire mesh on wooden frames and are set on shallow reefs or on deeper slopes (Chakallal *et al.* 1994). Soak time can range from 3-7 days and a large variety of demersals are caught. This fishery is exploited all year round and increases in May –August which is likely due to the closure of the lobster season (Table 3.3). Many fishers have to replace or purchase new traps every year due to corrosion, damage, misplacement or theft. Specialised traps are used for lobsters during the season. Many persons enter the fishery specifically during this open season and many of the other fishers switch to this species.

3.7.3 Trolling

Trolling or “towing” involves the use of one or more long monofilament lines with various hooks and bait (Chakallal *et al.* 1994). Small multi-purpose vessels are driven with the line towing behind and targets large offshore pelagic species such as tuna, wahoo and bill fish (Food and Agriculture Organization 2002b). This is also a common fishing technique for recreational fishers and small inshore pelagics are the bait of choice for fishery. This can be done solitarily or with a small crew. Some of these species are caught incidentally (e.g. barracuda) by shallow shelf and deep slope fishers (Food and Agriculture Organization 2002a).

3.7.4 Seine net fishing

The inshore seine fishery is very important in the Grenadines. It is the most favoured fish for consumption in St. Vincent & the Grenadines (Jardine & Straker 2003) and is caught using wooden double ender boats (see Appendix 4). Boats surround schools in bays using a large

net of irregular mesh sizes which have floats and weights so as to span the water column (McConney 2003b). Divers beat the water to scare the fish into the net which is slowly brought to a close. For instances where the net is attached to a stationary object onshore, the net is drawn slowly ashore (Chakallal *et al.* 1994).

3.7.5 Gill and trammel nets

Gill nets are small nets that are used to target schools of pelagic species (Chakallal *et al.* 1994). They are made of small monofilament nylon which is hardly visible to the fish. Trammel nets which are now illegal in both Grenada and St. Vincent & the Grenadines are similar to gill nets but consist of three panels (McConney 2003b). These nets have a float and lead line which keeps it on the bottom and are soaked for about 18-24 hours. These nets are also utilised in the lobster fishery as nets left for an extended period of time contain decaying fish which attracts lobsters (McConney 2003b). This entanglement net is very unselective and catches many unwanted species leading to large quantities of by-catch which is detrimental to the marine ecosystem.

3.7.6 Longlining/Palang

Longlining or multi-hook fishery varies from the home made palang to mechanised longlining with hydraulic pulley systems. Many of the Southern Grenadine fishers are involved in the Grenada commercial longline fishery on the larger sloop vessels (e.g. sloops) The smaller vessels in the other islands use home made multihook (300-400) palang gear. Surface or “floating” palang is set high in the water column and this gear targets offshore pelagic species. Bottom or “sinking” palang targets demersals and are sometimes placed vertically along shelf slopes or along the edge of banks (Chakallal *et al.* 1994).

3.7.7 Diving

Spear guns are used extensively all around the Grenadines, particularly by younger fishers. Free diving fishers can go to depths of 60-80 feet and they target conch, lobster and demersals. Scuba diving fishers fish much deeper (e.g. 150 feet) which at many times is much deeper than the regulations stipulate for non-commercial divers. Many of these SCUBA divers do not have any formal training in SCUBA diving. The average crew size for spear fishers is 5-6 fishers (Chakallal *et al.* 1994) and fishers use a small wire noose to trap lobsters and short poles to carry fish.

3.8 Boat types

In the Grenadines, the most common boat type is the small wooden bow and stern. Boats are not specific and are used in many types of fishery (Chakallal *et al.* 1994). Details on the boats can be seen in Appendix 4.

4 RAPID INITIAL SURVEY (PHASE I): RESULTS AND DISCUSSION

The rapid initial survey was carried out to acquire a basic, broad picture of the resource use and the socio-economic status of fishers in the Grenadine fisheries. Below are the results of this survey.

Table 4.1 shows the distribution of fishers by island, each island’s estimated population, and also the proportion of the populations that were interviewed in this initial stage of the study.

Table 4.1. Sampling distribution of fishers interviewed and the island populations in the Grenadines

Island	Number of Respondents	* Population Estimates (2005)	Proportion of Population Interviewed	Estimated Fisher Population
Bequia	90	4420	2.0%	
Mustique	20	1290	1.6%	
Canouan	16	1830	0.9%	**800 (1982 records)
Mayreau	22	170	12.9%	
Union Island	32	1900	1.7%	
Petit Martinique	30	600	5.0%	**191 (1988 records)
Carriacou	57	8000	0.7%	
Total	267	18,210	1.5%	991

(Source: *SusGren 2005; ** Source: Chakallal *et al.* 1994)

From previous studies (Chakallal *et al.* 1994, Baldwin 2006) and through general observation, it was clear that the fishers were unequally distributed throughout the Grenadines. Islands such as Bequia and Carriacou contain larger proportions of fishers because of: (1) larger populations, (2) their highly active and concentrated fishing villages and (3) strong historical fishing traditions. Most of the fishers in the Mustique and Canouan fishing camps were not native to the islands but were mainly Bequians from Paget Farm. The men stated that increased competition in the fishery as well as proximity to fishing grounds are the two main reasons for residing at these camps.

4.1 Alterations to sampling design

Although it has been reported that more than 80% of adult males in the Grenadines are fishermen (CCA/IRF 1991), many fishers stated that this is an overestimation as it is unlikely that all of these men are dependent on fishing for some aspect their livelihoods. This was verified after many conversations with key informants and fishers who gave a drastically lower estimation of the fishing population on their respective islands. For example in Mayreau it was speculated that all male residents are reliant on fishing, however the fishers themselves identified a much lower number (15-20 fishers), which was comparable to those encountered in this study.

4.2 Demographic information

Out of the 267 fishers that were interviewed in the initial phase of this study, only one was female. The average age of the fishers was 43 years (median age = 42) and Figure 4.1 presents the percent frequency within the identified age groups. The graph follows a normal distribution with a slight skew to the left. It must be noted that 8.3% (n=22) of the fishers were beyond the age of 65, which is an age that is normally associated with retirement. The youngest mean age on any island was 36 years which was observed in Petite Martinique, while the oldest mean age of 46 years was among the fishers observed in Bequia. The average number of years spent fishing was 21, and thus fishers in the Grenadines begin to fish at an approximate, average age of 22 years.

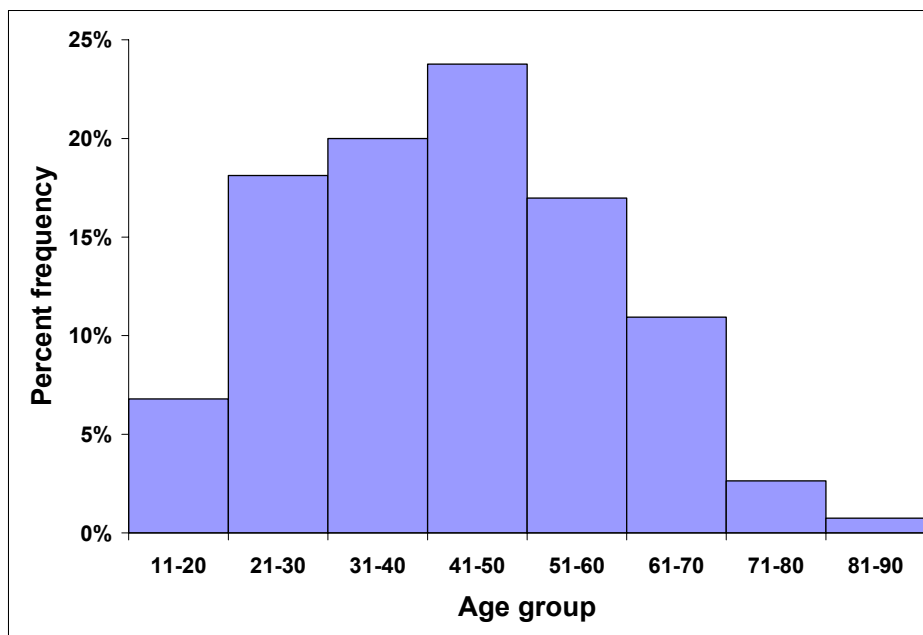


Figure 4.1 Age distribution of fishers interviewed in the Grenadines

4.3 Dependency on fishing

Sixty-four percent of the fishers interviewed stated that they are solely dependent on fishing, that is, 100% of their annual income comes from fishing. An additional 23% make half or more of their income from fishing, leaving only 12% making more income from other occupations.

There is a strong correlation between age and sole dependency (i.e. 100% of income) on fishing. The results of a Mann-Whitney, non-parametric test show that the difference between the mean age of fishers who are solely dependent (45.46 years) is significantly different from the mean age of fishers who are not (37.53 years) ($Z=-4.118$, $n=254$, $p=0.000$). A bar graph was created in Figure 4.2 to look at the dependency on fishing within the different age groups. It demonstrates a positive relationship which shows that older fishers are relying more on fishing. It also implies that younger fishers have more diversified sources of income.

These results present a very considerable vulnerability within the Grenadines fisheries where older fishers are evidently more dependent on fishing. This could be due to a mix of the following factors, *inter alia* : (1) the older generation were traditionally more dependent on fishing as there were fewer options in the past, (2) with the gradual growth in the economy and job market, younger fishers have more opportunities and are just using fishing to top up other work, and (3) as fishers get older, they are unable to adopt new skills to pursue other trades and thus, remain or turn to fishing. To identify which factors cause this relationship would require more extensive socio-economic research which is beyond the scope of this study. It is unclear how much of the older population on these islands is reliant on fishing but it seems to be one of the very few options available to them. This is a possible cause for concern as the older fishers who may not have national insurance, pension or welfare, remain in fishing as their only means of income generation.

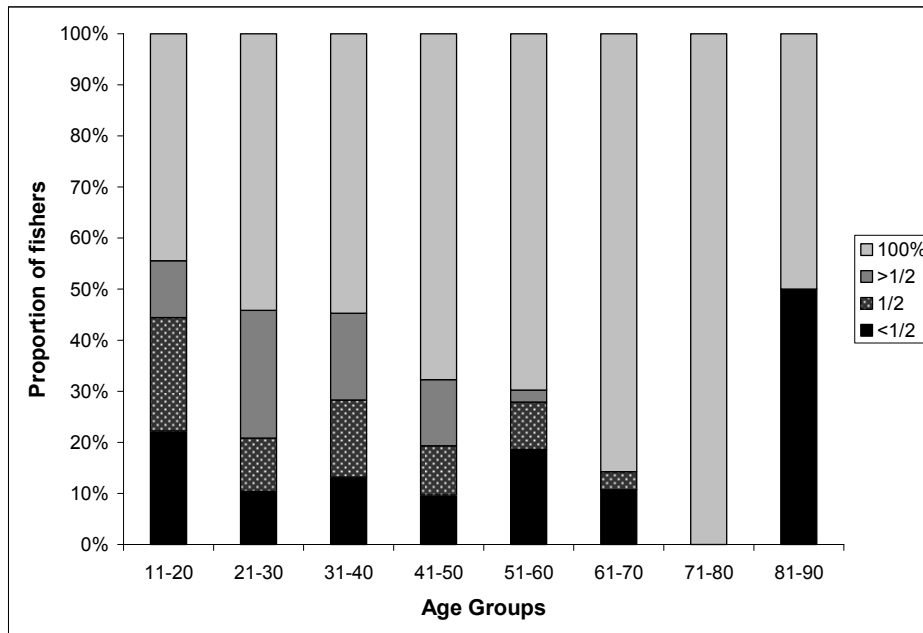


Figure 4.2 Dependency on fishing by age group

Figure 4.3 compares dependency on fishing among Grenadines islands. It shows that Bequia, Petite Martinique and Union Island have a larger proportion of fishers that are heavily dependent on fishing. All of these islands have strong historical fishing traditions (Bequia Tourism Association 2006, Logan 2001, Mohammed *et al.* 2003). This highlights a possible vulnerability as a decline in the fishery would have a greater impact on fishers in these three islands.

It was also observed that the fishers at the Canouan and Mustique Fishing camps are on average 4 to 10 years older than the overall average and 75% and 80% of them are solely dependent on fishing. This is expected as fishers who take the trouble to leave home to reside at fishing camps are likely be more dependent on fishing.

Mayreau and Carriacou fishers are less dependent on fishing and are likely to have more alternative sources of income. This may be due to, among others: the large size of Carriacou, which presents greater opportunities for businesses and agriculture; and the opposing small size of Mayreau may result in a greater need for multi-occupationality within the community (that is, fishing is one of the many frequently chosen occupations). Contrastingly, Petite Martinique is a small island with fishers who depend heavily on this sector which may be due to historical and cultural influences. To accurately determine the factors that generate the observed level of dependency, a more in-depth study would be required.

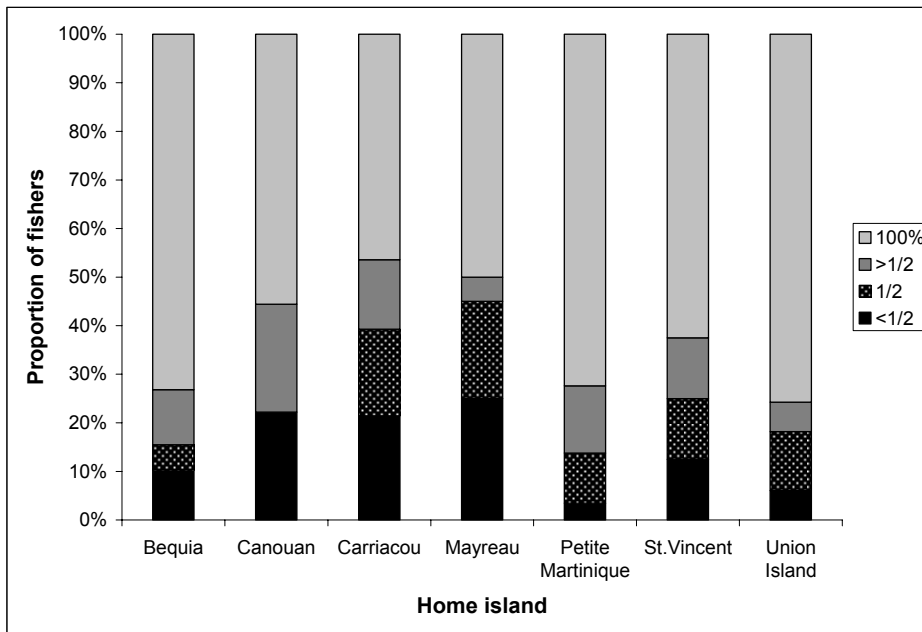


Figure 4.3 Dependency on fishing by home island

4.4 Boat ownership

Overall, 46% of the fishers interviewed during Phase I were boat owners and 54% either fish from shore or work as crew.

4.4.1 Boat ownership by island

Results show that Bequia has the largest ratio of crew members/shore fishers to boat owners. It can be speculated that this is due to a lack of initial capital to purchase a boat, along with a strong cohesion that was observed within the community which facilitates the sharing of resources such as boats and gear. This strong co-operation among fishers was again observed in Mustique where equipment and materials are also shared. Canouan and Union Island have more number of boat owners as fishers tend to operate on an individual basis (i.e. less crew) and on these islands and there is a lower density of fishers.

The average number of crew in all the islands is 4 with Bequia and Mustique having an average of approximately 1 more crew member than the other islands. To determine average number of crew for each type of fishing would require a larger survey effort.

4.4.2 Boat ownership, dependency on fishing, and age

The levels of dependency on fishing of boat owners and crew were plotted as pie charts in Figure 4.4 and they clearly demonstrate that boat owners are more heavily dependent on fishing while crew members and shore fishers have other sources of income. To test the relationship between ownership and dependency, a Chi-squared statistical analysis was performed and fishers were divided into sole dependents (i.e. 100% of their income from fishing) and those with other occupations. The results show that dependency on fishing is likely to be influencing boat ownership ($\chi^2=10.875$, $n=262$, $p=0.001$) or vice versa. A Mann Whitney test also showed there to be a statistical difference ($Z=-0.510$, $n=261$, $p=0.000$) between the age of boat owners (47.50 years) and non-owners (38.24 years). That is, those fishers who are solely dependent on fishing, or choose to focus on fishing, are more likely to purchase vessels.

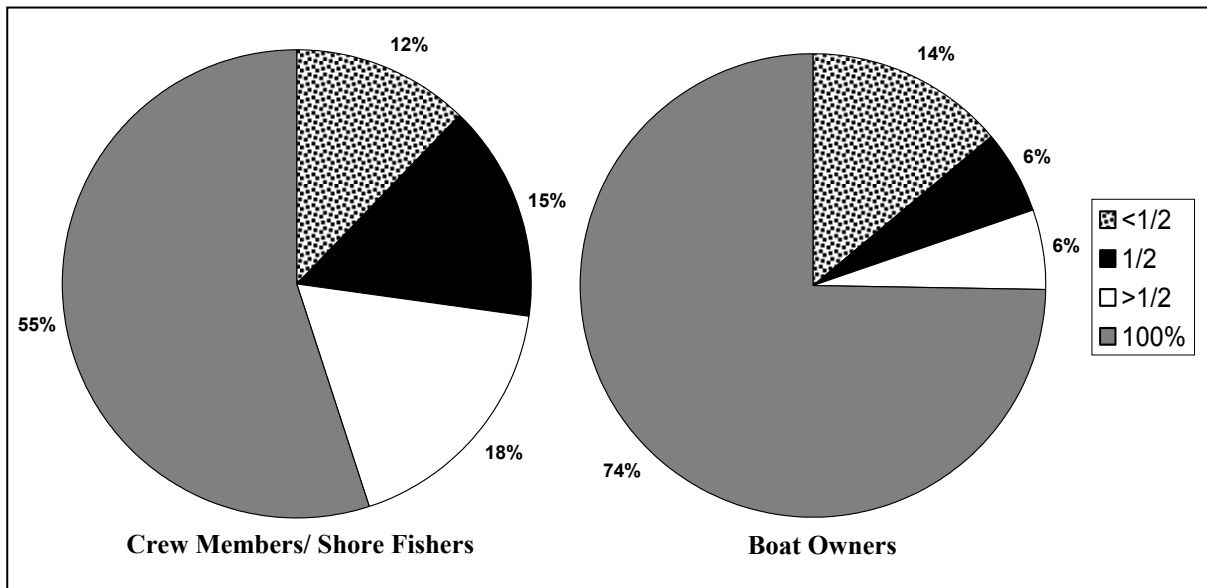
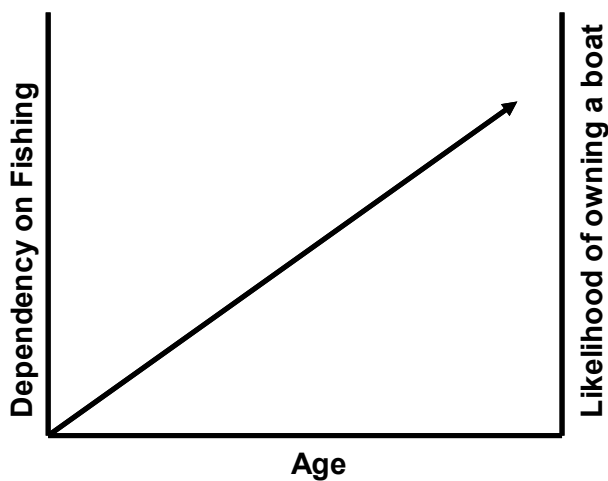


Figure 4.4 Proportion of income from fishing for crew members/shore fishers and boat owners

The average age of boat owners (47.50 years) was significantly higher than that of crew/shore fishers (38.24 years) according to a Wilcoxon Signed Rank statistical test ($Z=-4.076$, $n=262$, $p=0.000$). Older fishers are more experienced and may have accumulated the capital and time necessary to purchase their own fishing vessel or younger fishers prefer not to put large investments into fishing.



These two results illustrate a positive relationship between age, likelihood of owning a fishing vessel and dependency on fishing. This is illustrated in the diagram found in Figure 4.5.

Figure 4.5 Diagram showing dependency on fishing and boat ownership increasing with age

4.5 Other occupations

Although most of the persons interviewed (79%) stated that their primary occupation was fishing, there were 30 other occupations identified that part-time fishers use to supplement their income. These were grouped into the categories seen in Figure 4.6.

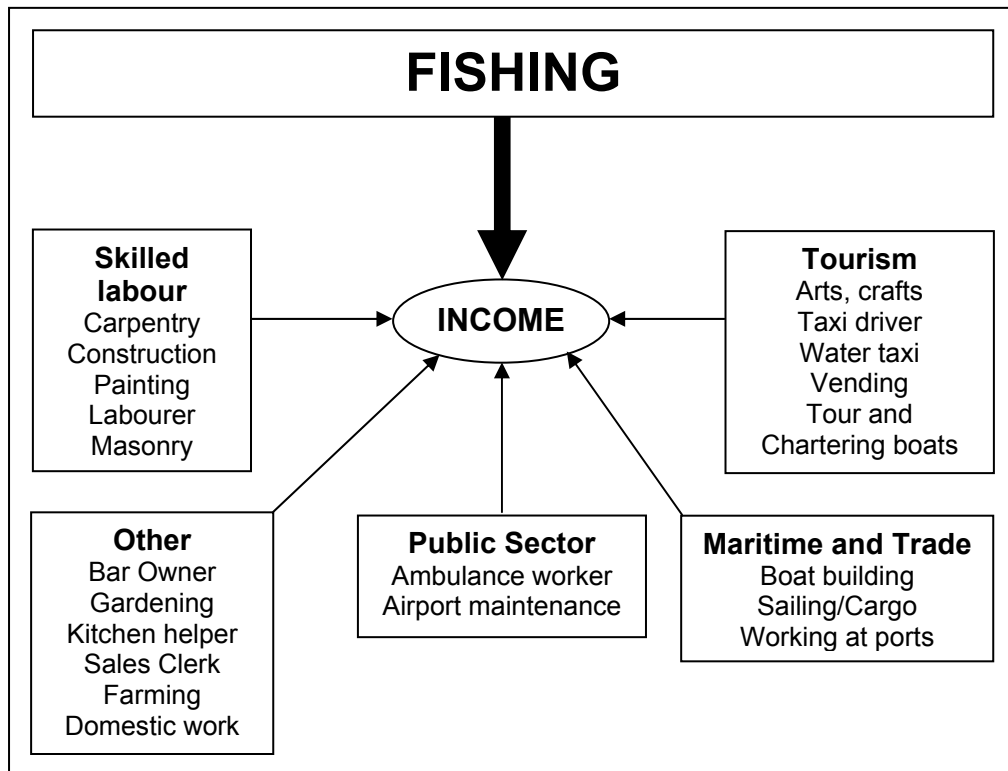


Figure 4.6 Diagram showing the main income earning activities identified by fishers in the Grenadines

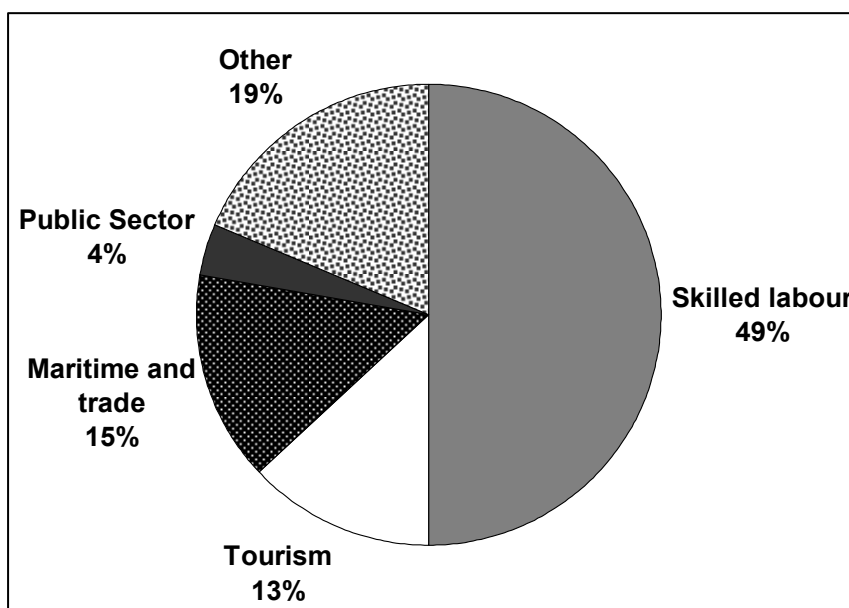


Figure 4.7 Main occupations of part-time fishers in the Grenadines (n=54)

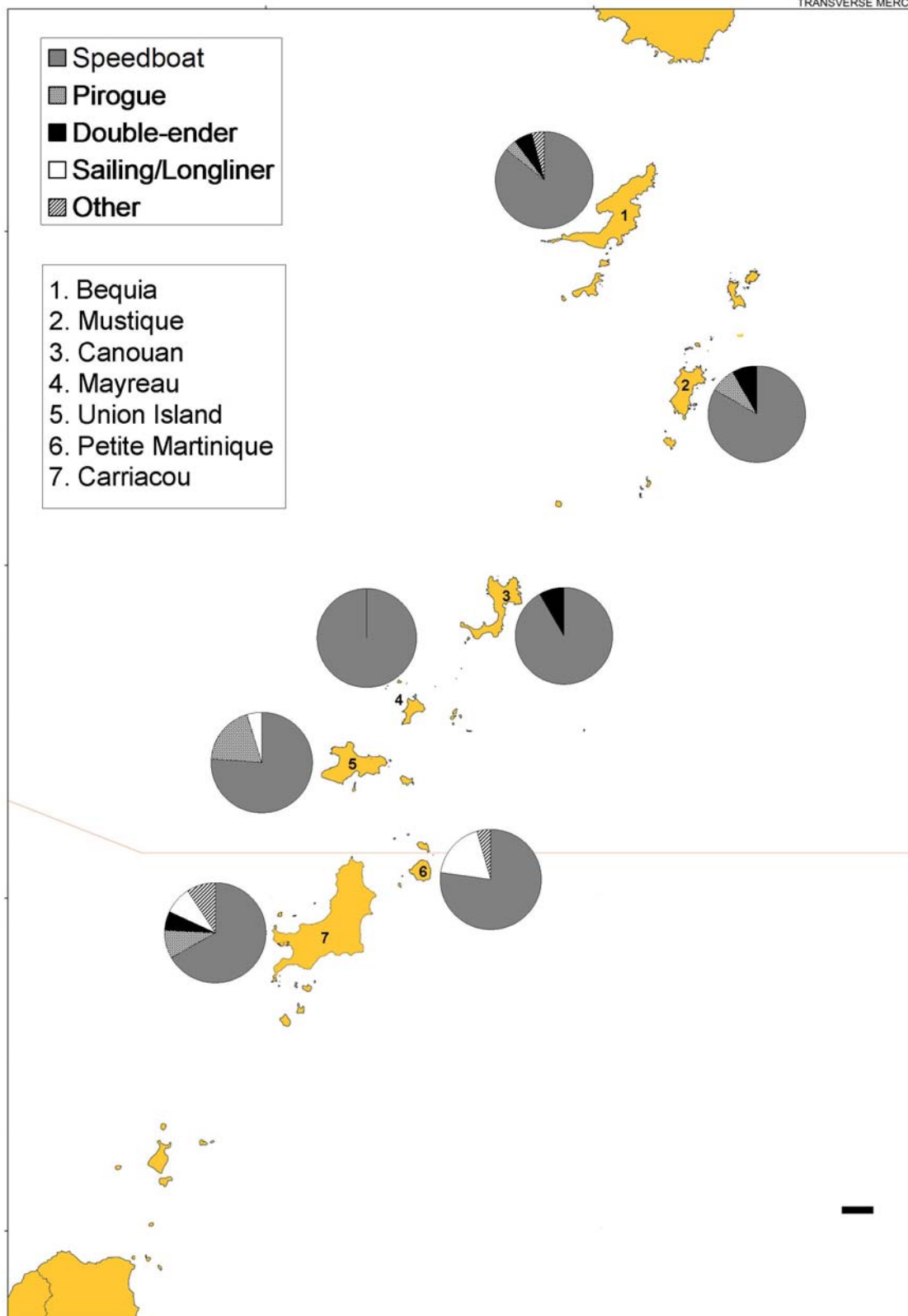
The pie chart in Figure 4.7 shows the primary occupations of part-time fishers and clearly shows that the majority of fishers turn to skilled labour to supplement their income. Very few fishers are also employed in the public sector and relatively small proportions are involved in tourism (13%) and marine and trade related occupations (15%). This may be due to the lack of compatibility between these occupations (e.g. skills not transferable) or simply due to lack of availability and/or interest.

4.6 Boat and engine types

The predominant boat types observed and recorded were wooden and fibreglassed coated, bow and stern boats (Figure 4.8). Less common were pirogues, sloops, modified speed boats and “bertrams” (cabin cruisers). There were six longlining vessels which were only encountered in the south, particularly in the Grenada Grenadines. The majority of boats (except for longliners and double-enders) are multi-purpose, i.e. are used in more than one type of fishery and target a variety of species (Chakallal *et al.* 1994).

Forty horsepower Yamaha engines were the preferred engines of fishers surveyed. Petite Martinique and Carriacou have the most powerful engines, averaging 75.9 HP and 66.3 HP respectively (overall average = 60 HP). This may be the result of subsidised costs due to government support through duty free concessions in the Grenada Grenadines.

The average boat length is 19.6 feet (5.9 m) with the largest boats situated in Petite Martinique (23.0 feet/ 7.0 m) and Carriacou (22.2 feet/6.7 m) while the smallest boats were located in Mayreau (17.3 feet/5.2 m) and Union Island (17.6 feet/5.3 m). This may be a reflection of a greater intensity of longline fishing which is taking place in the Grenada Grenadines or the government support within the industry. There was a weak positive relationship between boat length and total horsepower ($R^2 = 0.532$) which is seen in Figure 4.9.



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Figure 4.8 Map showing the distribution of boat types in each island surveyed

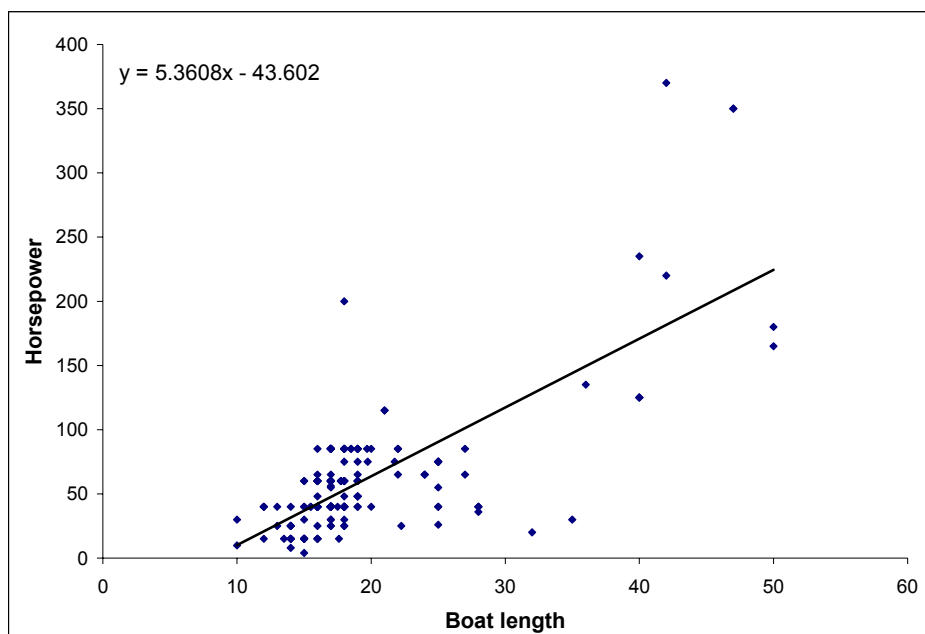


Figure 4.9 Linear relationship between boat length and engine horse power

4.7 Coastal and marine resource use

4.7.1 Fishing techniques

In each island, handlining was the predominant type of fishing practiced, except for Petite Martinique where spear fishing was the most common (see Figure 4.10). In terms of percent frequency within the age groups, handlining exhibits the same distribution as the overall age frequency distribution throughout the Grenadines (see Figure 4.11). This illustrates that handlining is more frequently practiced among all the age groups. Previous studies have also shown that this fishing technique and trap fishing are the two most common methods in the Grenadines (Chakallal *et al.* 1994).

Traps are also widely used in all islands, especially in Carriacou, Mustique and Mayreau. Spear fishing and/or scuba diving, with the exception of Petite Martinique, is more commonly practiced in the Northern Grenadines (see Figure 4.10). The distribution of the fishing techniques observed in Petite Martinique maybe not be representative of the actual fisher population due to the absence of longline fishers during the time of the survey who, according to key informants, spend the majority of their time out to sea or in Grenada.

A significant result is the obvious skew of spear fishing and scuba diving towards the younger age groups between the ages of 20-40 years (see Figure 4.11). This may be due to the large amount of risk, effort and fitness required to free/scuba dive and also because these are not the most traditional forms of fishing that older fishers may be more familiar with.

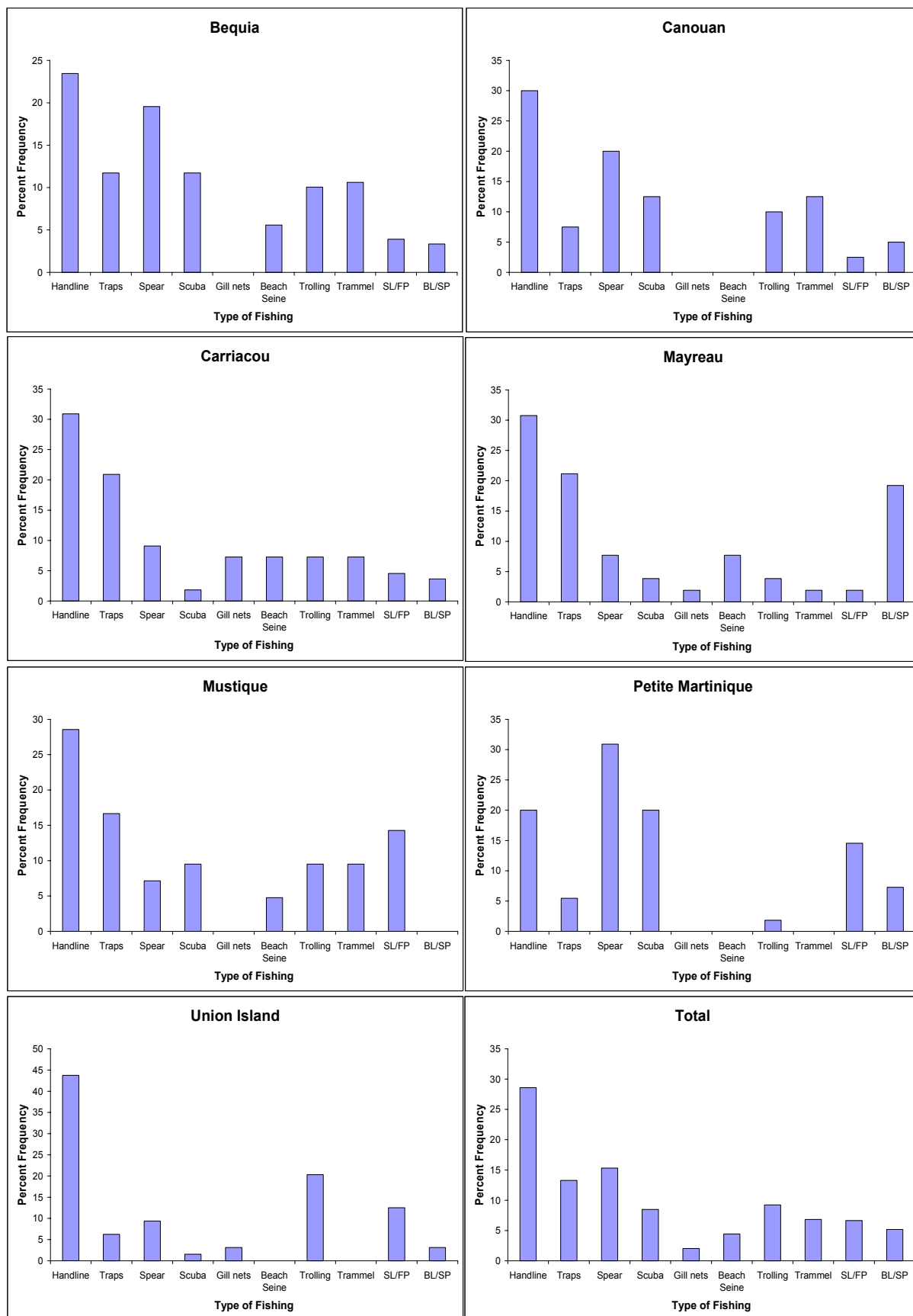


Figure 4.10 Percent frequency of each type of fishing by island (SL/FP- Surface longlining/floating palang, BL/SP- Bottom longlining/sinking palang)

Gill nets were not reported to be used often however this may be due to a misunderstanding as gill nets were mistaken by many for trammel nets. Therefore the data may not give an accurate account of these two types of fishing. Beach seining is not commonly practiced in many islands, but is focused mainly in Bequia, Carriacou and Mayreau.

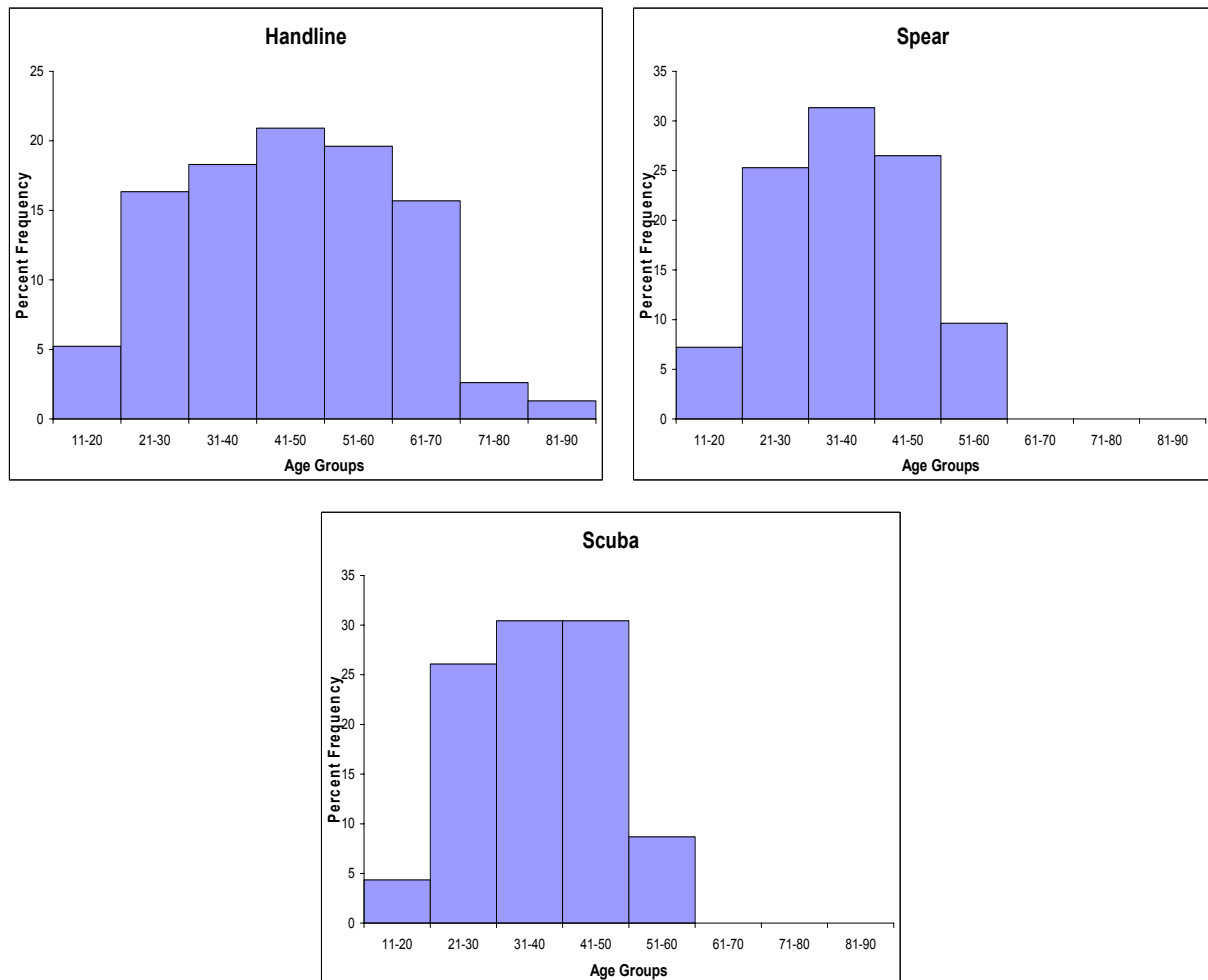


Figure 4.11 Types of fishing by age group

Lobster is an important target species due to its high ex-vessel price. From discussions with key informants within the St. Vincent & the Grenadines Fisheries Division, it is likely that the amount of lobster fishers was underestimated in this study. This is because a large number of fishers enter the fishery only for this species and this study was not conducted during the open season between September and April. Traps were encouraged by the St. Vincent & the Grenadines Fisheries Division so as to reduce death and injury by scuba divers going beyond the recommend limits. One fisher has stated that up to 30 fishers each year suffered from decompression sickness and had to be airlifted to Barbados for treatment in the decompression chamber. However, this is a costly and difficult exercise as the fishers have to pay over EC \$300 for airfare alone plus treatment and accommodation for the victim and an accompanying friend/relative. The frequency of scuba diving injuries in the Grenadines is due to the lack of proper training and the disregard for the recognised safety regulations. Fishers state that they knowingly go beyond safe dive limits so as to increase their catch per dive and have done repeat dives to 150 feet (45.5m).

Offshore pelagics are more important to the Southern Grenadines (see Figure 4.10). This again is due to the Grenadian government's encouragement of longline fishing on all of its

islands. It was also noted that trolling for this fish group is dominated by older fishers in smaller vessels where 43% are above the age of 50. However, as previously mentioned, it is believed that the proportion of fishers targeting these species is much higher than recorded due to the absence of longline fishers from the islands at the time of this study.

4.7.2 Fish groups targeted

As is illustrated in Figure 4.12, the majority of fishers interviewed on each island are targeting demersals. These are commonly caught using handline and spear which are the two most popular fishing techniques used. This supported the results of a baseline study conducted in the 1990s, where deep-water demersals were found to be the most important species group for 75% of Vincentian Grenadine fishers (Chakallal *et al.* 1994). This also supports reports of overexploitation of some demersal species such as red hind in the Vincentian and Grenada Grenadines (Caribbean Regional Fisheries Mechanism 2004, Finlay 1999). The Fisheries Officer for Carriacou and Petit Martinique stated that the government encouraged fishers to enter the longline fishery to reduce the fishing effort on the overexploited bank demersal species. This appears to be successful as informants on islands such as Petite Martinique stated that a large majority of the fishers are becoming involved in the longline fishery. It is not clear at the moment if this has reduced fishing pressure on the demersals and studies will have to be performed with regards to the status of this species group.

All of the fishers who target whales and porpoises are from Bequia and this group is the least pursued species in the Grenadines. Sea turtles were reported to be rarely targeted as well but this could be due to fishers being unwilling to share this information in fear of the consequences of being identified as fishing a conserved species.

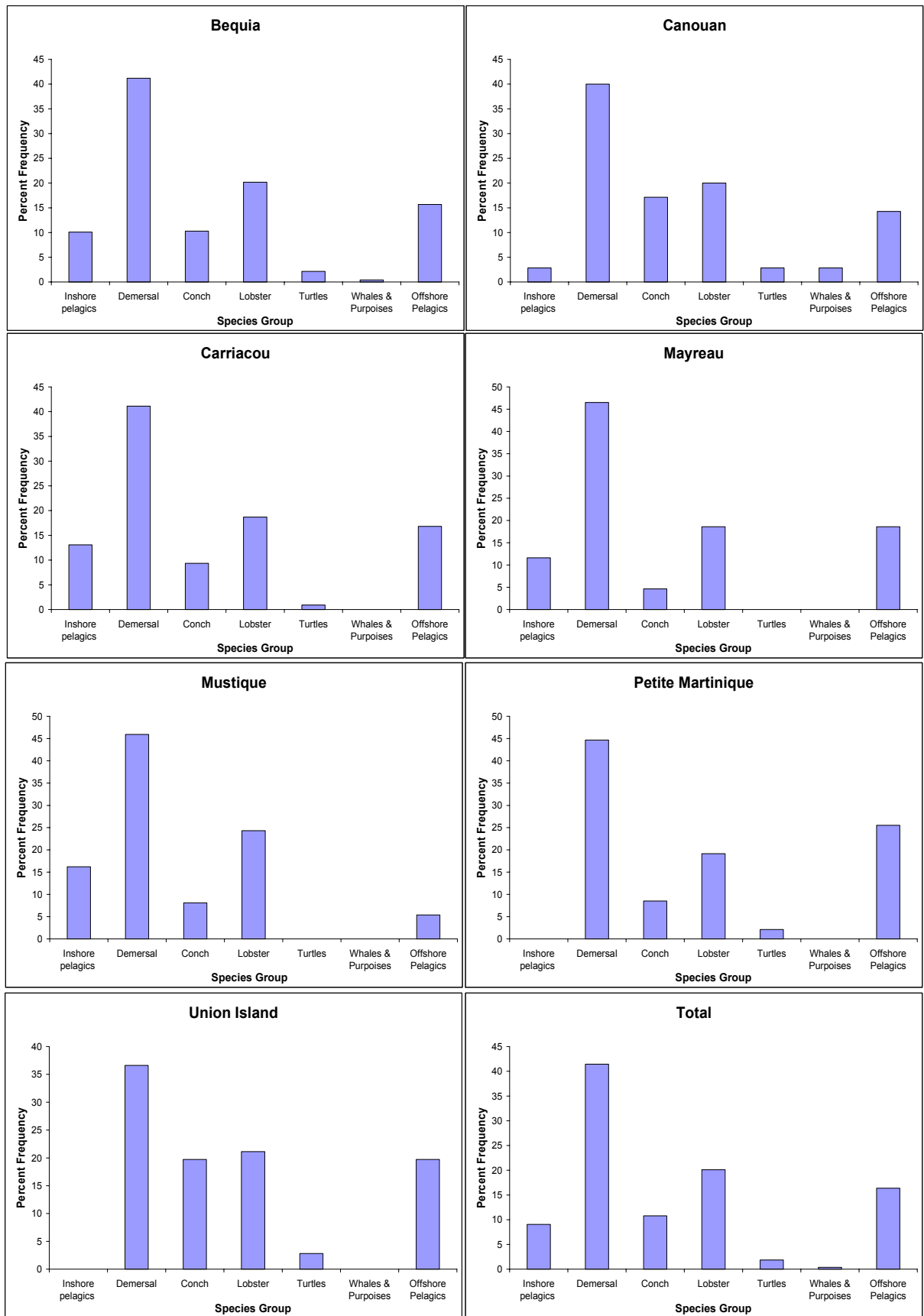


Figure 4.12 Proportion of fishers targeting each fish group by island

4.7.3 Areas fished

Fishing areas by island of operation

The majority of fishers interviewed fished around the islands closest to their base of operations, as is shown in the matrix diagram in Figure 4.13.

- Approximately half of the fishers operating from Bequia fish around the island of Bequia, Petit Nevis, Isle de Quatre, Mustique, Savan, Pillories, Balliceaux and Batowia (see Figure 4.14). These findings confirm previous results which determined that Bequians are the most mobile fishers of the Grenadines (Chakallal *et al.* 1994).
- The majority of the fishers operating out of Canouan (42%) remain close to the island while some (13.2%) venture towards Mayreau. This is logical as most of these fishers left their home island of Bequia to camp at the Canouan Fisheries complex.
- $\frac{3}{4}$ of the fishers operating out of Mustique, all of whom are from Bequia, fish near Mustique (see Figure 4.15). This again makes sense because they would remain at the Mustique fishing camp for long periods of time. Out of all the fishing villages, the Mustique fishers travel the least, or remain closest to their base of operations.
- Half of the fishers from operating out of Carriacou fish close to home (see Figure 4.16).
- Approximately half of the Mayreau fishermen stay near Mayreau and Canouan
- Petite Martinique fishers remain close to home (33.9%) and also fish further south in Grenada (19.4%). This is due to the longline fishing that is practiced on this island.
- Union island fishers that were interviewed exhibit quite an even distribution of fishing throughout the Grenadines (except for St. Vincent) with the majority (25.8%) fish closer to Union Island.

Source of fishers

- The majority of fishers (longliners) who go offshore to other islands in the Eastern Caribbean are from Union Island. This however may not be an accurate representation of the distribution of longliners but due to the interviewing of a crew members from one boat during the study. It was also difficult to interview those longliners who would fish here from PM because they are based in Grenada.
- The majority of fishers in Grenadian waters operate out of the islands from their own territory, Carriacou and Petite Martinique.
- There were only 3 fishermen encountered (two from Bequia and one from Petite Martinique) that fish around St. Vincent.
- The Tobago Cays is visited by fishermen from Bequia, Canouan, Petite Martinique and Union Island. Although there were only 10 fishermen who mentioned fishing off of the Cays, the exact locations of this practice are not known. In the recent past, there was an established fishing camp on Petite Tabac and thus some fishers are returning to these islands to fish. This could have implications for the conservation efforts taking place within the Tobago Cays Marine Park.
- Carriacou, Canouan and Mustique, Savan, Pillories, Balliceaux, Battowia, All Awash are the most intensely fished areas. This may be due to the fact that most of the fishers in our sample were from Carriacou and Bequia.
- St. Vincent, Tobago Cays and the Eastern Caribbean (e.g. St. Lucia, Barbados, Martinique, etc) are the least intensely fished areas. The Tobago Cays are not fished

as intensely because it is a marine park. It is expected that due to the large investment required to enter the longlining industry (larger boats, expensive gear, fuel, etc), few fishers are venturing beyond the Grenada Bank.

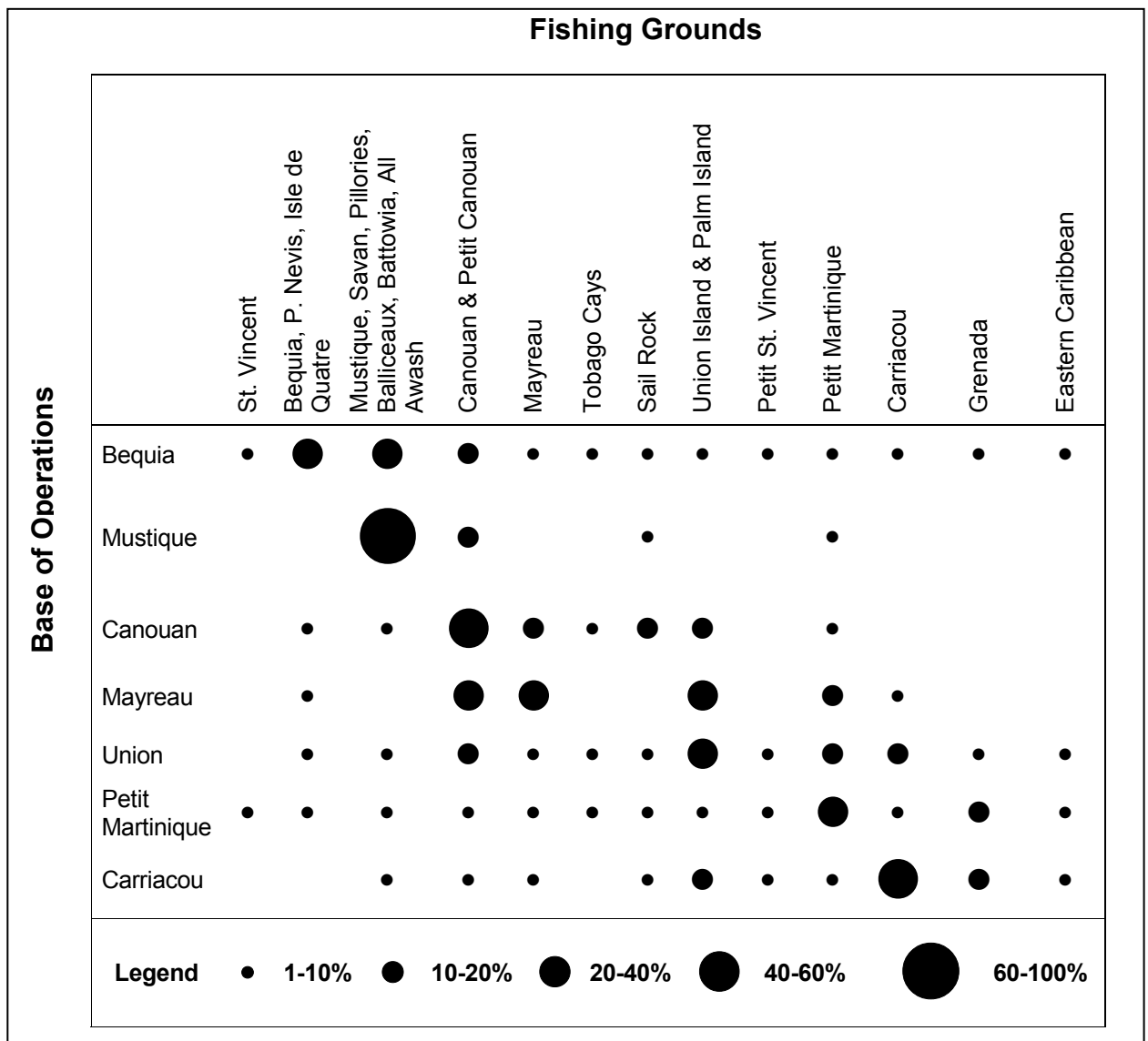
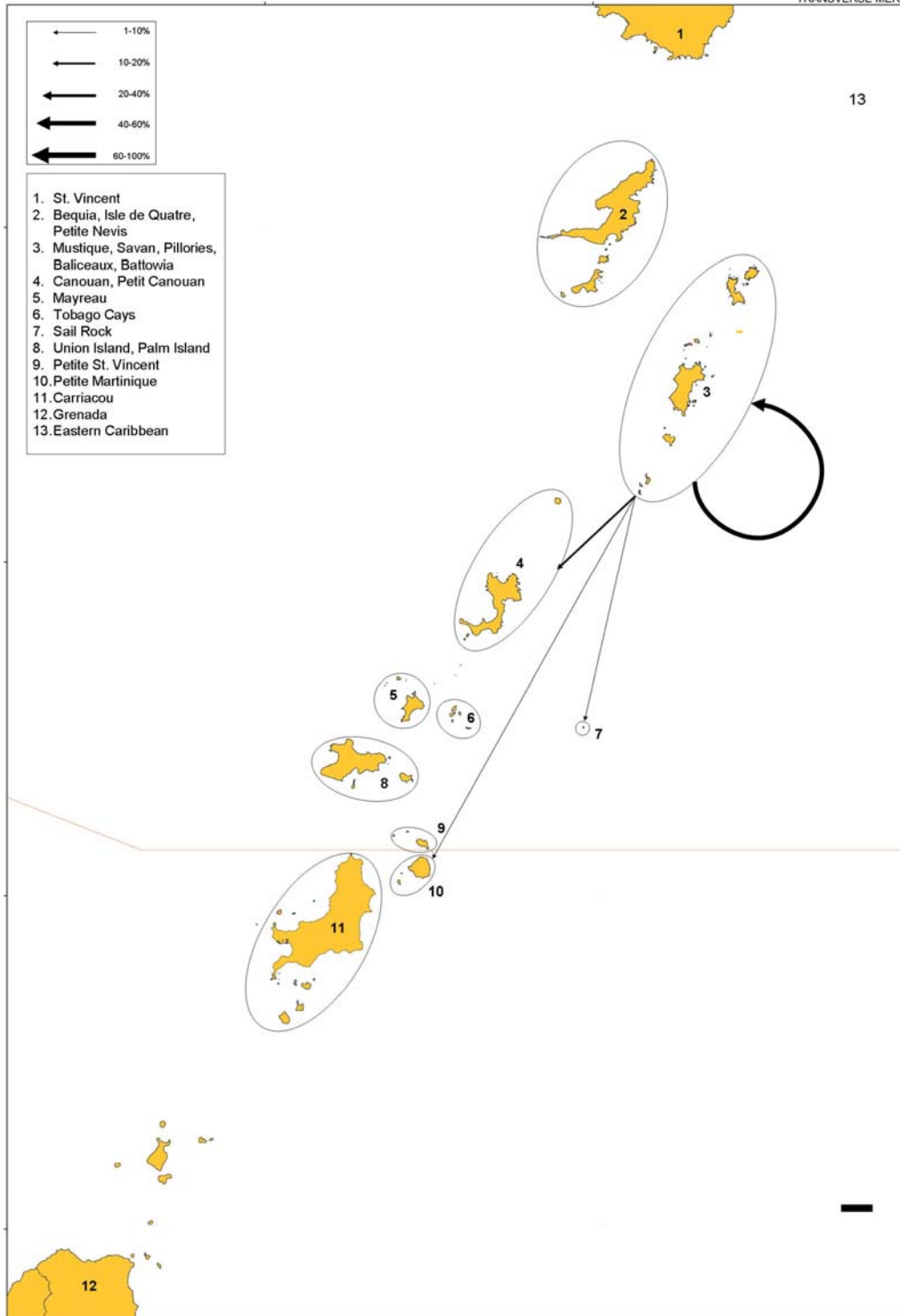


Figure 4.13 Matrix diagram showing the distribution of fishing locations of fishers from each island of operation

Figures 4.14 - 4.16 show the “destinations” (i.e. fishing grounds) of fishers from each island. The fishing grounds were grouped (circles) and delimited by proximity and the 20 m bathymetry contour line.



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Figure 4.15 Map illustrating the location and intensity of fishing around the Grenadines by fishers based in Mustique



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Figure 4.16 Map illustrating the location and intensity of fishing around the Grenadines by fishers based in Carriacou.

5 IN-DEPTH SURVEY (PHASE II): RESULTS AND DISCUSSION

This survey involved 64 fishers and was designed to give a more in-depth look into the socio-economic characteristics of the fishers.

5.1 Demographic information

Similar to the results of the initial survey, the age distribution of interviewed fishers was approximately normal (Figure 5.1). The average age of fishers was 45 years, who have fished for an average of 23 years. All of the age groups except the 11-20 and 81-90 were encountered in this phase (Figure 5.1) and all of the respondents were male. The predominant religion found in this study was Roman Catholic followed by Anglican and Pentecostal (Figure 5.2). Roman

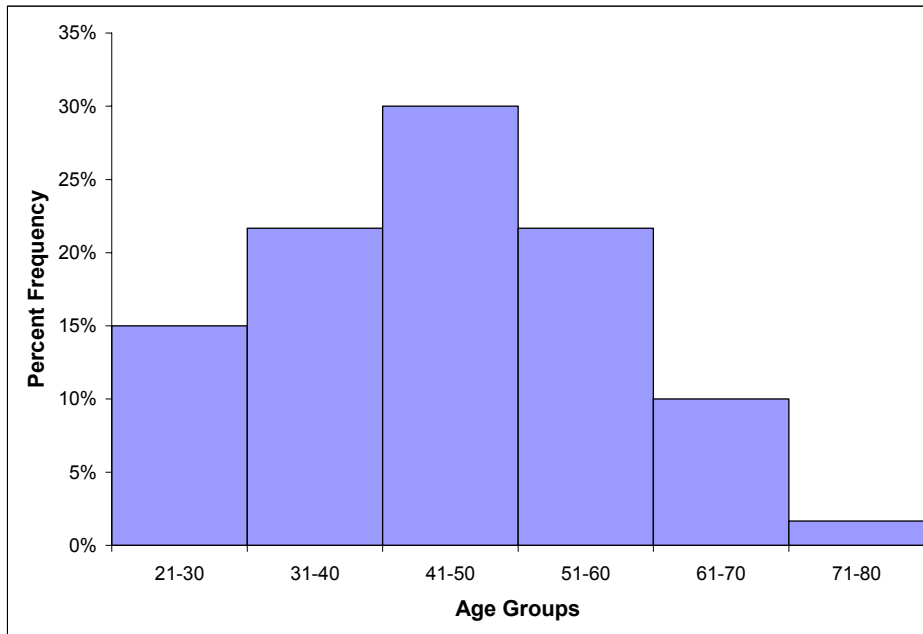


Figure 5.1 Age distribution of fishers sampled during the in-depth survey

Catholics dominated islands such as Mayreau and Petite Martinique where all of the respondents were members of that religious group. Sixteen percent of the interviewees stated that they were not part of any religious group. Almost $\frac{3}{4}$ of the respondents were Afro/Negro/Black with Mixed and East Indian making up the remainder (Figure 5.3).

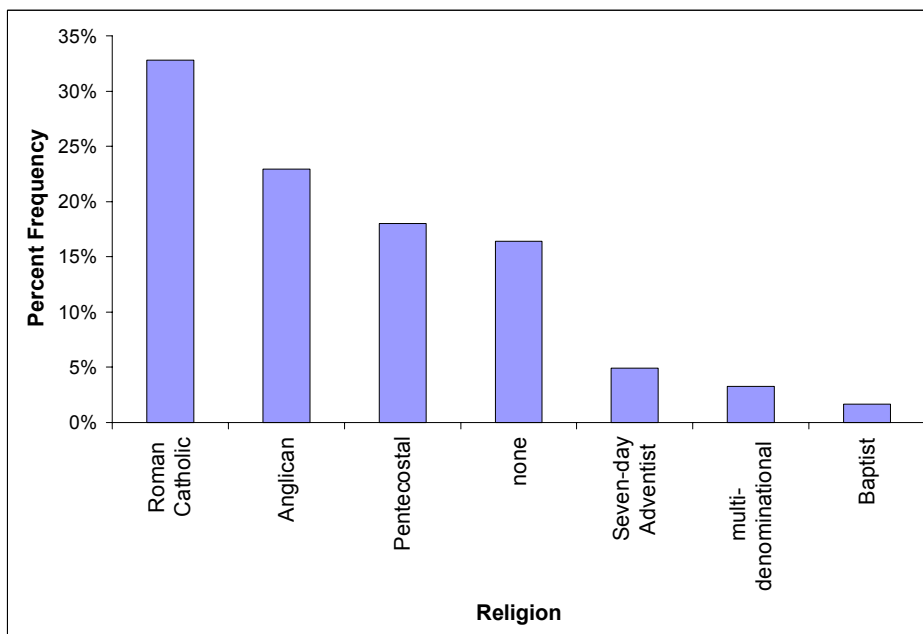


Figure 5.2 Percent frequency of the types of religion of the interviewed fishers

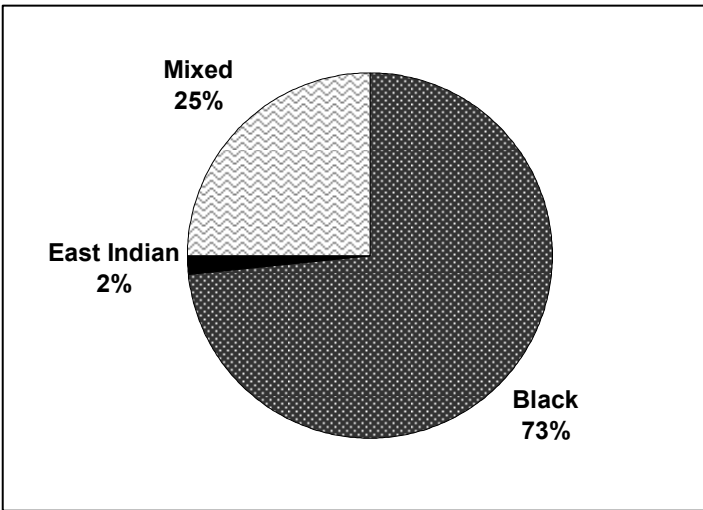


Figure 5.3 Ethnicity of fishers interviewed in the in-depth survey

5.1.1 Education

The majority of fishers have obtained up to primary education with only 32% reporting secondary or post-secondary education (Figure 5.4). In Bequia there was some difficulty in assessing the level of education of the fishers. It appears that a large number of the fishers attended a government ‘primary’ school until they were 15 years old and it is unclear if the curriculum contained teaching that would be considered secondary level. Therefore the education data from Bequia was excluded from the analysis where a large portion of interviewees left school at this age. It must be noted however that the only fisher in this survey to attend a technical learning institution was from Bequia.

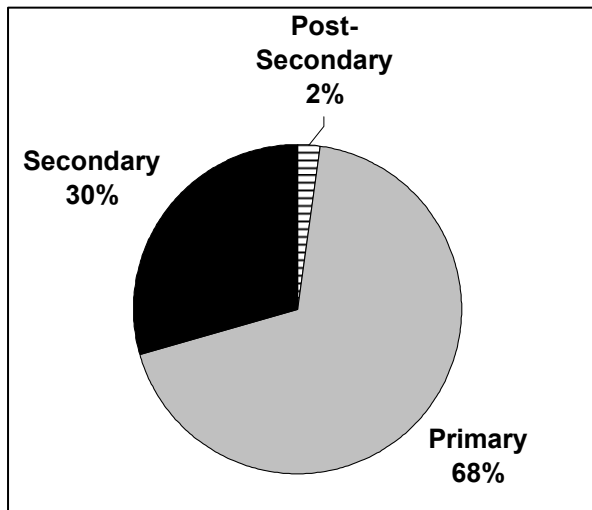
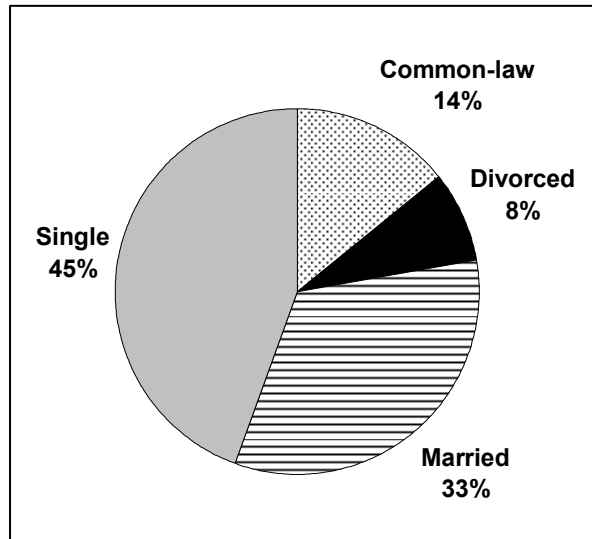


Figure 5.4 Level of education of fishers surveyed in the Grenadines

Secondary education is not available on every island (e.g. not in Mayreau, Petite Martinique) and parents have to send their children to school by boat to other islands. One Petite Martinique fisher described the great financial burden of having to send his children to Carriacou each day by boat so that they can attend secondary school. Most of the secondary schools in the Grenadines were recently established which would have made it more difficult for fishers thirty

years ago to obtain secondary education. Some also said that due to financial problems within the household, they were required to enter the workforce (i.e. fishing) at a young age. One of the fishers stated that even now fishers lack access to tertiary education. He believes that this lack of access is a limitation to fishers being able to better sustain themselves with regards to fishing and to manage their money effectively.

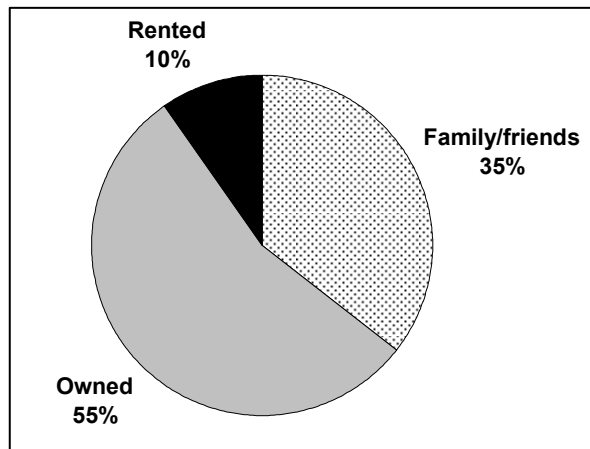
5.2 Household composition



One third of the fishers surveyed were married and 58% were either single or had a common-law partner (Figure 5.5). For the fishers who provided information (n=14) on dependents in the household (even though it was not asked in the survey), the number of dependents was on average 5.6 and ranged from 2-9 children. Eighty percent of the fishers were the head of their households and on average there was 1 other person in the house who also had a regular source of income. Only 9 of the 64 respondents stated that they lived in a household with another fisher.

Figure 5.5 Marital status of fishers interviewed in the in-depth survey

5.3 Material style of life



Fifty-five percent of the interviewees owned the house they lived in (Figure 5.6) and half owned the land that their house is upon. All houses have galvanised roofs and majority of the outer structures are concrete walls (58%) (Figure 5.7). The predominant flooring type is cement (55%) followed by wood (Figure 5.8). Information was collected on select household items during the interview. Figure 5.9 shows the percent of respondents possessing various household items.

Figure 5.6 Ownership of households of fishers interviewed

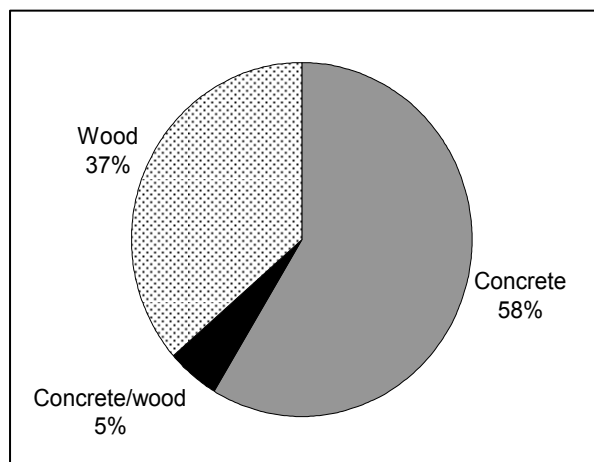


Figure 5.7 Wall material of the households of the fishers

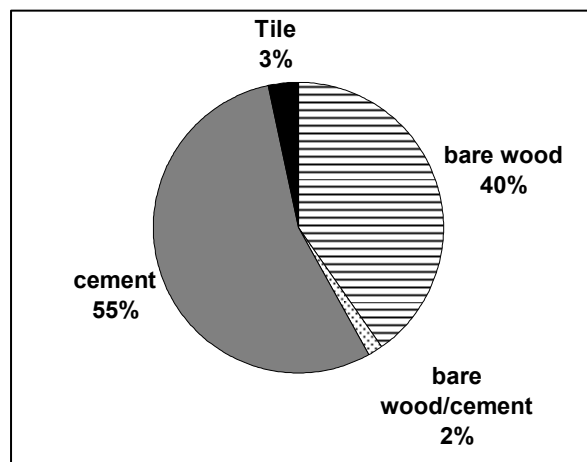


Figure 5.8 Flooring material of the households

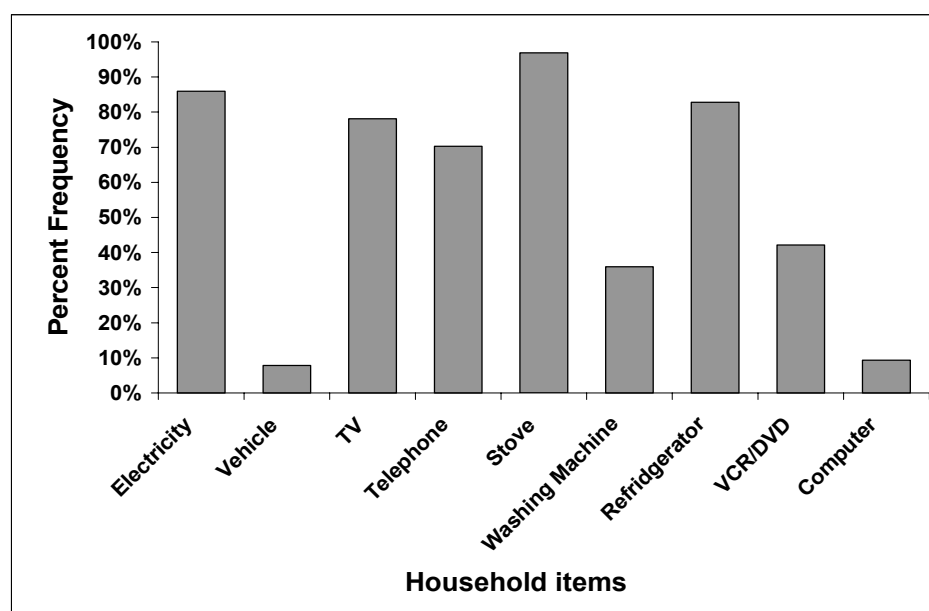


Figure 5.9 Percent frequency of household items of fishers interviewed during the in-depth survey

Almost all of the fishers had a stove and over 70% had electricity, television, telephone and refrigerator (Figure 5.9). Vehicles were not practical as the islands were small and many used or shared boats and vehicles as their means of transport. Most of the fishers with vehicles were found in Carriacou and Bequia (the largest of the islands). As a result of the water scarcity on many of the islands, washing machines were not frequently used, especially in the Vincentian Grenadines. Computers were also not very popular household items and almost all were found in the Grenada Grenadines (Figure 5.10). Overall, from the data collected, the fishers in the Grenadines appear to have a quite comfortable standard of living.

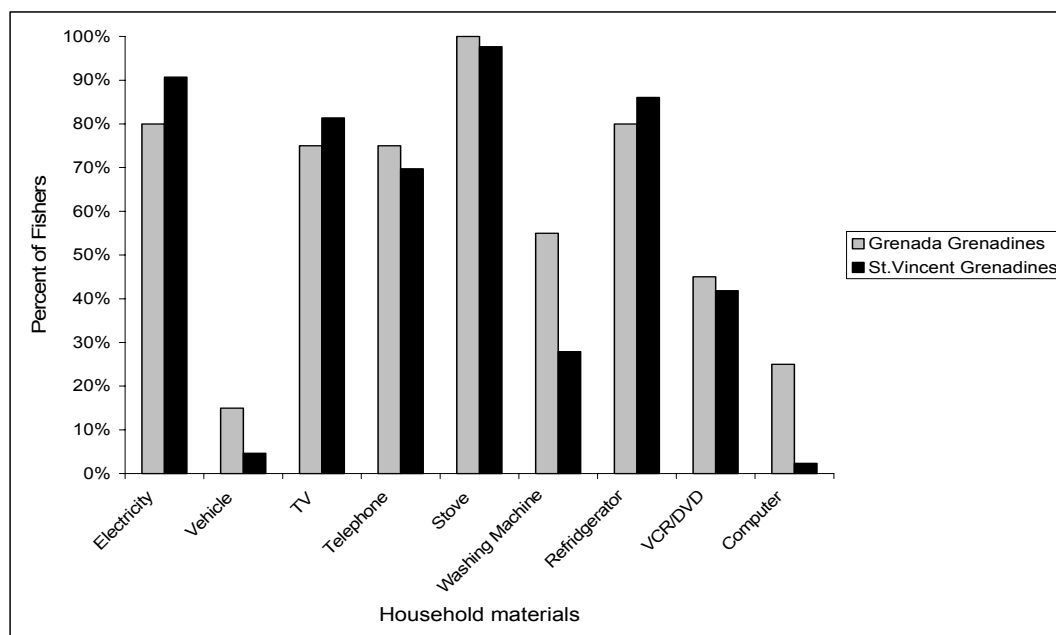


Figure 5.10 Percent frequency of household items owned by fishers in the Grenada Grenadines vs. the Vincentian Grenadines

5.4 Occupations and dependency

Seventy percent of the respondents stated that they earned all of their money from fishing (see Table 5.1). This was similar to the findings in Phase I. Only 11% of the fishers had a primary occupation other than fishing, 4.7% of these other occupations were marine based.

Table 5.1. Table showing the primary occupations and its proportion of the annual income of the individual fishers in this study

Primary Occupation	Proportion of Income	Percent of Respondents
Fishing		
	100%	70.3%
Fishing	1/2	3.1%
	>1/2	15.6%
Total		89.1%
Maritime and Trade		
Boat repairs, maintenance	>1/2	1.6%
Sailing	>1/2	1.6%
Shipping	>1/2	1.6%
Total		4.7%
Skilled Labourer		
Carpentry	<1/2	1.6%
Labourer	1/2	1.6%
Total		3.1%
Tourism		
Vending: t-shirts	>1/2	1.6%
Total		1.6%
Other		
Bar operation	>1/2	1.6%
Total		1.6%

Fifty-nine percent of the fishing households have a fisher that is solely dependent on fishing and is the main income provider. As most of the spouses and partners of the respondents stayed at home, fishing is the sole income source for many households in this study. Seventy-five percent have a marine/tourism based occupation as a main income earner for the households (i.e. fishing, sailing, boat building, t-shirt vending). Twenty-eight percent of the interviewees had more than one other job but only 1 respondent reported three jobs. Some of these included construction, gardening, sailing, water-taxiing, mechanics and chartering. This highlights a major vulnerability as many of the fishers are not taking part in any other jobs other than fishing.

Fifty-eight percent of the persons interviewed were boat owners and 40% crew members (2% were not identified). As seen in the Phase I, a greater proportion of boat owners were solely dependent on fishing than crew/shore fishers and thus it appears that more crew members/shore fishers have other jobs as their primary occupation.

5.5 Share systems

The most common share system that was encountered was all the fishers get an equal share with a share going to the boat and a half or whole share going to the engine (after fuel expenses). This is consistent with the findings of Chakallal (1994). Only a few crew members expressed dissatisfaction with the share system on their boat or that owners are taking advantage of them. Some of the other share arrangements encountered were: (1) owner gets 1/3 of crew's catch (after expenses), (2) crew pay \$2/kg for the "boat keeper" (person who stays on board the boat during spear/scuba diving), (3) 1/2 of earnings to the gear (seine net), 1/2 of earnings distributed among owner and crew.

5.6 Cleaning and servicing

To get an idea of some of the possible environmental impacts of fishing (mainly marine pollution), fishers were questioned on their boat and engine cleaning/maintenance practices.

Boat cleaning

Most of the fishers usually bring their boats on the docks after selling their catch to empty gear and clean the boat after each trip. Very few fishers do not clean after each trip but in less frequent intervals (e.g. every weekend). For those who fish from areas without docks, the cleaning is performed in the nearshore. The most common cleaning agent is a liquid soap/detergent commonly called "squeeze" (due to being dispensed from soft plastic bottles). Some of the fishers use disinfectants and bleach along with the liquid soap. This is mixed with seawater or freshwater to rinse the boat of fish offal and debris.

Engine Servicing

Almost all the respondents service their engines themselves and the majority do it at least once every month (62%). There was no standard method of engine servicing used by all boat owners. This ranged from using the basic water repellent lubricants such as WD-40 to spray on the engine to checking and replacing spark plugs and cleaning filters. It is not clear if these methods are sufficient to ensure the proper maintenance and running of the engines. Most of the engines are repaired and serviced professionally only when absolutely necessary.

Boat Painting

Fifty-nine percent of the respondents paint their boats every year or more frequently. Most fishers chose to clean their boat once a year during the "off season" (i.e. out of lobster season). This process usually involves sanding to remove old paint and algae, the removal and repair of

fibreglass and finally the repainting of the boat. It appears that this process is performed on the docks or at the nearest haul out site. The most common paint that is used is a marine, anti-fouling paint which is toxic in nature. There have been some initial efforts to by SusGren to introduce and encourage the use of other less toxic paints but have not been fully implemented at the time of this study.

5.7 Coastal and marine activities

5.7.1 Target species

Figure 5.11 shows the percentage of respondents which target the different fish groups. As seen in phase I, demersals are the species of choice, followed by lobsters and offshore pelagics. Only two turtle fishers and one whaler were interviewed during this stage.

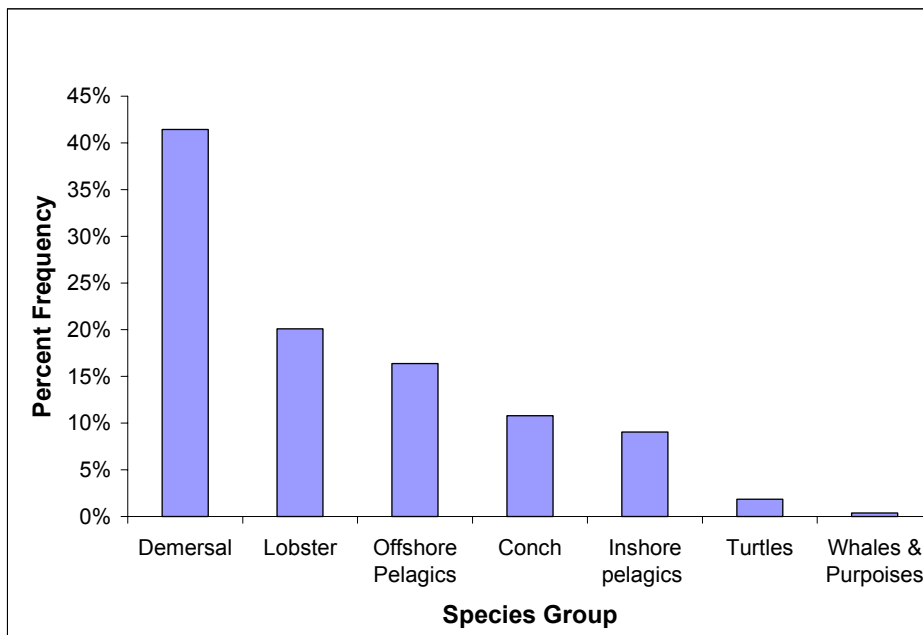


Figure 5.11 Percent frequency of fishers (interviewed in Phase II) targeting the various species groups

5.7.2 Limitations

Figure 5.12 shows the average catch for each species group. However, fishers expressed great difficulty in determining their average catch. Fishers would state what a “good fishing day’s catch” and a “bad fishing day’s catch” would be and then an estimation between that figure would be created. As such, this data was not combined with other variables to be used in further analysis such as: total landings, average annual catch, average catch by fishing ground and average gross earnings per species. An expected bias would be that fishers would understate their catch so as to give an opinion of less earnings. The opposite was also observed where fishers drastically overstated their catch, possibly to give a better impression of their fishing skills. Information that was obviously misleading or was completely contrary with the information from key informants was discarded (i.e. data from 2 in depth surveys). However, to ensure that the average values were not entirely inaccurate, an average weekly wage of a typical fisher was created and compared to other data collected in the concurrent livelihood study. Gross weekly earnings for a typical fisher were calculated using the following formula:

Estimated Weekly Earnings =

$$\frac{\text{Avg. Catch} \times \text{Avg. Price Received}}{\text{Avg. Crew}} \times \text{Avg. Fishing trips per week}$$

Using this equation, the average demersals fisher would make EC \$500 per week. This is significantly lower than the average weekly catch earnings found in the livelihood study conducted by Staskiewicz in 2006 (EC \$943.86). However, the average daily catch for demersals fall within the range (18-45 kg) given in a previous study (Chakallal *et al.* 1994).

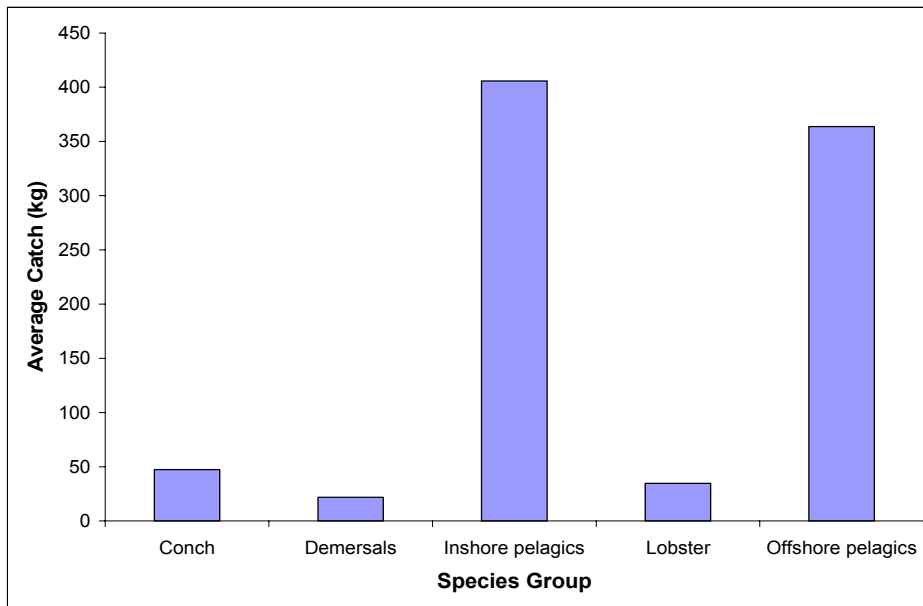


Figure 5.12 Average catch of fishers in the Grenadines by species group

The average fishing trip (in hours) given for each species group was measured from the time of leaving the mooring/dock to the time of landing (Figure 5.13). This was a rough estimate and trips reported for some target species were relatively similar (e.g. demersals) and while others varied greatly in duration (e.g. offshore pelagics). Again it was difficult to isolate the hours fished by type of fishing as fishers used more than one technique to capture the same species on a single trip. To gather this information would have made the interview process too complicated as the fishers had already showed difficulty in giving adequate detail for the current survey. Figure 5.13 shows the average hours fished for each species group.

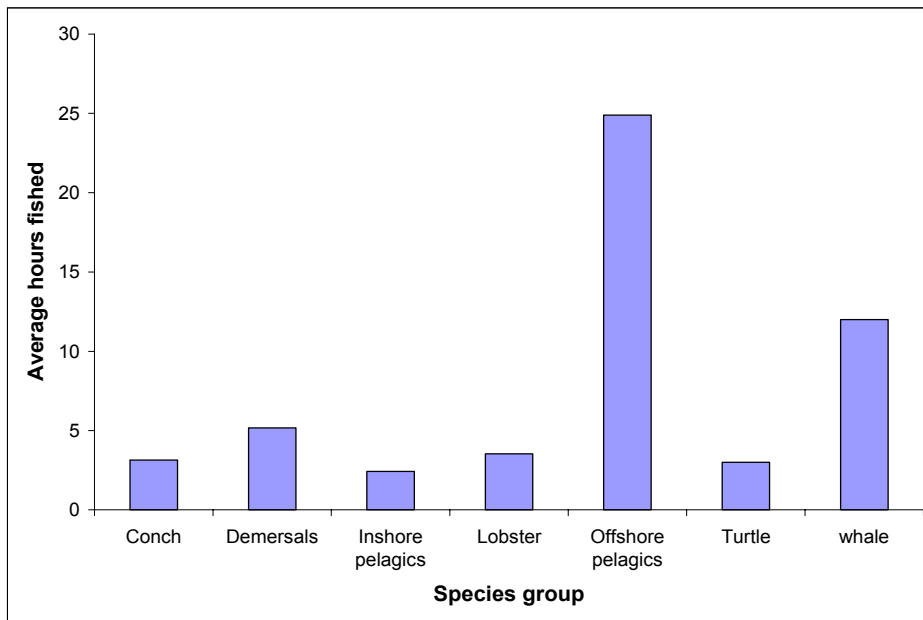


Figure 5.13 . Average hours of fishing for each type of species

5.7.3 Fishing techniques

Conch is fished by free/scuba diving and thus the fishing effort is limited by the amount of air in the tank and/or by the dive limits of the human body. The average catch was 47 kg and is usually fished for 2-3 hours.

Demersals are fished using a variety of fishing techniques. These are (in order of usage): handlining, spear fishing with/without tanks, traps and sinking palang/bottom longlining. This resulted in a range of catch sizes and effort. Trap fishers would usually fish only 3-4 times a week for about 2-3 hours whereas handliners could sometimes fish up to 9 hours a day, 6 days a week. The most common catch and effort would be 14-23 kg and fishers would leave around 5-6 am and return around 11am-12pm.

Inshore pelagics are fished for an average of 2.4 hours and an average catch of 406 kg was calculated. However, it must be noted that other fishers disagreed with this number stating that it is too large (no alternate was given). These were caught using the seine nets close to shore or attached to the beach. This would require a crew of at least 4-6 persons in order to manage the gear. It must be noted that these species are also caught in smaller quantities by cast net by most fishers to be used as bait.

Offshore pelagics were caught in boats ranging from small 17 foot (5.2 m) cigarette boats to larger 30 foot (9.1 m)sloops. Most of the smaller boats used the floating, homemade palang or tow a floating handline whereas the larger boats would tend towards the more widely used standard longline gear with multiple hooks, reels and perhaps hydraulics. The average time of fishing ranged from 3 hours (towing) to one week trips on longlining ships. During the community workshops, fishers (mostly small boat fishers) noted that the average catch for inshore pelagics appeared to be too large. As these two groups were clumped together, the catch values may be skewed by the few larger vessels that would catch thousands of pounds on each trip (average =1083 kg) and overshadow the catch data of the smaller vessels (average = 63 kg). Towing was by far the most preferred technique for catching this species group.

Over half of the lobster fishers interviewed used traps followed by 32% using scuba. As stated earlier, the Vincentian government has been promoting the use of traps to reduce the amount of dive injuries from lobster fishing with scuba usually caught using a loop to hook around the lobster to catch it. Other techniques not as commonly used were freediving, trammel net and gill nets. Gill nets are left for an extended period of time on the reef and it traps fish which die and rot in the net. This scent attracts the lobsters and they climb and get entangled in the net trying to reach the fish.

Turtles are caught either in the water by divers with spear or as they come to nest on the beach. One fisher reported that the location of a fishing camp in Petit Tabac, Tobago Cays was a good location for capturing nesting females. Usually 1 to 3 turtles are caught at a time each estimated at 68 kg. It was stated by a fisher that turtles are shot with the spear and left in the water wounded for sometimes over a week until the fishers are ready to leave the camp and head back to the home dock.

Whaling has been a controversial issue and during this study only one whale fisher was encountered. His estimates were that an average trip would last about 12 hours and that a normal sized whale would be about 60-70 tons. These are caught using the traditional harpoon in a small double-ender boat.

5.7.4 Fishing intensity

Overall, the average number of fishing trips per week was 5 and virtually all the fishers fish only once a day. All except 4 fishers stated that they fish 6 days a week and almost never on Sundays. Fishers also would not fish if weather conditions seem to be inappropriate (e.g. storms) or when the “tide is hard”, indicating a strong current. This would prevent mainly handliners and divers from remaining over a fishing spot for a long duration and fishers say that fish would hide under rocks and crevices with strong currents, thus reducing catch success.

Due to the multiplicity of the types of fishing employed, it was difficult to determine the average fishing intensity by type. However, from informal interviews with the fishers, it seems as if the trap fishing averages about 3-4 trips per week, handlining, spear, scuba, bottomlining, towing, palang and seine about 6 days a week and surface longlining from 1-3 trips (this varies with length of trip which can be up to 2 weeks).

As combining all the fishing trips per week over the year did not reveal any significant trends, the 4 graphs below were created only to show some of the most common temporal fishing patterns (Figure 5.14).

The lobster season seems to be the most significant factor that affects monthly fishing intensity of artisan fishers in the Grenadines. Graph A is common for a part-time fisher or a lobster trap fisher. During the lobster season, (September to April) this fisher would go 3 times a week to set the traps for lobsters, leaving 1-3 days soak time before returning to haul the traps. During the off-season (May to August), the fisher will resort to using handline or spear to generate income. During this time the fisher will fish more intensely to generate more income as demersals do not generate as much profit per kilogram as lobster (Figure 5.15). Graph B shows the typical part time fisher (who usually has another occupation) who only fishes during the lobster season using traps. Many seem to enter the fishery only during lobster season as this species has the highest value per kilogram. Graph C represents the most common type of fisher encountered which is a the typical full time fisher who fishes from Monday to Saturday and does handlining, spear, trolling, etc for species groups such as demersals, pelagics, etc. During the lobster season this fisher will use traps, scuba or free dive for lobsters on some days and continue to fish for other

species on other days. Graph D shows the trap fisher and/or part time fisher. This fisher will usually target demersals and lobster (when in season) and is normally a crew member or a shore fisher.

During the lobster season, both owners and crew/shore fishers fish on average 5 times week but during the off-season, boat owners fish about one more trip a week. It is difficult to confirm that this is due to boat owners fishing more or if it is due to the type of fishing (e.g. trap fishers go out 3 times a week, handliners, scuba divers go out 6 days a week).

Demersals, conch, offshore and inshore pelagics were generally fished all year round. One major seine fisher from St. Vincent would fish for offshore pelagics during February to May to coincide with the high point of that season (Mohammed & Rennie 2003). Whales, turtles and lobsters were fished during their open season and no fishers said that they fished these species at any other time. Again, this may not be entirely accurate as there were some reports of out of season fishing and the fishers might have been fearful of being reported to the authorities.

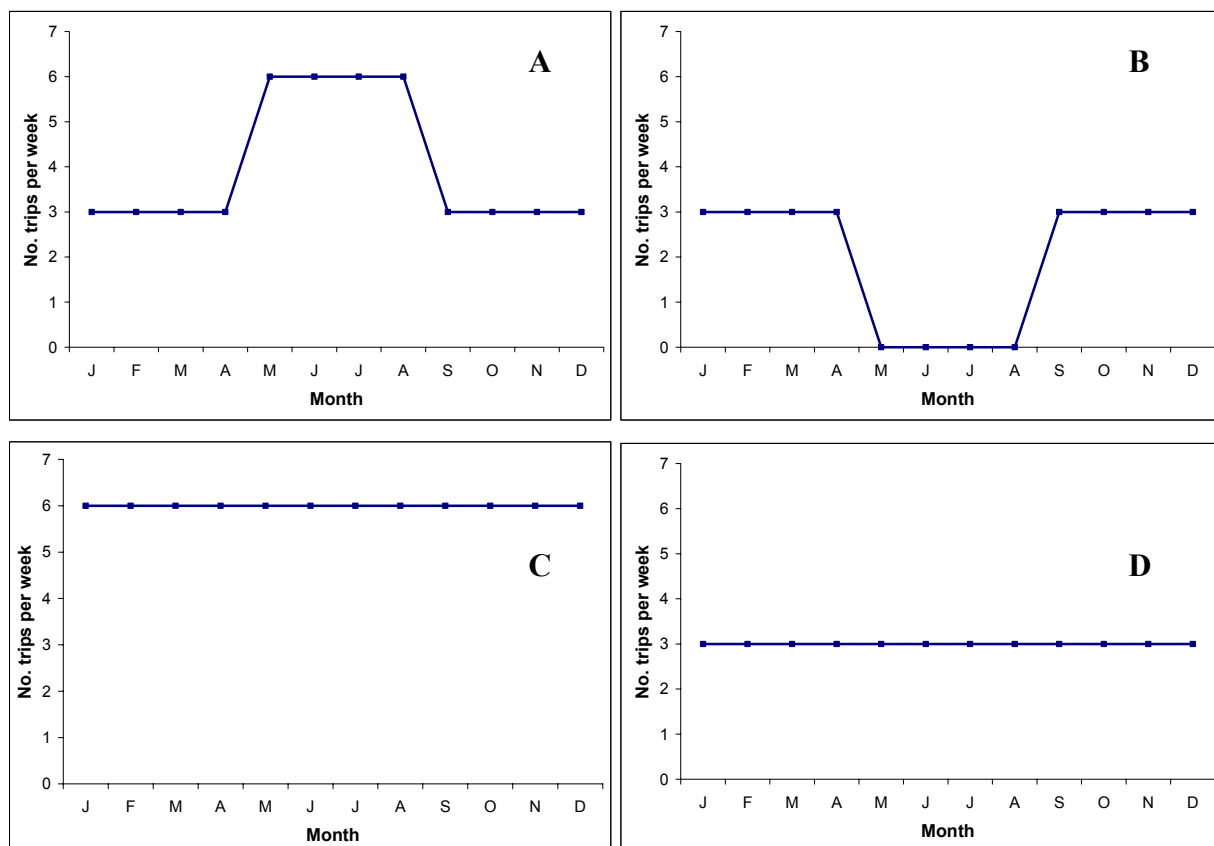


Figure 5.14 The four most common fishing intensity patterns for a normal year

5.7.5 Fishing grounds

There were no real patterns or trends when associating fishing grounds with particular species groups. Data on the spatial fishing practices was gathered during Phase I which reported on the fishing grounds used by fishers on each island, but they cannot be separated by target species. Anecdotal information was given by the fishers on some of the “good” fishing ground. For example, Sail Rock was said to be a prime location for offshore pelagics and off the bank reefs off of Mustique, Carriacou were good location for demersals species. This information will be collected in detail during mapping exercises to be conducted by Kimberly Baldwin of CERMES.

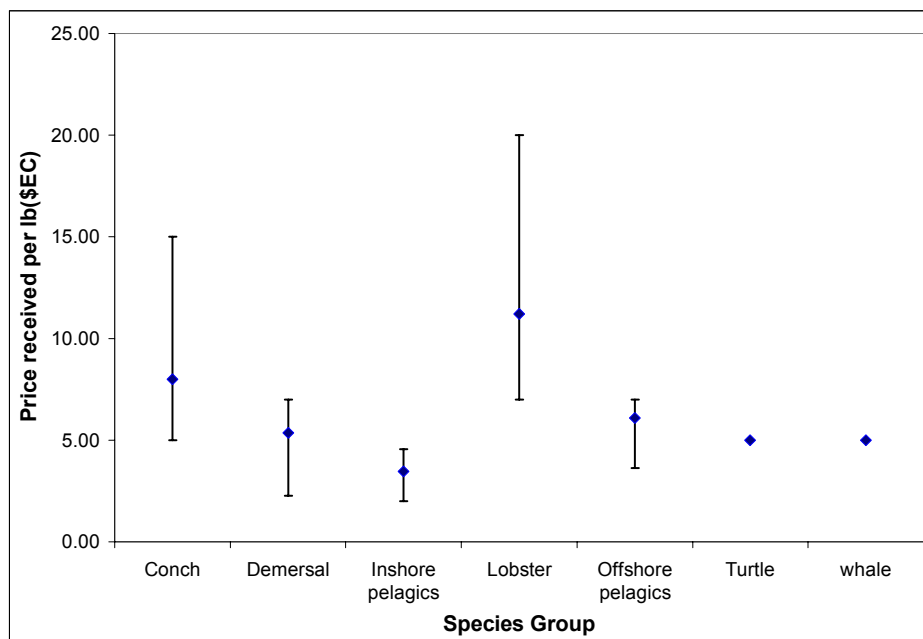
5.8 Fish marketing

5.8.1 Demand

There was a visible difference in the demand for fish at the landing sites in Carriacou and those in the St. Vincent side (e.g. Bequia and Union Island). During an observation one morning at the Hillsborough fish market, persons were seen “claiming the fish” even before the fishers got to the market. Some fishers sold all of their catch within minutes of reaching the market. However in Union Island, the fishers were complaining that their catch would often spoil because of lack of demand and storage facilities. One fisher told of a case where a fisher brought in 136-181 kilograms of dolphinfish (*Coryphaena hippurus*) and was forced to beg a restaurant owner to store the fish as there weren’t enough buyers for the catch. Fishers in Mayreau have demonstrated a great reliance on the trading vessels due to a lack of demand onshore. Cultural events such as the Fishermans’ Day competition in Bequia (see Section 3.2.1) significantly attracted a large crowd with a high demand for fish. Large crowds of locals and tourists would gather around the boats to purchase fish even before the fisher can weigh his catch.

5.8.2 Market information by species type

Figure 5.15 shows the range and the average price received per kg of the different species. Some of the values seem to be overestimated or underestimated, for example, fishers who sold demersals to the same trading vessel stated they received EC \$5, \$9 and \$10 per kg.



Despite this, the average price of demersals seemed to be consistent with those given by key informants.

5.8.3

Figure 5.15 Range and average price received per kg for the various fish groups

The average price for conch is EC \$17.60 per kg (Figure 5.15). It must be noted that fishers disagreed with the maximum price given for conch (\$33 EC), stating that it was too high. Only a few fishers (10.9%) were encountered that actively fish this species. Conch is mostly sold locally and sometimes sold to other islands to be exported regionally.

The average price for demersals is EC \$11.79 per kg and is the most popular fish group caught and sold. More than half of it is sold to trading vessels followed by approximately ¼ selling their catch on shore (Figure 5.16). Fishers get a higher price for demersals on shore (EC \$13.20- 15.40 per kg) than on the trading vessels (EC \$10 per kg). Snapper receives a higher price (EC \$11 per kg) than other species on the trading vessels. Very few stated that they sell to tourists, even to local restaurants. However this may not be the case as it was observed that quite a few restaurant

workers greet the vessels on shore and take the fish back to the restaurants.

The average price for inshore pelagics is EC \$7.60 per kg. Inshore pelagics are sold on shore all over the Grenadines. These seem not to be popular fish for tourists and are mainly sold on the local market. Some fishers take these fish back to St. Vincent where they are sold in the market for about EC \$6.60 per kg. This species group is also sold to longline vessels for use as bait.

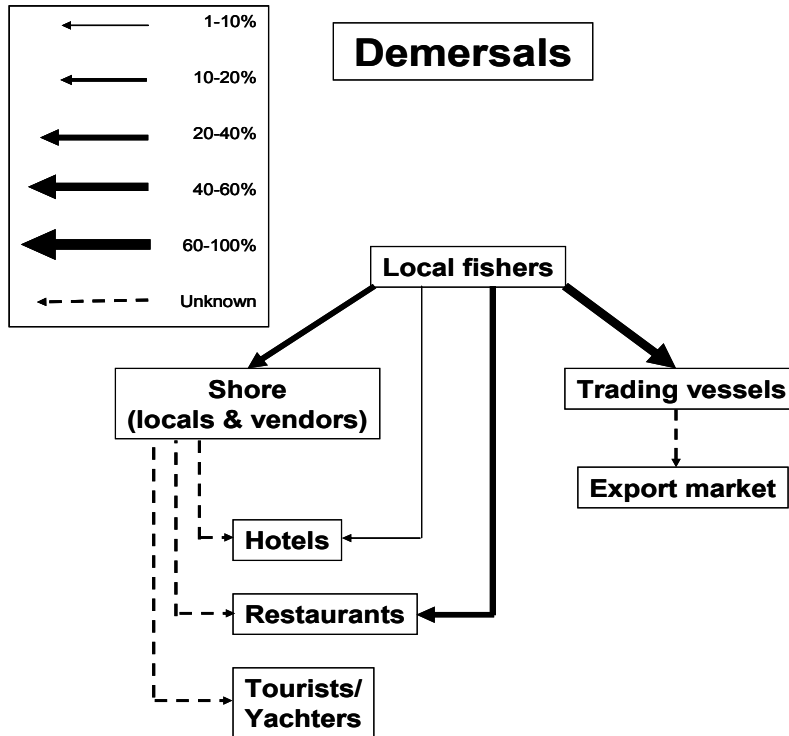


Figure 5.16 Customer preference of demersal fishers in the Grenadines

Lobster, although is the second most traded species on the market, holds the highest sale value. The average price for lobster is EC \$24.65 per kg. However, this is not consistent for the entire season as it is often sold at EC \$22 per kg at the beginning of the season and sometimes up to EC \$30.80 per kg at the end when landings become scarce. Some fishers therefore do not enter the fishery till later in the season when profits are higher. Lobster is sold to tourists and yachtees at a higher price (up to EC \$44 per kg). Almost half of the respondents say they sell lobster to be exported to Barbados and/or Trinidad (Figure 5.17) at around EC \$22-\$26.40 per kg. Other export countries include the United States and Martinique. Few of the respondents stated that they sell directly to tourists on shore or to yachts. Many restaurants and businesses (e.g. Mustique Company) buy the fish to sell to tourists.

Almost half of the respondents stated that they sell offshore pelagics on shore or to the government. In Grenada, this is then exported to the U.S.. Some are also exported to Barbados. Very few are sold to the trading vessels and the average price of offshore pelagics is EC \$13.39 per kg.

All of the respondents who stated that they fish turtles were from Bequia. The average price of turtles is EC \$11.00 per kg. The turtles are sold to local residents and there seemed to be no cases of turtles being sold for export or to tourists.

As with turtles, all the whale meat is sold locally in Bequia at EC \$11.00 per kg. This is a community event where locals would come from all over the island to purchase meat from a landed whale.

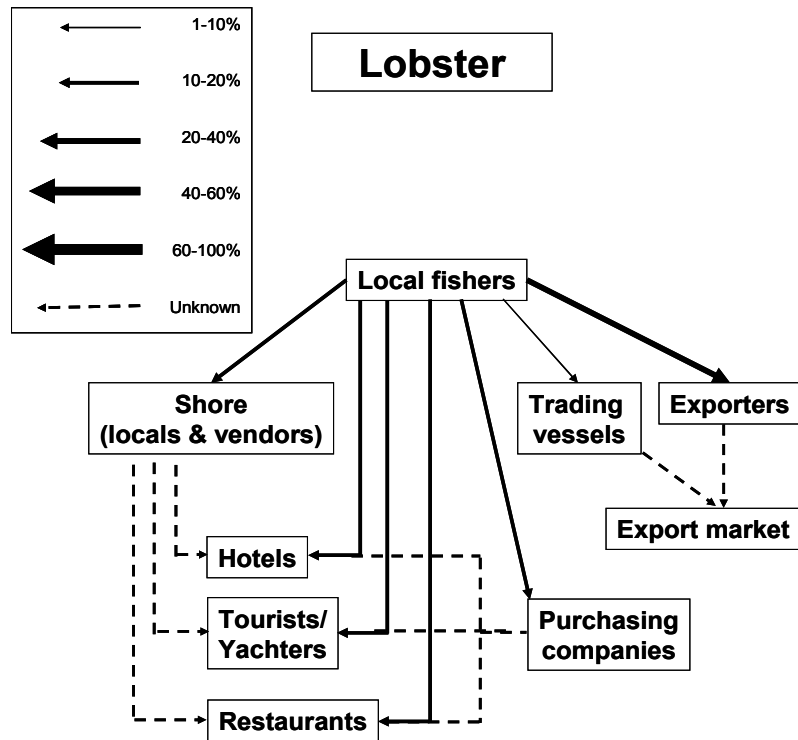


Figure 5.17 Customer preference of lobster fishers in the Grenadines

5.8.4 Market information by buyer

Almost 50% of the respondents sell their fish to trading vessels for export and all the fishers interviewed in Mayreau sell to trading vessels. This shows that trading vessels play a vital role in sustaining the livelihoods of fishers in the Grenadines. About half of the fishers also land their fish on shore either in their base island or in other islands. One third of the respondents sell to a purchasing group (i.e. Canouan Fisheries, Mustique company, government, vendors in Kingstown). These seem to be chosen because of their proximity; that is, namely all the fishers in Mustique sell to the Mustique company and fishers who sell fish to the St. Vincent vendors are from the northern Grenadines.

Fishers in Bequia seemed to have chosen to sell to many different buyers. Here they sell on shore, export, tourists, restaurant, hotels, vendors in St. Vincent and sell on many other islands. However this may be just because more fishers were sampled in this island and would have to be confirmed in future studies. In Bequia, about 60% of the respondents sold their lobsters to a local fisher who arranges for the lobster to be exported to Barbados. Here 70% of the fishers sell to trading vessels. In the southern Grenadines (Canouan, Carriacou, Petite Martinique, Mayreau, Union Island), most fishers sold their catch on shore.

5.9 Market orientation by fisher preference (reliability, price, convenience)

The majority of fishers said they prefer to sell to trading vessels because they are reliable buyers and it was the leading buyer of fish. None said it was because of price and few said it was because they were convenient. Most of the ones who said it was convenient were from Carriacou. These were the trading vessels located on the north-eastern side of the island in

Winward close to shore where the fishers would return and dock. Prices received from trading vessels have increased over the years. In 1994, the average purchase price received for demersals was \$7-8 per kg (Chakallal *et al.* 1994) and is now \$10 per kg. Inshore pelagics were \$3-4 per kg and is now about \$7.59 per kg. Most of the fishers sell on shore because it is more reliable (i.e. regular buyers), even though there seemed to be less of a demand for fish in the Vincentian Grenadines on shore.

Few stated that price was a driving factor for selling fish to a specific buyer. Out of all the locations, restaurants were the choice location for price received (n=6) followed by the Canouan Fisheries (n=4). Some saw the export market (not including the trading vessels) as being reliable (n=13) and very few sold it there because of price (n=3). Most Mustique fishers sell to the Mustique Company because it is convenient and restaurants are seen to be convenient as well.

5.9.1 Tourist sector

On all of the islands, only a small amount of fishers sold their catch directly to tourists, hotels or yachts. However, as the tourist season coincides with the lobster season, which increases the amount of potential buyers in the islands. During lobster season, the demand increases drastically. Restaurants, hotels, locals, tourists and importers from the region all purchase from the fishers at this time.

Fishers in Mustique benefit directly from the tourist industry through the Mustique Company, who appears to buy a large portion of their fish. It was also observed on this island that tourists would come directly to the fishing village and purchase fish for consumption or bait for game fishing. Fishers in Union Island and Mayreau were the only ones observed selling to yachts which are most likely those found in the Tobago Cays. However, it is likely that quite a good portion of fishers from other islands surrounding the Cays sell to the tourists as well. Water taxi operators buy the fish from them and sell at higher prices to persons on yachts. One fisher saw this as a threat and thought the exorbitant prices would drive the tourists away from buying local fish.

5.10 Physical capital

During the assessment of the physical capital of the fisher, most of the fishers were able to give reasonably sure values of their boats and engines. However, the estimation of the value of gear was not as accurate and many had to guess what their gear was valued. All of the following values did not account for depreciation and therefore the initial cost of the gear was used.

5.10.1 Boat and engine

The average boat cost was about EC \$14,000 and the average engine cost was approximately EC\$10,500. In the Grenada Grenadines, a few fishers were able to purchase engines duty free from islands such as St. Marteen. This could explain the larger boats and engines that are found in the area.

5.10.2 Gear

As stated earlier, it was difficult to assess the average gear better than a gross estimation as many gear items (ropes, safety equipment, traps) were not quoted. Handliners had the lowest gear costs (approximately EC \$40-\$100) compared to longliners and those with expensive gear. Palang nets for demersals and offshore pelagics was rather expensive and could cost up to EC \$1,000. This is a very high risk investment as some of the more experienced fishers stated that they have lost entire palang nets on one fishing trip. Seine nets are also extremely expensive and one fisher estimated the cost of his net at EC \$35,000. The average scuba diver owned his own regulator,

Buoyancy Control Device (BCD), spear gun, mask and fins and would usually rent scuba tanks for about EC \$10 per tank. This gear was valued around EC \$2,000-\$3,000. The cost of traps depended on the materials and the maker. However, most fishers stated that they cost about EC \$450-600 per trap and many voiced their concern at the high costs of the chicken mesh wire and the theft of traps by other fishers. One fisher in Mayreau said that he had to stop using fish traps because of the theft and switched to other types of fishing. Along with the cost of traps is the costs of buoys, ropes, etc. which could add another EC \$50-\$100 to the cost of each trap. Fishers owned a range of 11 up to 30 traps and stated that because of natural damage and theft that they would have to make/purchase new traps each year.

VHF radios were extremely expensive due to the requirement to purchase a license, which was stated by one fisher to be EC \$1000. This could significantly reduce the availability of this important safety gear to the lower income fishers. Most fishers use cellular phones too as a backup means of communication, some going as far as using two cellular phones, one with each service provider. These phones would cost about EC \$60-\$200 each. Fishers were complaining of the rising cost of gear (e.g. increase in the cost of a spear gun by over EC \$100 in a few years). They also complained about not enough competition in the fishing supply industry and merchants are making high profits on gear. This should be investigated so as to ensure that fishers are not being taken advantage of.

5.11 Expenses

5.11.1 Trip expenses

The responses for the trip expenses appeared to be relatively consistent. The average amount of fuel used by the smaller crafts that remain within the Grenadines is 10.2 gallons. When the cost of oil is added, the cost of fuel was on average EC \$118.39 per trip. For fishers travelling outside of the Grenadines (longliners), the average fuel used was 214 gallons, costing EC \$2,214 (oil included). Fishers complained of the rising costs of gas and oil and it ranged from EC \$9.50 -\$12 per gallon. Some fishers argued that fish are sold at the same price but the effort and the costs of fishing differ with type (e.g. demersal trap fisher using less gas than a demersals handling fisher).

The average gear cost per trip is EC \$57.30 and this would include items such as ice, scuba tanks and scuba gear. Ice was very expensive as water is scarce. In the Vincentian Grenadines, ice is sold in very small containers whereas in Petite Martinique it can be bought in large quantities at a much cheaper rate due to the presence of an ice machine on the island. The average food cost per trip is EC \$40.50. Fishers would take a small lunch for the trip that was prepared at home. Bait was usually caught by cast nets the day before and rarely would purchase it from other fishers. Longliners however would regularly purchase over EC \$50 in bait for each trip from seine net fishers.

5.11.2 Recurrent expenses

Estimates of annual repairs and gear costs were both dependent on the memory of the fisher and were estimated from recent major expenses. From repainting costs to buying more hooks, these expenses would vary greatly and many fishers do not keep account of smaller purchases and thus descriptive statistics such as averages will not be very accurate. An estimation based on the normal costs of repainting the boat and engine servicing alone (using the given costs of materials) is around EC \$2,000 per year while the average of the figures given by the fishers (estimates of yearly expenses) was EC \$1,847. Boats are repainted and fibreglassed usually once or twice a year and engines are serviced professionally when needed.

Gear purchases are more consistent and could have possibly been more accurate than repair costs. The average gear cost was estimated at EC \$1,817. Most of the fishers caught their own bait and rarely was this item bought. Some of the more common other gear that was used was scuba tank and gear rentals, and ice. Repairs to gear often takes the form of purchasing new parts such as more fishing lines, new spears for the spear gun and new hooks. The gear costs of handlining, trolling and spear fishers were lower than those of palang, scuba and longliners. Most fishers seem to repair their own net which is a very important skill to reduce costs. Many fishers attempt to service their engines and repaint/fiberglass the boat themselves as well, rather than getting it done professionally. Again, if the fishers possess the skills to do these effectively, this can significantly reduce expenses incurred. Also, proper maintenance of gear is another method that can help fishers save money.

6 CONCLUSION AND RECOMMENDATIONS

The information collected during this study and discussed in the previous three chapters highlights some issues that should be of high priority for managers of Grenadines fisheries and other stakeholders or interested parties to address.

6.1 Demographics and stakeholder characteristics

Older fishers depend more heavily on fishing whilst younger fishers appear to have more options. This puts the older fishing generation at considerable risk. The lack of pension schemes for fishers makes it difficult for them to exit the fishery and many have stated that they have to continue fishing as there is no other source of income for them at their age. There were also cases of fishers saying that they were too old for other lines of work and were forced to enter the fishery to generate income. These fishers usually go towards the demersal/handlining industry which is showing signs of a continual decline in catch due to overexploitation of the resource. If a pension scheme was established for fishers, this would protect the livelihoods of these older men many of whom fish until their health fades.

6.2 Resource use patterns

6.2.1 Demersal fishery

The demersal fishery is clearly the most important and also a severely overexploited fishery in the Grenadines (Food and Agriculture Organization 2002b). Resource managers should design and implement monitoring programs that gather data on the ecological status of stocks and the effort and landings by the fishers in the Grenadines for fishery assessment purposes.

Rigorous stock assessments need to be carried out to assess whether the less targeted species can be sustainably harvested. Once this is completed, effort should be put into exposing fishers to and training them for other types of fishing that target less exploited species. Although there have been attempts by fisheries managers to do this, some fishers believe that more effort should be placed into accomplishing this objective, especially in the Vincentian Grenadines. Major hurdles of entering a new fishery include training in the fishing techniques, the starting capital to purchase boat and equipment, and the availability of appropriate fishing gear. This however have been more successful in the Grenada Grenadines.

6.2.2 Reducing vulnerability

Safety at sea is an issue that many fisheries managers around the world have to grapple with and a considerable number of fishers appear not to use all the necessary safety equipment. Also many of the fishers SCUBA dive without having had professional training and this has resulted in many suffering from dive related injuries. With proper training, fishers would be more equipped

to protect themselves and others as they carry out their operations. Insurance is another important issue that needs to be addressed by the fishers and government. Many of the fishers who do not have (life) insurance have dependents and spouses who rely solely on them for income.

Building the resilience of fishers within the industry is also vital and basic steps can be taken to ensure that fishers possess the knowledge and skills to protect their livelihoods. For example, the Vincentian government recognised the vulnerability of fishers to hurricanes and published an informational booklet on “Hurricane Tips for Fishers” which provides fishers with instructions on how to secure their boat and gear before a natural disaster. Also in 2005, the Ministry of Fisheries in Grenada provided monetary contributions to fishers who received losses to their boat and gear (Government of Grenada 2005).

6.3 Market attributes and orientation

Exports to Martinique represent a large proportion of sales of Grenadine fishers and are thus a major income source for fishers. It is therefore imperative that the government of St. Vincent & the Grenadines work to ensure that they improve the infrastructure of the markets so as to meet the European Union standards. However, caution must be exercised as this may encourage more to rely on the overfished demersal stocks. With information on which fish stocks that could be sustainably harvested, marketing options can be researched at the local, regional and international level so as to create a demand for a less exploited species. In the Vincentian Grenadines, a large proportion of fishers believe that supply exceeds demand in the local market. Many fishers complain that they are unable to sell all of their catch which leads to the spoiling of fish in some cases, and that the earnings from a day of fishing are too little. The marketing of offshore pelagics from the Vincentian Grenadines is a potential option with sustainable harvesting being one of the key fundamentals of the fishery and marketing planning.

6.4 Material style of life

Fishers in the Vincentian Grenadines would often complain of barely being able to survive financially due to lack of government support. Despite this, fishers in all of the islands appear to have a reasonably good standard of living. In the Grenada Grenadines the standard of living appears to be even higher. This may be due to the additional support received from the government or to the fact that more economic activity occurs in islands such as Carriacou and not a reflection of the fishing industry.

6.5 Sectoral coordination

Fishing is one of the most important economic, social and cultural drivers in the Grenadines and plays a vital role in maintaining food security. It is therefore imperative that decision makers pay close attention to the management of this integral sector. Many fishers in the Vincentian Grenadines believe that governments are not concerned with the problems facing the fishing industry. With the increase in fuel prices and other rising costs, many fishers are pleading for assistance through the subsidising of fishing costs, increased price received for fish and the improvement or access to facilities and amenities. Projects such as the building of the fishery complexes by the Japanese were not done in consultation with the fishers and are now scarcely used and are an economic burden for the sector. This could have been avoided if management and planning were inclusive and transparent to the fishers as well as to other civil society organisations and the facilities were constructed to meet the current needs of the fishers.

Education and raising awareness within the fishing community is imperative for their involvement in conservation efforts and so they can participate in planning from an informed position. Fishers have already expressed interest in learning organisation skills, conservation and

management (CERMES 2006) and education would help raise awareness to promote more sustainable fishing practices (e.g. no anchoring on reefs). More consultation and collaboration between MPA managers and the fishers where the latter are able to participate in the planning, objectives and management of the MPAs would drastically increase the effectiveness of parks in meeting the needs of the community and compliance by the resource users to the regulations. With the establishment of more fishing cooperatives or other organisations, fishers can formally cooperate to promote and protect their interests and have a representative body to communicate with government and other bodies.

6.6 Regional coordination

Due to the transboundary nature of the fisheries, management decisions and policies created by one government will not materialise in a vacuum, but will have some impact on those of the other government. Therefore, bilateral coordination and the sharing of information and management tools would drastically improve the effectiveness of management decisions. Many of the efforts of the Grenada government to improve the fishery were well executed and these can be replicated by the Vincentian government. Policy makers in both governments should examine how fishers exploit the resource, what tools they have available to them and the threats and opportunities that affect their livelihoods. This is important to reducing the vulnerability of the fishermen to natural and anthropogenic shocks (e.g. hurricanes, loss of boats, increased oil prices, etc.) and to ensure that the industry moves forward sustainably.

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8 APPENDICES

Appendix 1: Rapid assessment survey

Rapid Assessment/Inventory Survey

Location: _____

Respondent #: _____ Date: _____

Respondent Information & Fishing Practices

1. a) Respondent name: _____ b) M F
2. a) Age: _____ b) Address: _____
3. a) Is fishing your primary occupation? Y N
b) Do you get most of your income from fishing? Y N
c) What percentage of your income is from fishing? _____%
4. How long have you been fishing (years)? _____

Boat Information

5. Name of Boat: _____ Registration Number: _____
6. a) Name of Owner: _____ b) M F
7. Average number of crew working on boat: _____
8. Name and sex of other crew:

9. What gear is used on the boat?

10. Length of Boat: _____

11. Type of Boat (wood, fibreglass, pirogue, cigarette, flatstern, other):
_____.

12. # of engines: _____ Brand: _____ Horsepower _____
Brand: _____ Horsepower _____

13. Where do you operate from? _____

14. What kind of fishing do you do? What islands do you mostly fish around?

15. a) Do you know of any places where fish gather to breed? Y N

b) What kind of fish? _____

c) Location/s _____

16. Will you be willing to take part in a more in depth interview? Y N

Contact Info: _____

Appendix 2: In-depth survey

**Detailed Interview for Collecting
Socio-economic data on Grenadine Fisheries**

The purpose of this study is to gather detailed socio-economic information on fishing in the Grenadines. This looks at how you fish, sell your fish, fishing expenses and other aspects of your livelihood. Information on individuals will not be shared or reported.

1. Respondent #: _____ Location _____ Date _____

Resource Use Patterns: This looks at the different types of fishing that you do and where and when you fish.

2. Are you a: boat owner captain crew member solo fisher

3. How many fishing trips do you make per week?

J	F	M	A	M	J	J	A	S	O	N	D

4. This table looks at how you would normally fish.

Species Group	Average hours fished per trip	Average lbs caught per trip	Where species are caught (island)	Gear Used	What months
1.					
2.					
3.					
4.					
5.					
6.					

Goods and Services: This section will look at how you are able to sell fish and on average what you get for your fish. It also looks at some of the expenses of your fishing trips.

5. How and where do you sell your fish? How much do you get for the fish?

Location	Species Group	Price Received per lb	Quantity of catch sold		
			Most	About Half	Few
1	1				
	2				
	3				
	4				
2	1				
	2				
	3				
	4				
3	1				
	2				
	3				
	4				
4	1				
	2				
	3				
	4				

6. Reasons for selling to different merchants:

Location	Reliable buyers	Price	Convenience	Other reason(s)
1				
2				
3				
4				

7. How many boats do you own? _____

8. What fishing gear do you own?

9. What was the initial cost of the :

boat \$ _____ engine \$ _____ gear \$ _____

10. What are the average costs of the following (per trip):

Item	Amount	Cost
Fuel and oil		
Gear		
Bait		
Food		

11. How often do you service engine? _____ Bottom Paint? _____

12. Cleaning of Boats: Where? _____ With? _____ How Often?

13. What are some of your other fishing costs? (e.g. insurance, repairs)

Repairs \$ _____ per mth yr

Insurance \$ _____ per mth yr

Gear \$ _____ per mth yr

Other: _____ \$ _____ per mth yr

Other: _____ \$ _____ per mth yr

14. If you have a share system in place (for crew), how is the money distributed?

Demographic Information: This is some personal information that will help us to know more about the fishers.

What is your marital status?

Single Married Common law Divorced Other: _____

15. What was the last school you went to?

Primary Secondary Post Secondary

Professional/ Vocational/ Training

16. Ethnicity:

African/Negro/Black Carib East Indian

Mixed White/Caucasian Other: _____

17. What is your religion?

Anglican Pentecostal Seven- day Adventist Roman Catholic Jehovah Witness

Methodist Other: _____

18. What are your four main sources of income in the past year? (*Ranked and give proportion*)

1. _____ %
2. _____ %
3. _____ %
4. _____ %

19. Are you the main provider for the household? Y N

20. This table looks at who lives in your house and their occupations:

Household Members (in relation to household head)	Age	Gender	Primary occupation	Secondary occupation

Material style of life: This section looks at some aspects of your quality of life..

21. Do you own land? Y N

22. Is your house you live in:

Your own rented family /friends

23. Type of roof:

galvanized shingle

24. Type of outside structural walls:

concrete wood

25. Type of Floor covering:

Tile cement bare wood dirt vinyl carpet

26. Does your household have:

electricity vehicle TV_ telephone stove washing machine refrigerator

VCR/DVD computer

Appendix 3: Species groups

Demersals

Major species: Hinds, groupers, butterflyfish (Serranidae), snappers (Lutjanidae.), parrotfish (Scaridae)

**Description/
Habitat:** bottom dwelling; found on shallow shelf, and the deep slope

**Fishing method/
Gear used:** handline, bottom longlining (sinking palang), traps, spear gun (free diving and scuba)

Seasonality: All year



Offshore pelagics

Major species: dolphinfish (*Coryphaena hippurus*), yellowfin tuna (*Thunnus albacares*) kingfish (*Scomberomorus cavalla*), barracuda

**Description/
Habitat:** migratory species; found miles offshore

**Fishing method/
Gear used:** towing, surface longlining (floating palang)

Seasonality: All year, mostly January to May/June



Inshore pelagics

Major species: Robins (*Decapterus* sp.), jacks (Carangidae)

**Description/
Habitat:** pelagic; found along the coastline

**Fishing method/
Gear used:** beach seine, cast net

Seasonality: All year



Lobster

Major species: Caribbean spiny lobster (*Palinurus argus*)
Description/Habitat: benthic; found in reef crevices on shallow shelf
Fishing method/Gear used: scuba and free diving using wire nooses ("jigs"), traps, gillnets
Seasonality: September-April



Conch

Major species: Queen conch (*Strombus gigas*), milk conch (*Strombus costatus*).
Description/Habitat: benthic; found mainly in sea grass beds
Fishing method/Gear used: scuba and free diving
Seasonality: All year (opportunistic)



Turtles

Major species: hawksbill turtle (*Eretmochelys imbricata*), green turtle (*Chelonia mydas*)
Description/Habitat: pelagic and migratory; Green turtles found on seagrass beds, hawksbills on reef
Fishing method/Gear used: spear, onshore while nesting
Seasonality:



Whales and Porpoises

Major species: humpback whale, pilot whales
Description/Habitat: pelagic and migratory; migrates from the north during the winter months
Fishing method/Gear used: traditional harpoon in a small double ender boat
Seasonality: February - April

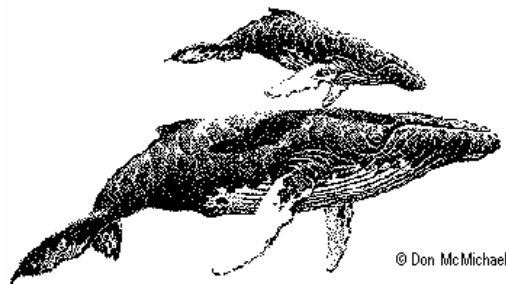


Image Source: <http://www.adfg.state.ak.us/pubs/notebook/marine/hbwhale.gif>

Appendix 4: Boat types

Bow and Stern (Cigarette/Speedboat)

Description: Pointed bow and flat stern
Length range: 11-27ft
Width range: 3-7ft
Horsepower range: 14-115hp
Type of fishing: Handline, trolling, floating and sinking palang, traps, spear (scuba and barewind)



Pirogue

Description: Higher bow than the speedboat
Length range: 19-30ft
Width range: 4-10ft
Horsepower range: 40-85hp
Type of fishing: Trolling & demersals fishery



Double-ender

Description: Two bows, canoe-shaped
Length range: 10-29ft
Width range: 4-8ft
Horsepower range: 6-48hp (Mainly oars)
Type of fishing: Beach seine fishery



Sloop/Longliner

Description: Most have mechanical equipment for hauling lines on board
Length range: 34.7-48.5ft
Width range: 9.7-15.9ft
Horsepower range: 90-190hp (inboard diesel engine)
Type of fishing: Surface longlining for tuna, trolling, and bottom longlining

