

A livelihoods analysis of fishers in the Grenadine Islands

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ABSTRACT

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Fishing is a primary economic and social activity in the Grenadine islands. In order to obtain a sound understanding of both biological and human factors associated with the exploitation of marine and coastal resources, a livelihoods analysis of fishers was conducted. The first phase of the study involved an initial inventory to (1) identify the fishers of Bequia, Mustique, Canouan, Mayreau, Union, Petite Martinique and Carriacou, (2) determine what types of fishing they do, (3) document the types of fishing vessels and gears that are used and (4) obtain preliminary information on the locations of fishing hot spots. The second phase involved an in-depth survey which focussed on livelihood assets (human, natural, physical, financial and social capital), strategies and vulnerabilities that fishermen both utilize and face. Results show that over 60% of the fishers interviewed are solely dependent on fishing. Those that are involved in multi-occupational livelihoods have chosen additional means of earning an income because fishing, by itself, can not sustain them or their families throughout the year. Declining fish abundance, lack of government support and the need for fishers' co-operatives are key concerns that were also expressed. The goal of this study is to provide relevant organizations and persons with a basis of information that can contribute to improving the effectiveness of decision making, interventions and organization with respect to the management of fisheries and other marine resources. The qualitative information obtained from this livelihoods analysis can be used as a common ground for working with fishers to achieve sustainable development and utilization of marine resources within the Grenadines.

Keywords: fishing, Grenadines, livelihoods, marine resources, sustainable development

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1 INTRODUCTION

1.1 Background

The Grenadines of the Windward Caribbean islands are scattered between mainland St. Vincent in the north and Grenada in the south (Figure 1.1). This cluster of approximately 600 islands, islets and cays lie atop the 3,000 km² Grenada Bank and extend for almost 96 km between the two sovereign nations. Seven of the inhabited Grenadine islands (Bequia, Mustique, Canouan, Mayreau, Union, Palm and Petite St. Vincent) belong to St. Vincent and the Grenadines, and the remaining two (Carriacou and Petite Martinique) are a part of Grenada (Baldwin 2006).



Figure 1.1 Map of the Grenadines (Adapted from Cooke *et al.* 2005)

The unique coastal and marine environments of the St. Vincent Grenadines (SVG) and the Grenada Grenadines (GG) provide good conditions for tourism and fishing activities – two major contributors towards social and economic activities in the area. For example, approximately 7% of the SVG labour force is involved directly or indirectly in the fishing industry and many of these persons depend exclusively on fishing for their livelihoods (FAO 2002a). Fishing in the Grenadines is small-scale and artisanal, focussing on shallow-shelf and deep-slope demersals, lobster, conch, and inshore and offshore pelagics. A variety of traditional gear and fishing techniques are utilized in the islands including handlining, spear fishing, pots/traps, floating and sinking palang, and more recent methods such as commercial longlining (Chakalall *et al.* 1994).

1.2 Goal of this study

The people of the Grenadines are significantly dependent on their coastal and marine resources for sustenance. As with many human activities, the fishing industry can have negative impacts on the marine environment which supports these island communities. It is therefore critical to have an understanding of not only the biological, but also economic and social factors, in order to manage the Grenadine fishery in a sustainable and efficient manner. The aim of this study is to provide governments, non-governmental organizations (NGOs), and the people of the Grenadines with basic information that can contribute towards improving the effectiveness of decision making, interventions and organization with respect to the management of fisheries and other marine resources. To achieve this aim, a livelihoods analysis of the Grenadine fishers was conducted.

1.3 Livelihoods analysis of Grenadine fishers

According to the Department for International Development (DFID 1999) “[a] livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living.” Based on this knowledge of one of the primary extractors of fishing resources, a livelihoods analysis of the Grenadine fishers can help design appropriate inputs and focus management priorities that are required for managing the fishery. Furthermore, the qualitative information obtained from this livelihoods analysis can be used as a common ground for working with fishers in a participatory manner, to achieve sustainable utilization of marine resources within the Grenadines.

Results of this study will also contribute to the Sustainable Grenadines Project (SGP) and the Marine Space-use Information System (MarSIS), which respectively are geared towards sustainable development and compiling spatial information of coastal resources and their users within the island chain. The SGP strives to achieve integrated sustainable development of the Grenadine islands for both the social and economic benefit of its people. A participatory co-management approach is encouraged by this NGO, which involves resource users and stakeholders in the planning and management of the resources they depend on (CERMES 2005).

One of the main projects undertaken by the SGP is the Water Taxi Project (WTP) which seeks to assist the water taxi operators (WTops) of the Grenadines. Along with fishers, WTops are primary marine resource users who are important social and economic contributors to their respective communities. In 2005 an analysis of their livelihoods was also conducted and according to Cooke *et al.* (2005), WTops adopt a multi-occupational livelihood strategy which helps reduce the vulnerabilities associated with water taxiing. The livelihood studies of both WTops and fishers can assist the SGP in attaining their goals by generating an overall picture of two very important resource users in the Grenadine island chain.

2 ISLAND PROFILES

2.1 General history of the Grenadines

The Grenadine islands’ geophysical formation resulted from tectonic plate subduction of the Caribbean and Atlantic plates, and volcanic activities taking place on mainland St. Vincent and Grenada (Paradise at best 2005). Technically, due to the positioning of the islands on top of the Grenada bank, they are more geospatially related to Grenada than St. Vincent which is actually located approximately half a mile off the bank. However, political regimes and European colonialization have determined the resulting controls of the individual islands that are seen today.

All the populated Grenadine islands share similar ancestry and histories where Amerindians were the initial settlers. The Arawak group was displaced by the Caribs who inhabited and defended the islands until the arrival of European planters in the early 1700s. For years colonial possession of the Grenadines was fought over by France and Britain (Miller Publishing Company 2004b). The 17th Century Grenadines were dependencies of Grenada until Britain finally defeated the Amerindians in the 1790s. During this period the chain of isles were divided into two for easier management: those islands to the north of and including Petite St. Vincent (PSV) were linked to St. Vincent, while Petite Martinique and Carriacou fell under the Grenadian regime. Up until the 19th century, the Grenadine islands were privately owned, after being distributed to individual European families. Today, only Mustique, Palm Island and Petite St. Vincent are exclusive and privately owned resort islands, while most of Mayreau remains privately owned (Logan 2001).

Like many other Caribbean islands, the Grenadines began exploiting their natural resources and building their economies based on agriculture. Small plantations were established by the Amerindians and British, and crops such as sugar, cotton, coconuts, cassava and potatoes were cultivated and exported. Eventually, resource extraction shifted from the land and soil to the coast and sea. Farmers adopted a fishers' livelihood and with modern fishing gear and boats they were able to efficiently extract fishery resources further offshore. Although tourism has now become the mainstay of the economy in the Grenadines, fishing still plays a major role in generating income and providing employment for several coastal communities (Belmar 2006; FAO 2002a).

The following is a brief profile of the islands visited throughout this study. This section will portray relevant histories and give a better understanding of what is taking place with respect to fishing on the individual islands.

2.2 Bequia

Approximately 18.1 km² comprise the second largest Grenadine island of Bequia. Some of the earliest settlers were shipwrights and carpenters, and thus maritime activities such as boat building and fishing were inevitable. Not only were the inhabitants experienced seamen, but the abundant white cedar on the island and excellent fishing grounds, provided for the conditions required to make fishing a means of survival. Into the 19th and 20th centuries boat and ship building became a thriving industry for Bequia who dominated the rest of the Grenadines in this skill (Bequia Tourism Association 2006).

Whaling is also an important cultural and at one time an economic activity for the island. The first whaling station was built in the 1870s by William Wallace Junior in Friendship and at this time, whale oil was ranked fourth in value of exports. To this day, whale meat is a staple food for many Bequians and bones are used in furniture and as part of home and building decor (Bequia Tourism Association 2006).

While traditional skills and boat building methods have been passed on throughout the generations, fishing has progressed in Bequia. Today a fishing complex built by the Japanese in 1994 is evidence of the type of investment taking place in the industry. It is appropriately located in Paget Farm, the most active fishing village on the island.

2.3 Mustique

Second in the chain of Grenadine islands is the 5.2 km², private island of Mustique. This island is managed by the Mustique Island Company which was established in 1968 under a development agreement with the St. Vincent Government, to encourage tourism and the building of private homes on the island (Miller Publishing Company 2004a). Mustique is also

one of the two Grenadine islands that have both a fishing complex and camp. The Mustique Island Company owns and operates this fishing facility.

2.4 Canouan

Approximately 40.2 km south of St. Vincent is the 12.9 km² island known as Canouan – the Carib word for turtle. In the 19th century, two whaling stations were established on the island after the British shipwright, Benjamin George Compton, was invited to teach boat building techniques. These boats were the basis for the whaling trade in the Grenadines although it was dominated by Bequia (Miller Publishing Company 2004b). Another Japanese built fishing complex and camp is located in Friendship, Canouan and is operated by the St. Vincent Government.

Canouan is heavily dependent on tourism and since the 1990s, 3.2 km² of the 13 km² island was sold to an Italian group called the Canouan Resorts Development Limited who began developing a luxury hotel in the north of the island (Miller Publishing Company 2004b).

2.5 Mayreau

Mayreau is the smallest of the inhabited SVG islands and amounts to 3.9 km². There is only one village, one road and one very close knit community that depends primarily on fishing and tourism for sustenance. Its close proximity to the Tobago Cays and pristine waters make Mayreau an ideal stop for yachters (Miller Publishing Company 2004c).

2.6 Union Island

Union Island is located midway between mainland St. Vincent and Grenada. Although farming is an important means of survival, inhabitants are also known for their fishing and maritime skills, using their earnings to develop homes and the economy of the island. This dry 7.8 km² island is also a major attraction for visitors to the Grenadines; hence the high concentration of water taxi operators and dependency on tourism (Miller Publishing Company 2004d). The major town Clifton is the location of a fishing complex which was constructed by the Japanese in the 1990s.

The town of Ashton is another active fishing and community driven settlement in Union Island. This area was the location of the failed Ashton Marina development which started in 1990s. The project was abandoned, however irreversible damage to the coral reef and mangrove ecosystems have been observed, and this has had impacts on the fishing and nursery grounds nearby (Price and Price 1998).

2.7 Petite Martinique

Roughly 0.4 km away from the SVG boundary, which ends with Petite St. Vincent, is the 2.6 km² island of Petite Martinique. With the migration of Scottish and Irish shipwrights in the 18th century, fishing and boat-building became, and remain to this day, as the basis for both cultural and economic activities on the island. The majority of demersal fish species caught around Petite Martinique are exported by trading vessels to French Martinique, with which Petite Martinique has great ties and linkages since the days of their initial owners. In the past decade many fishers have become involved in commercial longline or tuna fishing in Grenada. The catch is sold to buyers on the mainland and then exported to the United States and the European Union (Logan 2001). Petite Martinique is also the only island in the Grenadines with an “active” fishers’ co-operative.

2.8 Carriacou

Carriacou and its 33.7 km², is the largest of the Grenadine islands and was named “the land of reefs” by its earliest Amerindian inhabitants. European settlers from Scotland and Ireland

began the traditional boat building culture which is still observed today. The five major fishing villages of Hillsborough, L'Estere, Harvey Vale, Belmont and Windward also coincide with the main communities on the island (Wikipedia 2006).

3 FISHING IN THE GRENADINES

Now that the individual Grenadine islands have been described, it is also important to discuss the history and trends observed in the fishing industry within St. Vincent and the Grenadines and Grenada. Fishers from the St. Vincent mainland and the Grenadine islands target different fisheries. Dominating in St. Vincent are the trolling, longline and beach seine fisheries which are directed towards offshore and inshore pelagics. On the other hand, handlining for demersals, and the lobster and conch fisheries prevail in the St. Vincent Grenadines (Mohammed *et al.* 2003).

Grenada fishers and those in Carriacou and Petite Martinique also target different fish species using various techniques. Longline and seine fishing dominate the Grenada fisheries for offshore and coastal pelagics respectively. Carriacou and Petite Martinique fishers mainly target demersal species via handlining and trap fishing off of the expansive shallow shelf which surrounds the islands (Mohammed and Rennie 2003).

3.1 Development of the fishing industry

The following section discusses the various government investments, market developments, and advancements that have occurred in St. Vincent and the Grenadines and Grenada and the Grenadines.

Commercial exploitation of fishery resources was not carried out in St. Vincent and the Grenadines until the 1940s. This was due to the small and unreliable market for fish at the time. Then the demand for fish in Martinique created the incentive to increase fishing and export of lobster, conch, turtles and demersals from the Grenadine islands to Martinique via trading vessels which began in the 1940s-1950s. Fishing operations from Bequia in particular were very important to this neighbouring market for lobster and demersals (Mohammed *et al.* 2003).

Government support and financial aid to the fishing industry in SVG began in the 1960s with duty-free concessions for the purchase of engines, timber and gear. There were, however difficulties associated with the implementation of this programme. By the 1970s 15% of the fishing fleets in the St. Vincent Grenadines were motorized in contrast to a much lower 6% on the mainland. This increase in fishing effort helped to achieve the government's goal of reducing fish imports and increasing local fish catches (Mohammed *et al.* 2003).

The fishing industry in SVG took a hard hit in the 1980s when high fuel costs, and an observed decline in fish abundance resulted in low fishing activity and hence reduction in exports from the St. Vincent Grenadines. As fishers began to make use of SCUBA gear and larger engines in order to access deeper fishing grounds, it was clear that more fishing effort was required to make a profitable catch (Mohammed *et al.* 2003).

In the 1990s, fisheries centres in Bequia, Canouan and Union Island were constructed by the Japanese along with donations of longline vessels. The addition of these commercially equipped boats to the fishing fleet has opened a window of opportunity for SVG fishers to develop the offshore pelagic fishery (Mohammed *et al.* 2003).

Unfortunately, in 2004 SVG lost their license to export fish to the European Union (EU) and its dependencies. Consequently, trade of demersal species to Martinique was prohibited, and this has greatly impacted the livelihoods of the small-scale Grenadine fishers who primarily targeted these fishes for that market. The EU and SVG are working towards improvements to

the fish market and fishing practices that will allow this import sanction to be removed (Government of St. Vincent and the Grenadines 2006b).

Until the 1950s, fishing in Grenada and its Grenadine islands was subsistence in nature and targeted coastal species. This situation changed in the 1950s to 1960s when the Grenadian Government offered loans to encourage the motorization of the fishing fleet. Additional support such as duty free loans on engines, gear and fishing equipment were also provided. These allowed fishers to extend their fishing grounds, increase the time spent fishing, and change target species from depleted demersals to larger, underexploited pelagics (Mohammed and Rennie 2003).

The 1980s came with new developments towards longline fishing after Cuban donations of semi-industrial vessels. Grenadian fishers were initially sceptical about adopting these changes because of the high initial investments needed, and the large catches that would be required to ensure a profit. By the 1990s however, longlining took over the fishery in Grenada. Carriacou and Petite Martinique fishers also began to switch to longlining in response to the decline in demersal fish species in the Grenadines and with the training provided from the Grenadian Government (Mohammed and Rennie 2003).

Unlike St. Vincent and the Grenadines, Grenada and the Grenadines are certified to export their fish to the EU, and have therefore not lost this significant market for regional and international trade.

3.2 Status of the fishing industry

Continued developments in the Grenadine fishery has led to various changes in not only the status of fish stocks, but also the governments' reactive responses to their relative abundance. Such biological information is difficult to come by as fish landing records are limited for both St. Vincent and the Grenadines and Grenada. This also applies and is especially true for the Grenadine islands between them that have sea-based landing sites aboard multiple trading vessels scattered amongst the island chain. As a result, there is limited data available on the amount of fish landed and fishing effort, therefore much of the information related to fish abundance and the status of fish stocks presented here are qualitative (Chakalall *et al.* 1994).

The majority of the St. Vincent and the Grenadines fishery resources are considered to be overexploited due to high fishing effort and destructive fishing practices (Table 1). The decline in fish abundance is also a result of habitat degradation. It has been recognized by the authorities that in order to relieve pressure on the demersal species, diversion of effort towards deep water fish is desirable. Also, sustainable management of the fishery to prevent the depletion of offshore species is essential (FAO 2002b).

Grenada and its Grenadines fish stocks follow a similar pattern to those in SVG with demersals showing a substantial reduction in abundance (Table 2). In response to this fact, according to the Fisheries Officer, the Grenada government sponsored the training of Grenadine fishers in longline fishing so as to relieve fishing pressure on these species and allow their populations to rebuild.

Table 3.1 Description of stock status, current regulations practiced and objectives for the management of various fisheries in St. Vincent and the Grenadines

Fish group/ fishery	Status of stock	Current regulations	Management objectives
Shallow shelf demersals	Overexploited	- No spear fishing in marine conservation areas	- Promote stock recovery - Divert effort to deep-slope demersals and offshore pelagics
Deep slope demersals	Underexploited	- No spear fishing in marine conservation areas	- Maximize catches within Maximum Sustainable Yield - Reduce illegal fishing from foreign vessels - Protect stock from overfishing by limiting effort - Improve the collection of catch and effort data
Inshore pelagics	Moderately exploited	- Net mesh size restrictions - Use of trammel nets are illegal	- Encourage co-management - Maintain artisanal nature of the fishery
Offshore pelagics	Underexploited	- None	- Cooperate with ICAAT to assess and preserve the resource - Promote the wise development of commercial and sport fisheries by controlling effort
Lobster	Overexploited	- Size restrictions (3.5 inches) - Close season from 1 st May to 31 st August - Illegal to catch or sell out of season - Illegal to remove berried lobsters or their eggs	- Rebuild stocks in depleted areas - Proper management by controlling effort is needed to ensure sustainable extraction
Conch	Overexploited	- Size restrictions (7 inches) - Minister can declare any period as a closed season	- Manage sustainably and prevent further resource depletion by controlling fishing effort

Source: FAO 2002b.

3.3 Importance of fishing

The fishing industry in the Grenadines is at risk due to the depletion of fishery resources. Now the question: “Why is fishing so important to the people of the Grenadines?” can be addressed. It must be noted that fisheries data is very limited for both the St. Vincent and the Grenada Grenadines therefore much of the information presented in this section applies to the Grenadines only as part of their mainland regimes. The facts, however, are still important in establishing the importance of fishing for these islands.

3.3.1 Economic value

According to the Jardine and Straker (2003), the contribution of fishing to the St. Vincent and the Grenadines’ Gross Domestic Product (GDP) was 1.7%. Seemingly insignificant, fishing is actually worth more than this value suggests as GDP calculations do not take into account

the importance of fishing as employment or its contribution to food production and other sectors such as tourism (Kirby-Straker 2003). Fish are also valuable trade commodities as total exports from SVG in 2000 amounted to 175 tonnes and approximately EC\$ 2.7 million (US\$ 1.0 million). Lobster and tuna are extremely important to the industry and represent 75% of total exports in the islands (FAO 2002a). In 2002 it was recorded that 80% of shallow shelf demersal fish species were delivered to trading vessels for export to neighbouring islands such as Martinique. Imported fish that are usually processed and/or canned surpassed the export market for 2000 in both weight and value at 300 tonnes and EC\$ 3.0 million (US\$ 1.1 million) (FAO 2002b).

Table 3.2. Description of stock status, current regulations practiced and objectives for the management of various fisheries in Grenada and the Grenadines

Fish group/ fishery	Status of stock	Current regulations	Management objectives
Demersals and shellfish	Overexploited	<ul style="list-style-type: none"> - Net mesh size restrictions apply - All shellfish are subject to a 4 month close season (1st May to 31st August) 	<ul style="list-style-type: none"> - Expand fishing effort to deep slope fisheries
Offshore pelagics	Underexploited	<ul style="list-style-type: none"> - No effort restrictions, close seasons or area closures exist yet 	<ul style="list-style-type: none"> - Sustainable exploitation of stocks - Relieve overfished demersal grounds - Apply licensing and taxes etc. to shape the direction of the fishery
Inshore pelagics	-	<ul style="list-style-type: none"> - Nets require licensing - Net mesh size restrictions apply 	-

Source: FAO 2000b.

In 2001, fishing contributed 1.5% to the GDP of the tri-island state of Grenada, Petite Martinique and Carriacou. Unlike SVG, revenue from fish exports from the Grenada Grenadines exceeds the value of fish imports. Exports in 2001 were approximately 200 tonnes and EC\$ 9.5 million (US\$ 3.5 million), while imports came in at 300 tonnes and EC\$ 5.1 million (US\$ 1.9 million). This makes the fisheries sector one of the few positive performers within the Ministry of Agriculture (McConney 2003). In 2000, it was recorded that 25-30% of demersal species were exported (FAO 2000b). Furthermore, trade between Carriacou and Petite Martinique to French Martinique brought in an average of EC\$ 1.3 million (US\$ 0.5 million) to the Grenadian economy between the late 1980s and early 1990s (Logan 2001).

3.3.2 Fish landings value

Fish landings in St. Vincent and the Grenadines were estimated at 1120 tonnes and EC\$ 7.3 million (US\$ 2.7 million) annually according to the Food and Agriculture Organization (FAO) Country Profile (2002a). Table 3 illustrates the relative proportions of landed fish by fish group and their estimated dollar values, taken from Jardine and Straker (2003).

Annual landings for Grenada fluctuate between 1,425-2,000 tonnes. Offshore pelagics represent 58%, demersals 25%, and inshore pelagics 15-20% of these landings (FAO 2000b).

Table 3.3. Table showing proportion and value of fish landings in St. Vincent and the Grenadines.

	Fish group				
	Demersals	Offshore pelagics	Inshore pelagics	Conch & Lobster	Other
Proportion of landings (%)	10	35	45	5	5
Value (million EC\$)	0.8	2.4	3.5	0.3	-

Source: Jardine and Straker 2003.

3.3.3 Employment value

According to the Jardine and Straker (2003), 5% of the labour force in St. Vincent and the Grenadines is employed within the fishing industry. There were 2,500 full-time and part-time fishers, while approximately 500 persons were involved in trading, vending, gutting and handling of fish. It is believed that the population of fishers in SVG has declined and this is especially true for the Grenadines where tourism and construction now dominate the job market (Jardine and Straker 2003).

There were fewer recorded fishers in Grenada and the Grenadines than SVG, with 1,749 full-time and part-time fishers and 92 persons employed in the secondary sector or involved in vending, exporting and boat building (FAO 2000a).

3.3.4 Food security value

Much of the St. Vincent and the Grenadines and the Grenadian population consume fish which is usually purchased fresh. The most favoured are robins and jacks, with the larger species such as snapper and kingfish close behind. Ironically, the inshore pelagics are also mentioned as the most disliked species according to the Fishery Country Profile (FAO 2002a), therefore leading to the conclusion that these fish are popular not by preference, but because they are easily available on the market (Jardine and Straker 2003, Government of St. Vincent and the Grenadines 2006a). The demand for fish throughout the Grenadines has been mounting due to an increase in tourist arrivals and the people's desire to achieve healthier lifestyles. For example, locally caught fish in SVG supplies 70% of the per capita consumption of fish, while the remaining 30% is supplied by imported processed and canned fish (FAO 2002a).

3.4 Fishing techniques

Fishing in both the St. Vincent and Grenada Grenadines is primarily small-scale and artisanal where multiple fishing techniques and gears target multiple varieties of fish and shellfish species (FAO 2002a). As a result, very few fishers specialize in and carry out only one type of fishing method. Now that the development, status and importance of the fishing industry has been described in substantial detail, it is appropriate to illustrate those fishing techniques commonly utilized by fishers in the Grenadines.

3.4.1 Handline fishing

Handlining involves one single fishing line, with one or several hooks, that can be swung over the side of a boat, the edge of a jetty, or even from shore. The line is baited, weighted and attached to a reel or rod that targets both shallow-shelf and deep-slope demersals such as red hinds and snappers (Jardine and Straker 2003). This method usually requires many hours of patience, a range of distances and may accompany trolling fishing which is described below.

3.4.2 Spear-fishing

Fishing with a spear gun can be accomplished either with scuba tanks or free diving known locally as “bare wind” where the fishers literally dive and shoot their demersal targets on one breath of air. Lobsters and conch are also picked up by these divers who can reach depths of up to 25 m (Jardine and Straker 2003).

3.4.3 Pot/trap fishing

Fish traps are usually constructed of wire mesh with either an arrow-head or z-shaped wooden frame. Pots can be set in either shallow or deep waters where they are confused for shelter by a variety of demersal fish and lobster (Jardine and Straker 2003). Pot fishing does not require as many hours out at sea as hauling and resetting the equipment takes a relatively short period of time.

3.4.4 Bottom longlining/sinking palang

Bottom longlining is yet another fishing method that aims for shallow-shelf and deep-slope demersal species. Baited branched lines with several hundred hooks are attached to a main line that remains vertically oriented in the water because of the weights/sinkers attached to the bottom end and the buoys fastened to the top end of the main line. The gear is usually set in the water for a few hours before being hauled onto the boat. Sinking palang follows the same procedure, but is operated on a smaller scale (Jardine and Straker 2003).

3.4.5 Gill net fishing

Gill nets are single panelled mesh nets that function to trap the opercula (gill cover) or any other bodily projections of pelagic fish species such as flying fish. The nets are usually set for a few hours before fishers return to haul their catch. Multiple panelled gill nets are called trammel nets which are actually illegal in SVG and GG due to their non-selectivity and ability to catch many species and sizes of organisms with little or no commercial value. Lobsters are also caught with gill nets as they are attracted to the decomposing bodies of the trapped fish (Jardine and Straker 2003).

3.4.6 Trolling

Trolling is a form of mobile handlining where a baited fishing line is pulled behind a slowly moving boat. The lack of weights or sinkers allows fishers to target surface, offshore pelagics such as kingfish, dolphinfish, tuna and billfish (Jardine and Straker 2003).

3.4.7 Surface longlining/floating palang

Surface longlining also targets offshore pelagics, in particular tuna and dolphinfish. Several hundred baited, branched lines with hooks are attached to a buoyed main line that floats on the surface without sinkers (Jardine and Straker 2003). Commercial longlining has become popular especially in the southern Grenadines and these vessels require days out at sea and hydraulic reels to haul in the gear and catch. Floating palang again uses the same procedure but is done manually and on a smaller scale.

3.4.8 Seine fishing

Inshore pelagic species such as jacks and robins are caught via mesh seine nets manned by approximately 15 men and a double-ender boat. Seine fishing also involves persons in the water who guide the boatmen and help to surround the schooling fish. The fish are hauled onto the beach and into the boats, or may be pursed and tied off to land and the fish removed as they are needed (Jardine and Straker 2003).

3.4.9 Types of vessels used and species caught

With the exception of commercial longline and seine fishing, the majority of fishing techniques are carried out in cigarette framed speed boats. As described above, commercial longliners require much larger and usually modified vessels with an ice box and storage facilities, while seine boats call for a great deal of manpower and double-ender row boats. Please refer to Appendices I and II for visual references and detailed descriptions of the fish species targeted and the fishing vessels used in the Grenadines.

4 IMPORTANCE OF A LIVELIHOODS ANALYSIS

With the St. Vincent and the Grenadines and Grenada fishing industries described, it is now important to discuss the relevance of pursuing a livelihoods survey of their fishers.

Marine fisheries, both large and small-scale, are critical providers of food and socio-economic resources to coastal communities around the world. Globally, small-scale fisheries such as those found in the Grenadines, employ 50 million fishers and produce more than half the world's annual marine fish catch of 98 million tonnes. Unfortunately, human dependence on fishery resources lends itself to overexploitation and habitat degradation which have resulted in the decline in fish abundance experienced worldwide. In order to prevent biological or economic extinction of fishery resources and the negative human impacts that will follow (e.g. unemployment and reduction in food provision), management whether government or community based, is necessary (Berkes *et al.* 2001; Gelcich *et al.* 2005).

Small-scale fisheries target multiple species, consist of multiple fishing fleets and fishers tend to employ multiple occupations in addition to fishing. In most cases, these fishers are located in developing countries such as the Grenadines, and some are considered to be unorganized and vulnerable, with low levels of education, skills and assets. These reasons contribute to the challenges associated with managing small-scale fisheries which are generally not well managed or sometimes even neglected. The main problem faced by this sector is establishing a means of reducing poverty and vulnerability of fishing-dependent communities, without involving further degradation to the resource (Allison and Horemans 2006; Berkes *et al.* 2001).

Traditional and conventional fisheries management systems are command and control in nature, involving top-down decisions and controls instituted by the state, which are bureaucratically communicated to the users of the resource. These systems place great emphasis on biological characteristics of the fish and tend to ignore the socio-economic aspects of the fishery (Mölsä *et al.* 1999). Regulation measures such as licenses and quotas, as well as monitoring programmes, require substantial financial inputs to cover administrative and enforcement costs necessary to ensure compliance. Unfortunately, most developing countries lack the capacity and ability to implement these conventional management strategies effectively, resulting in low levels of compliance and eventual overexploitation of fishery resources (Hossain *et al.* 2006). In addition to limited capacities, given the highly complex nature of these small-scale fisheries, top-down management would probably not be appropriate or effective in the Grenadines (Berkes *et al.* 2001).

More suitable suggestions for managing small-scale fisheries are community based which directly involve stakeholders in the planning and control of the resource and its uses. The success (i.e. increased compliance and enforcement effectiveness) of these initiatives however, will depend greatly on the willingness of fishers to participate in these systems. Therefore, in order to manage the small-scale fisheries of the Grenadines sustainably, an interdisciplinary approach that incorporates biological, socio-economic, cultural and institutional elements is required (Gelcich *et al.* 2005; Mölsä *et al.* 1999). Understanding the

human component of a fishery can help managers and policy makers apply appropriate management measures which reflect the needs of stakeholders without degrading the fishery resource. A useful tool in obtaining this people-centred information, which is required for co-management to work, is the sustainable livelihoods approach (SLA) (Cinner and Pollnac 2004).

4.1 Sustainable livelihoods

The concept of “sustainable development” and its relationship to natural resource and environmental management has become a global priority over the past few decades. A livelihood, along with many other sectors such as tourism, contribute greatly to this overall objective, and is considered sustainable “when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (DFID 1999).” Figure 2 below is a modified version of the sustainable livelihoods framework prepared by DFID, and highlights in black and grey the livelihood strategies, assets and vulnerabilities which are the focus of this study. This project did not consider the wider institutional and policy context in which livelihoods are formed and would benefit from such an analysis.

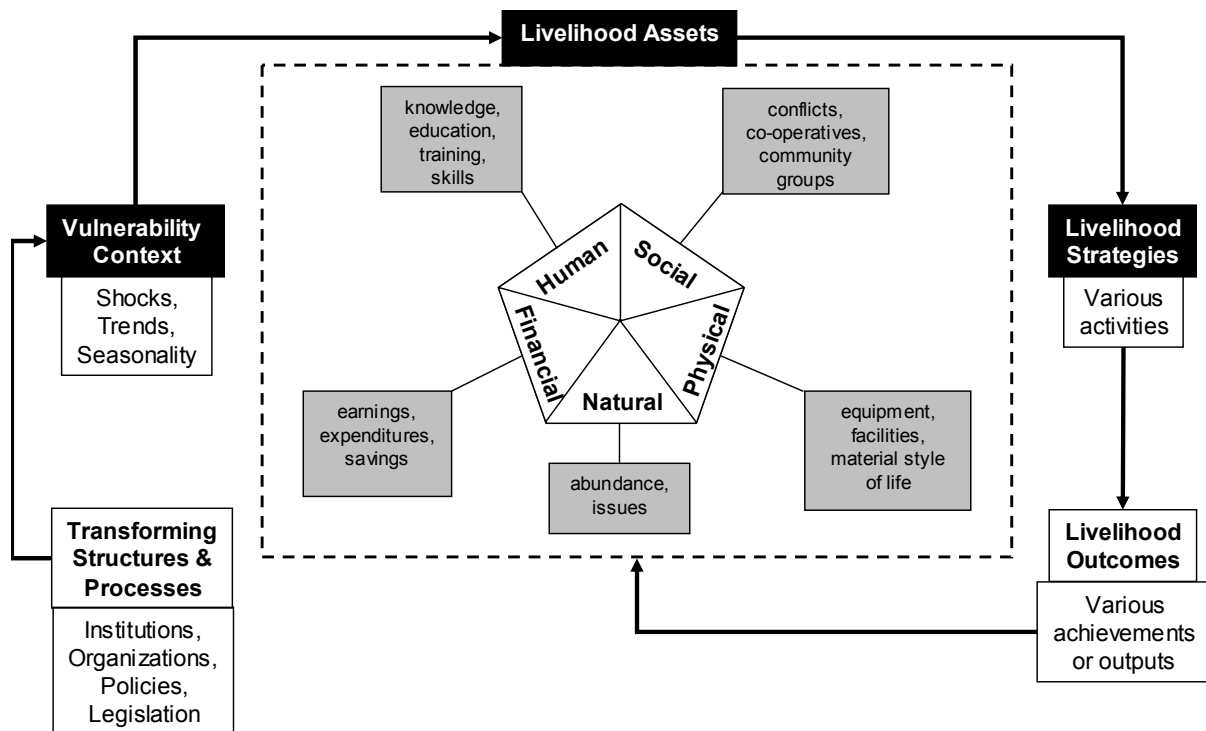


Figure 4.1. Diagram illustrating the sustainable livelihoods framework (modified from DFID 1999).

According to Brocklesby and Fisher (2003), the sustainable livelihoods framework has four main components: (1) people live within a vulnerability context where they are exposed to external risks, shocks, trends and seasonality which are beyond their control; (2) people have a number of assets which they draw upon to make their livelihoods; (3) these pentagon of assets (Figure 2) are used to form livelihood strategies (i.e. activities chosen to make a living) and resulting livelihood outcomes and (4) policies, institutions and processes determine a person’s access to their livelihood assets and strategies, as well as how they are able to cope with the vulnerabilities they face.

For example, among other things a fisher is subject to natural disasters such as hurricanes and the seasonal demand for certain species of fish. He/she may choose to become employed in

another industry such as construction in order to reduce the vulnerability associated with fishing as a single occupation. This additional skill contributes toward his/her human capital, and the livelihood strategy is to do construction work during the slow fishing season or outside of lobster season as is the case in the Grenadines. Multi-occupationality not only maximizes their efforts and skills, but also results in an increased level of income from construction, which would not have been gained while fishing during the off-season. This livelihood outcome then filters back into the assets pentagon as financial capital.

The SLA has been successfully utilized in West Africa where it contributed towards connecting the fisheries sector and its issues with a wider development process. The livelihoods approach improved the understanding of the problems faced by fishers and helped identify ways for managers to address them (Allison and Horemans 2006). The sustainable livelihoods theory has also been applied in the Philippines and Indonesia where it was found that alternative livelihoods, such as seaweed farming, combined with controls on fishing effort can improve the status of fish stocks and diversify income sources for artisanal fishers (Sievanen *et al.* 2005).

Despite its weaknesses, such as the difficulty in establishing relationships and tradeoffs between livelihood assets (Toner 2003), the SLA has proven itself a useful tool in identifying the complex people-centred issues which is necessary for a more integrated or holistic approach to the management of small-scale fisheries. To conclude, a livelihoods analysis of the Grenadine fishers can help design appropriate inputs and focus management priorities that are required for managing fishery resources and habitats. Once an intervention has been accomplished, the baseline information provided by this study can be used to assess any changes and make the necessary modifications to improve on the initial strategy. Furthermore, this study can contribute to community development projects, participatory management of marine protected areas (MPAs), sustainable development, and resolving or avoiding resource use conflict.

5 METHODOLOGY

The livelihoods analysis of fishers in the Grenadines is based on a two-phased interview approach. The first phase was an initial survey which sought to (1) identify the fishers of Bequia, Mustique, Canouan, Mayreau, Union, Petite Martinique and Carriacou, (2) determine what types of fishing they do, (3) document the types of fishing vessels and gears that are used and (4) obtain preliminary information on the locations of fishing hot spots. The second phase involved an in-depth survey which focussed on livelihood assets (human, natural, physical, financial and social capital), strategies and vulnerabilities that fishermen both utilize and face. Throughout the six-week fieldwork associated with this study, general observations and discussions with key informants were also recorded and reported.

Phases I and II were preceded by two preparatory field activities. The first was one week tour through the major Grenadine islands which provided initial exposure to the coastal issues of the islands. These considerations, as well as observations of the way of life in the Grenadines facilitated preparation for the fieldwork associated with this study. The second field activity was a scoping survey for the MarSIS Project (conducted by Kim Baldwin) where 11 of the Grenadine islands were visited in May, 2006 and information regarding marine resources, uses, users, management and areas that require further research was gathered (Baldwin 2006b). The scoping survey also identified and established contact with key informants and community leaders and introduced them to the MarSIS, socio-economic monitoring (SocMon; conducted by David Gill) and livelihoods analysis projects that were to follow. The list of resource users from the scoping report was helpful in identifying key fishers in the Grenadines.

5.1 Phase I: Initial survey (June-July 2006)

The initial survey took place over a two week period in June and July, during which time the major fishing communities in the islands (Table 4) were visited in order to gain an overall understanding of fishing in the Grenadines. Any fishers encountered in these villages were asked to take part in a brief 5-10 minute interview. Responses were recorded on the Phase I questionnaires (Appendix 3) and the following information was gathered: basic demographics, fishing practices, operations, ownership of fishing vessels, fish and vessel types, locations for fishing and also crew and contact information. To conclude, fishers were asked if they would be willing to participate in an in-depth survey that would focus on their livelihoods. The goal of Phase I was to interview as many occupational fishers as possible in an area until the interviewers came across no new fishers. At this point, the next fishing community was visited where the same Phase I interviewing procedure was carried out.

Table 5.1. Table listing the fishing villages/areas visited in seven of the inhabited Grenadine islands

Island	Fishing Village
Bequia	Port Elizabeth, Lower Bay, La Pompe, Friendship Bay, Paget Farm
Mustique	Mustique Fishing Camp
Canouan	Grand Bay, Canouan Fisheries Complex
Mayreau	Saline Bay, Salt Whistle Bay
Union Island	Clifton, Ashton
Petite Martinique	Sanchez
Carriacou	Hillsborough, Belmont, Windward, L'Estere, Paradise Bay, Harvey Vale

The data collected from the initial survey was then analysed to determine an appropriate and representative sample for the in-depth survey. The aim was to interview a range of fishers in terms of age, dependency on fishing and ownership of fishing vessels. The in-depth interview questionnaires (Appendix 4) were also modified and improved based on the previous initial interviews.

5.2 Phase II: In-depth livelihoods survey (July-August 2006)

The in-depth survey of this study aimed to assess the livelihoods of fishers in the Grenadines, therefore the interview questions (Appendix 4) were centred around livelihood strategies, assets and vulnerabilities. The fieldwork was conducted after the analysis of Phase I data, over a two-week period, and individual interviews lasted between one and three hours. During this time, initial surveys were also carried out in order to obtain this valid information from fishers who were not encountered during the rapid-assessment survey.

5.3 Presentation and validation of results (October 2006)

Two months after the fieldwork, presentations of the major findings from the socio-economic and livelihood analyses, as well as a MarSIS update were presented to government officials in St. Vincent and Grenada and to fishers and community members of the Grenadine islands. These presentations not only served to validate the information obtained from this study, but to give something back to the people of the Grenadines in the form of trust and genuine interest. This final stage will also be helpful in reducing fatigue and bitterness associated with the many interviews that have taken place in these islands, where little or no feedback was given back to the communities.

6 RESULTS AND DISCUSSION

6.1 Observations and discussions with key informants

6.1.1 Bequia

Paget Farm is the home of Bequia's resident Fisheries Department representative and the fishing complex (Figure 6.1) which is equipped with a boat ramp, locker facilities, desalination plant, refrigeration facility and also fish cleaning areas. At the time of this project's field survey, the fishing complex was not yet in operation, however, in October 2006 a business partnership known as the Grenadine Seafood Distributors began renting the complex from the government at EC\$ 7,000 / month (US\$ 2,590 / month) with additional electricity and water bills amounting to approximately EC\$ 7,000 / month (US\$ 2,590 / month). Fish are purchased at EC\$ 12 / kg (US\$ 4 / kg) and then sold to both local and export markets. This is providing a bit of competition and even loyalty issues with the export trading vessel nearby that purchases fish at EC\$ 10 / kg (US\$ 4 / kg).

According to one of the representatives of the Grenadine Seafood Distributors, the company has intentions of utilizing the complex's desalination plant to provide water, a scarce commodity in the Grenadines, for the community during the dry season. He also indicated that there are plans to reduce electricity costs by installing solar panels. The success of this expensive endeavour undertaken by the Grenadine Seafood Distributors can only be determined with sufficient time; however the complex has the potential to become both profitable and beneficial for the fishers and the company.

Another interesting fishing activity which was observed during the field survey is held every year in the month of July – Fisherman's Day is a vibrant celebration that brings both fishers and communities together. The competition involves the weighing of a team's landings which are then sold to the awaiting crowds who crown around the boats to select their fish (Figure 6.2). Winners of the different categories are rewarded with fishing gear and the festivities continue late into the evening. The benefits of such an occasion are both cultural and financial as the entire island becomes involved in a fishing related event and the fishers make a great sale that day. These advantages along with proper organization can help realize the potential for Fisherman's Day to become a more regular and profitable occurrence in Bequia.

6.1.2 Mustique

The fishing complex/camp located in Mustique (Figure 6.3) is owned and operated by the Mustique Island Company and offers cooking, locker, accommodation and bathroom facilities where fishers only have to pay for electricity via a slot-token machine. Occupants are primarily residents of Paget Farm, Bequia who usually stay for weeks at a time, and return home for special events and weekends. The complex also functions as a refrigerated storage and purchasing facility where the Mustique Island Company purchases the fish directly from the fishers and then sells to private owners and locals of the island.



Figure 6.1 Fishing complex lockers and boat ramp - Paget Farm, Bequia



Figure 6.2 Fisherman's Day – Port Elizabeth, Bequia

6.1.3 Canouan

The fishing complex/camp located in Canouan (Figure 6.4) includes a boat ramp, cooking, locker, accommodation and bathroom facilities for the fishers at EC\$ 35 / month (US\$ 13 / month) and is also primarily occupied by Bequian fishers. The refrigerated storage facility allows the representative of the Fisheries Division to purchase and store a variety of fish and lobster before selling to the resident hotels and restaurants. Fishers also sell their catch directly to locals on the roadside in the main town of Charlestown, as few people were observed entering the complex/camp.



Figure 6.3 Mustique fish market



Figure 6.4 Fishing complex/camp – Canouan

6.1.4 Mayreau

The very small fishing community and size of Mayreau does not facilitate the need for a fishing complex. With few restaurants to purchase fish on the island, fishers mostly sell their catch to nearby trading vessels.

6.1.5 Union Island

The fishing complex in Clifton, Union Island (Figure 6.5) has a boat ramp and refrigeration facilities and was not in operation at the time of this project's field survey. According to the resident Fisheries representative the government believes it is not economically viable as the fishers do not catch or earn enough to keep the facility running. The authorities plan to have the fishing complex functioning as a storage facility where fishers will be required to pay a fee in order to have designated racks to store their catch until they are ready for sale. Due to its inactivity over the years, the complex has been jokingly referred to as "the white

elephant.” According to persons in the Fisheries Department, the government hoped that the complex would be run by the fishers, however because they have been unable to organize and form a co-operation, the complex remains closed. Although Ashton is also an active fishing community, very little investment in the fishing industry was observed here (Figure 6.6).

Union’s close proximity to the Tobago Cays, and the resort destinations of Palm Island and Petite St. Vincent, provides constant opportunities for fishers to sell their catch directly to sailing tourists or to the hotels and restaurants.



Figure 6.5 Fishing complex and boat ramp – Clifton, Union Island.



Figure 6.6 Dilapidated fisheries co-op building – Ashton, Union Island.

6.1.6 Petite Martinique

The single operating fishers’ co-operative in Petite Martinique has 15 members and monthly fees which amount to EC\$ 5 (US\$ 2). The co-op building (Figure 6.7) is licensed to sell drinks and some fishing gear, however at the time of this survey the organization was not earning enough money to stay in operation. As a result, in order to keep the facility running, the President of the co-op is personally renting the building from the co-op so that it can remain open. According to one member, the organization is not functioning optimally as membership is lacking and there is a large debt to pay. Nevertheless, government investment in the fishing industry continues in Petite Martinique as they have funded the construction of a locker and ramp facility next to the co-op building.

6.1.7 Carriacou

The great expanse of forested hillsides provide the necessary conditions for sustainable agricultural activities, and thus a greater diversity of employment options for inhabitants of Carriacou. The Grenada Government is currently investing in the fishing industry on this island through the construction of a fishing complex located in the capital, Hillsborough.

Current development of the Tyrrel Bay Marina is likely to have severe environmental impacts on the nearby mangroves and oyster beds which are known breeding, nursery and spawning grounds for a variety of fish and lobster. Windward is the location of a derelict Japanese fishing complex which was abandoned years ago and the island’s main fish market is situated in Hillsborough (Figure 6.8). The resident Fisheries Officer for the Grenada Grenadines is also based in Carriacou.



Figure 6.7 Fishing co-op building – Petite Martinique.



Figure 6.8 Current fish market – Hillsborough, Carriacou.

6.2 Phase I: Initial survey

6.2.1 Sampling structure

In the initial rapid survey of Phase I of this project, 230 fishers were interviewed, whereas an additional 37 fishers were encountered during Phase II during the in-depth surveys. Table 6.1 below shows the distribution of fishers by island, each island's estimated population and also the proportion of the populations that was interviewed in this initial stage of the study.

Table 6.1. Table showing the sampling distribution of fishers interviewed and the island populations in the Grenadines.

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

* Source: Sustainable Grenadines Project 2005; ** Source: Chakalall et al. 1994.

From the MarSIS Scoping Survey in May 2006, 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) their highly active and concentrated fishing villages, (2) larger populations and (3) strong historical fishing traditions. Most of the fishers in the Mustique and Canouan fishing camps were not from these 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.

Although it has been reported that more than 80% of adult males in the Grenadines are fishermen (CCA 1991), 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, between 15 and 20, which was comparable to those encountered in this study.

Due to its small population and size, all the occupational fishers on the island of Mayreau were interviewed in the initial survey. Greater populations and larger sizes of the other Grenadine islands contributed to the challenge of conducting a complete inventory of all the fishers in the island chain. Therefore the 267 fishers that were identified in the Phase I initial survey is an underestimation. Apart from time limitations there are other reasons why the full-inventory was not achieved: (1) the study took place out of lobster season, and consequently, fishers were either engaged in other occupations or out of the island; (2) the fishers are dispersed throughout the islands which requires a much greater sampling effort and time to interview each household on the island; and (3) this study focussed on persons who depended on fishing for their livelihoods, as opposed to recreational fishers.

To overcome these limitations, the sampling design was restructured from an inventory to a saturation sample, where all persons located in and around the major fishing villages and markets were surveyed, until the interviewers encountered little to no new fishers.

6.2.2 Demographic information: Sex and age

Only one of the 267 fishers interviewed in the initial phase of this study was female, and the average age of the fishers was 43 years (median age = 42). The graph in Figure 6.9 follows a normal distribution with a slight skew to the left. It must be noted that 8% (n=22) of the fishers were beyond the retirement age of 65. The youngest mean age of 36 years was observed in Petite Martinique, while the oldest mean age of 46 years was for the fishers coming from Bequia. The average number of years fishing was 21, and thus fishers in the Grenadines begin to fish at age of about 22 years.

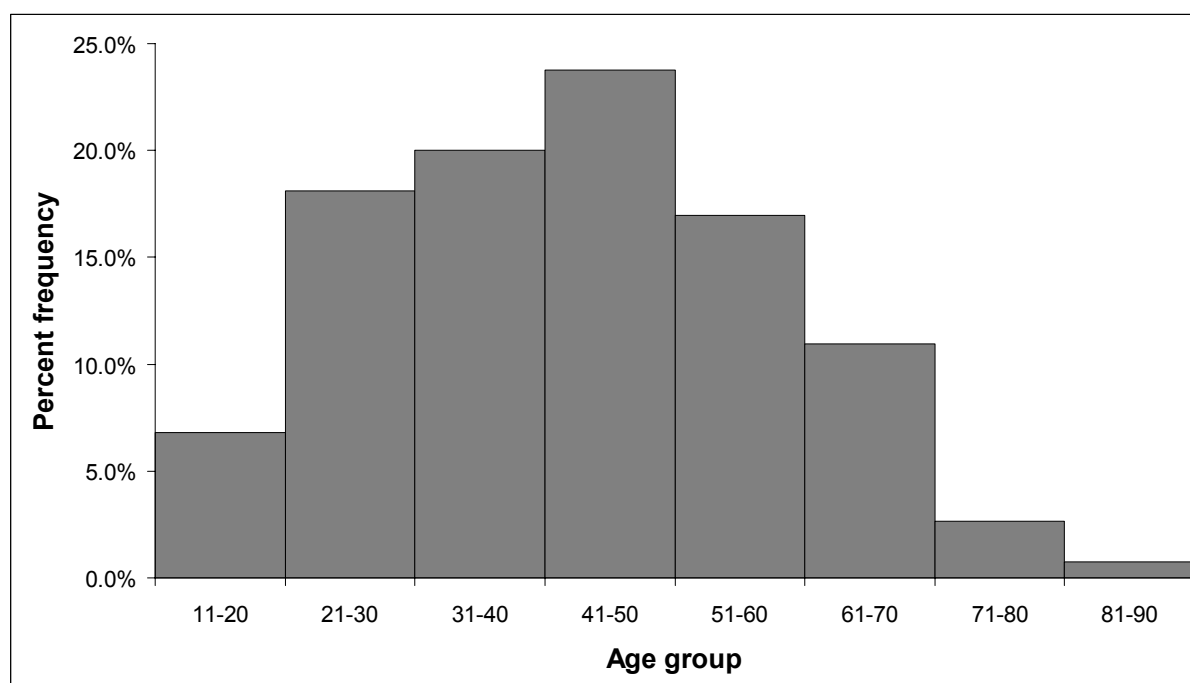


Figure 6.9 Age distribution of the 267 fishers interviewed in the Grenadines.

6.2.3 Dependency on fishing

Sixty-four percent of the fishers interviewed stated that they are solely dependent on fishing, i.e. 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.

Although most of the persons interviewed (79%) stated that their primary occupation was fishing, there were 30 other main occupations identified that part-time fishers use to supplement their income. These were grouped into the categories seen in Figure 6.10.

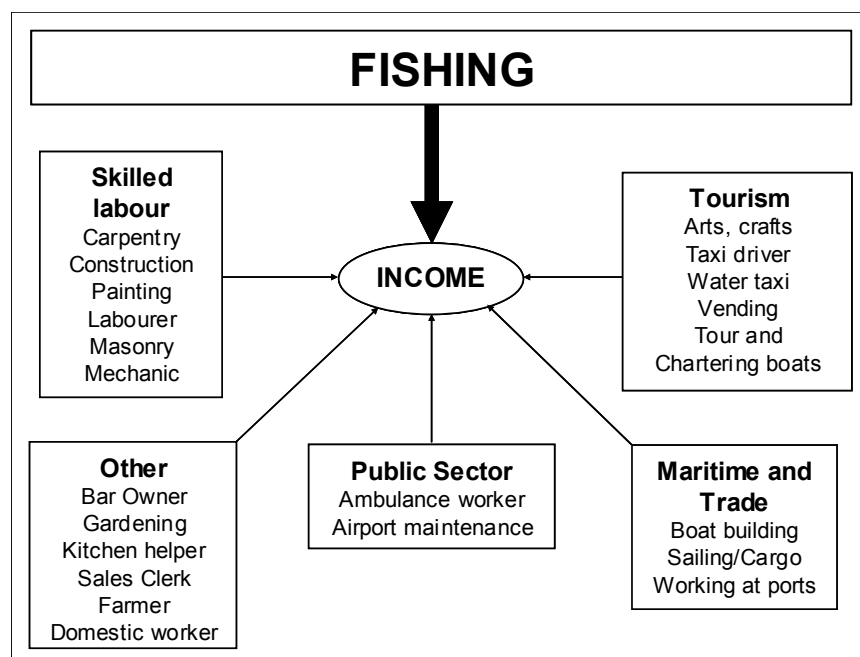


Figure 6.10 Diagram showing the main income earning activities identified by part-time fishers in the Grenadines.

The pie chart in Figure 6.11 shows the primary occupations of part-time fishers and clearly identifies skilled labour as the most common income earning activity. Few fishers (4%) are employed in the public sector and relatively small proportions are involved in tourism (13%) and marine and trade (15%) related occupations.

An interesting finding is the strong correlation between age and sole dependency (i.e. 100% of income) on fishing. A Mann-Whitney test showed that the difference between the mean age of fishers who are solely dependent on fishing (45 years) is significantly less than the mean age of fishers who are not (38 years) ($Z=-4.118$, $n=254$, $p=0.000$). The bar graph in Figure 14 shows the dependency on fishing within the different age groups. It demonstrates a positive relationship, where sole dependency on fishing increases with age. Note that for the 81-90 age group only two fishers were interviewed which could give an inaccurate representation for this age group.

These results indicate a considerable vulnerability within the Grenadines fishery where fishers are becoming more dependent on fishing with age. This could be due to the following factors, among others: (1) the older generation were traditionally more dependent on fishing as there were fewer options in the past, whereas younger fishers have more opportunities and (2) as fishers get older, they are unable to adopt new skills to pursue other trades and thus, remain or turn to fishing. It is unclear how much of the older population on these islands is reliant on fishing but it seems to be one of the few options available to them. This is a possible cause for concern as the older members of the population who may not have national insurance, pension or welfare, turn to fishing as their only means of survival.

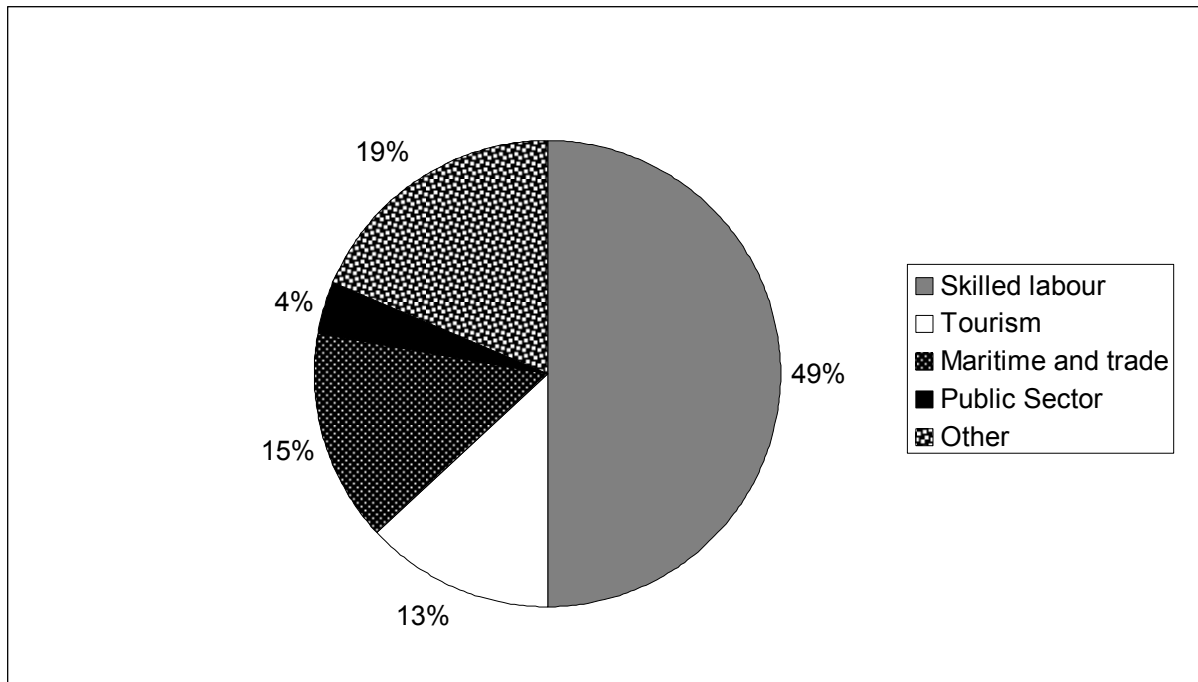


Figure 6.11 Main occupations of part-time fishers in the Grenadines (n=54).

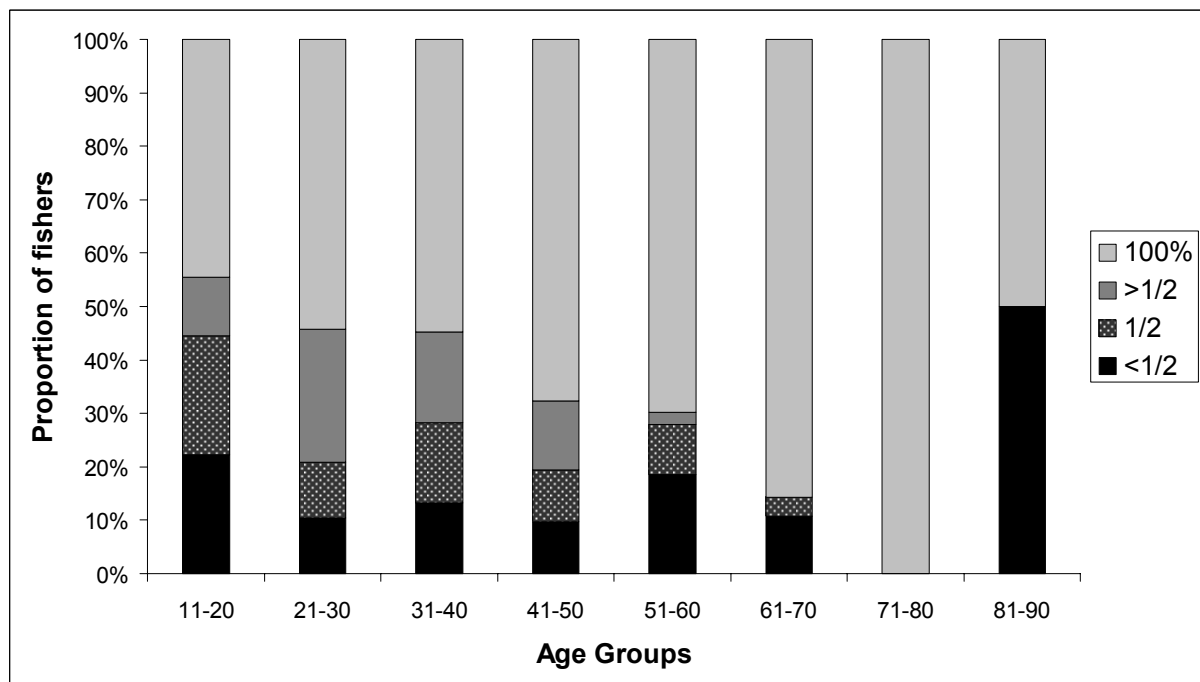


Figure 6.12 Dependency on fishing by age group.

Figure 6.13 compares dependency on fishing within the Grenadines and shows that in Bequia, Petite Martinique and Union Island a larger proportion of fishers are heavily dependent on fishing. 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 fishers at the Canouan and Mustique Fishing camps are on average 4 to 10 years older than the overall average and exhibit 75% and 80% sole dependency on fishing respectively. It is expected that the fishers who would leave home to reside at fishing camps would be highly dependant on fishing but the correlation with age is also significant.

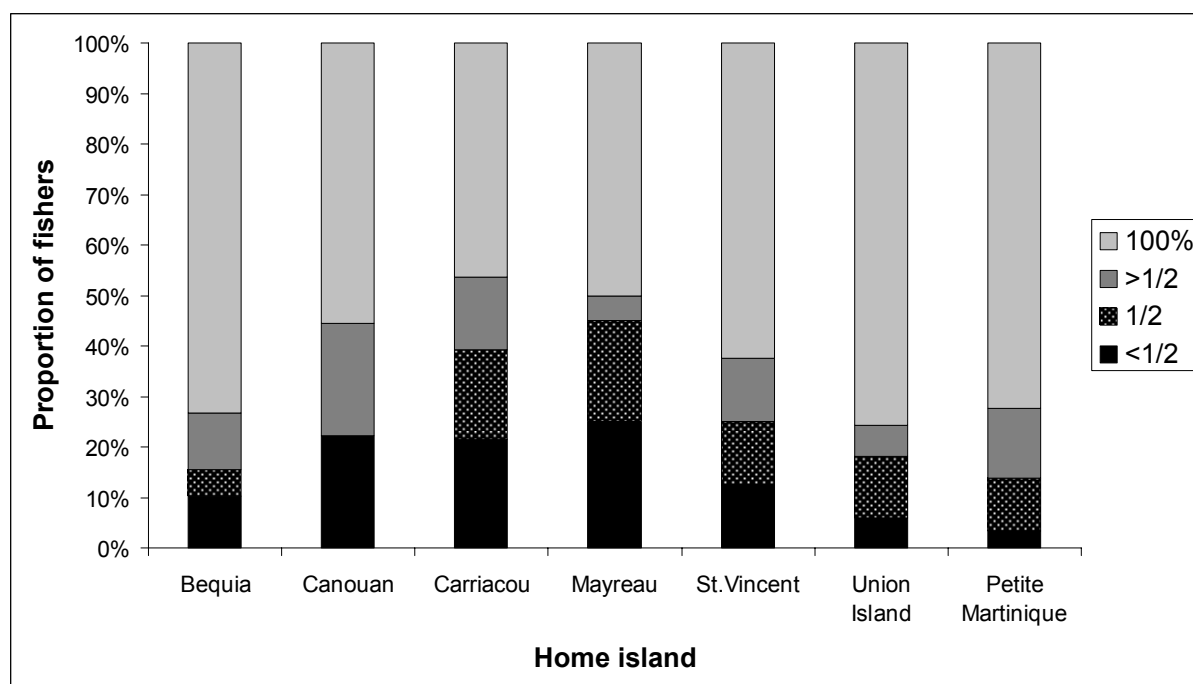


Figure 6.13 Dependency on fishing by home island.

Mayreau and Carriacou fishers demonstrate lower sole dependency on fishing and hence have more alternative sources of income. This may be due to the following reasons, among others: the large size Carriacou presents greater opportunities for businesses and agriculture, whereas the small size of Mayreau may result in a greater need for multi-occupationality within the community. In other words, fishing is one of the many chosen occupations in these islands. Contrastingly, Petite Martinique is a small island with fishers who depend heavily on this industry which may be due to historical and cultural influences. To accurately determine what factors play a role in generating the observed levels of dependency on fishing, a more in-depth study is required.

6.2.4 Boat ownership

Overall, the proportion of owners to crew remained relatively equal (Figure 6.14) with 46% of the fishers interviewed being boat owners and 54% either fish from shore or work as crew.

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 co-operation between fishers was again observed in Mustique where equipment and materials are also shared. Canouan and Union Island have a greater number of boat owners as fishers tend to operate individually on these islands and there is a lower density of fishers. The average number of crew overall for the islands is four, with the Bequia having the highest average crew membership of five.

6.2.5 Boat ownership and dependency on fishing

The levels of dependency on fishing of boat owners and crew were plotted as pie charts in Figure 6.15 and they clearly demonstrate that boat owners are more heavily dependent on fishing than crew members and shore fishers, who 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 or visa versa ($\chi^2=10.9$, $n=262$, $p=0.001$). A Mann Whitney test also showed a statistical difference ($Z=-0.510$, $n=261$, $p=0.000$) between the age of boat owners (47.5 years) and non-owners (38.2 years). That is, those fishers who are solely dependent on fishing are more likely to purchase fishing vessels or vice versa.

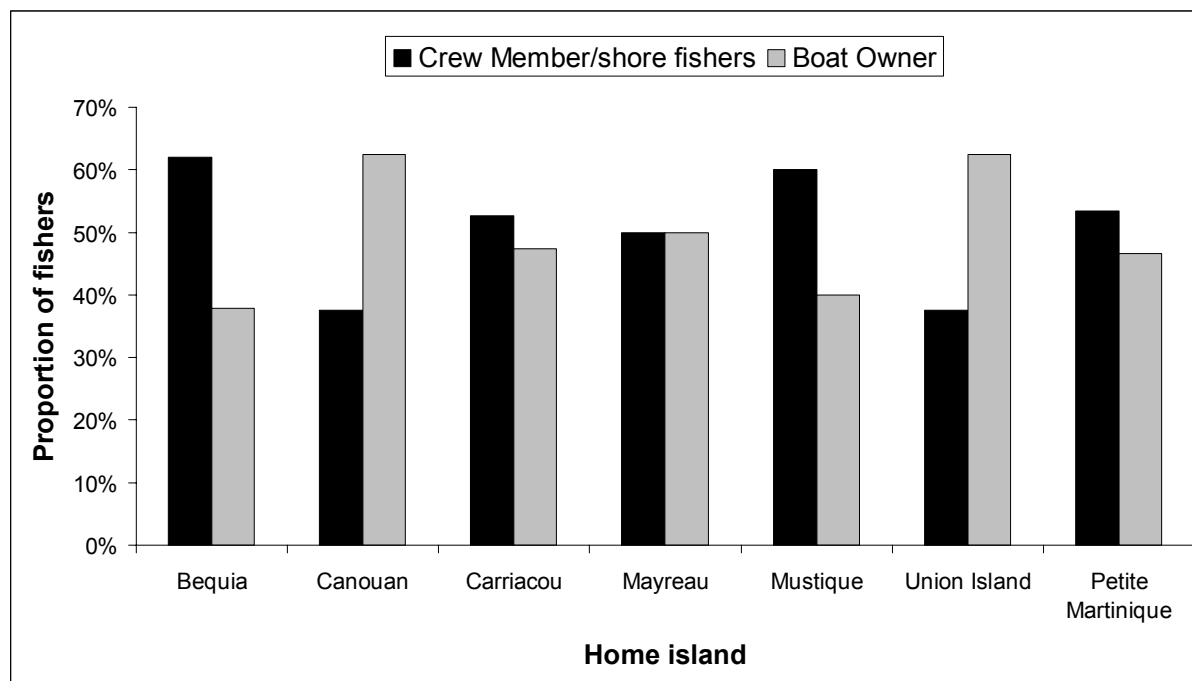


Figure 6.14. Proportion of crew members versus boat owners, by home island.

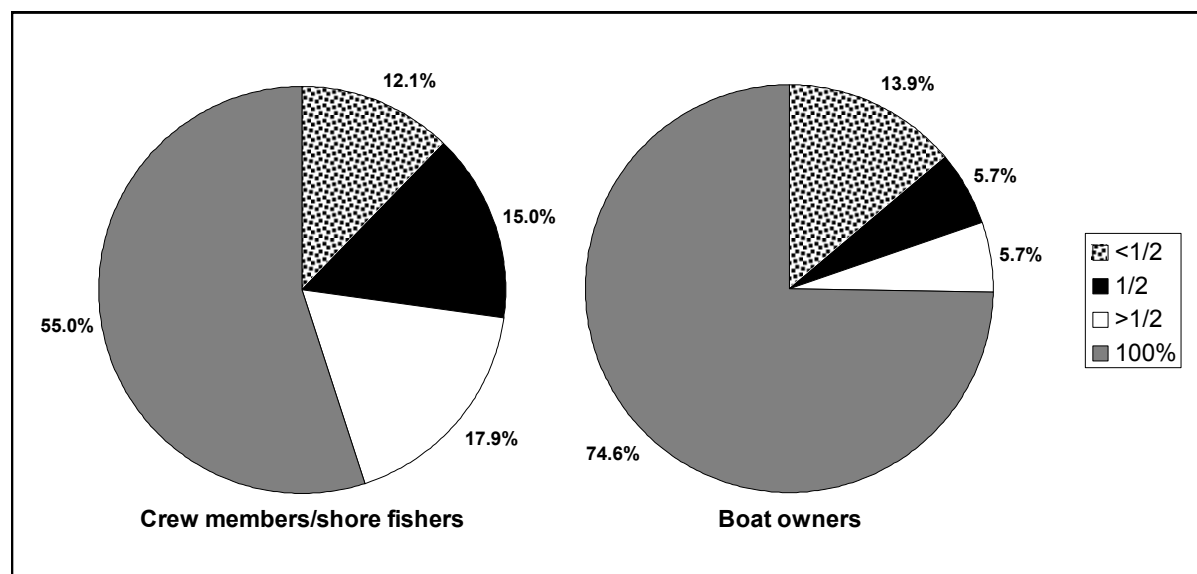


Figure 6.15 Proportion of income from fishing for crew members/shore fishers and boat owners.

The average age of boat owners (47.5 years) was significantly higher than that of crew/shore fishers (38.2 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. These 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 6.16.

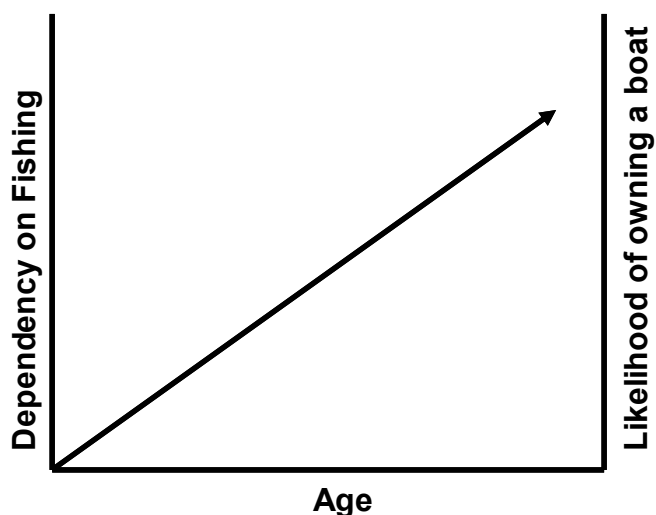


Figure 6.16 Diagram showing dependency on fishing and boat ownership increasing with age.

6.2.6 Boat types

The predominant boat type observed and recorded in the Grenadines were wooden and fibre-glass coated “cigarette” frame (bow and stern) boats. Less common were pirogues, cabin cruisers, sloops and modified speed boats (Figure 6.17). There were six longline 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 (Chakalall *et al.* 1994).

Yamaha engines were the most popular in the island chain with an average of 60 hp. Petite Martinique and Carriacou have the highest average horse power engines of 75.9 hp and 66.3 hp respectively. This may be the result of government subsidization through duty free concessions in the Grenada Grenadines.

The average boat length in the Grenadines is 6.0 m or 19.6 ft or with the largest boats found in Petite Martinique (7.0 m; 23.0 ft) and Carriacou (6.8 m; 22.2 ft) while the smallest boats were located in Mayreau (5.3 m; 17.3 ft) and Union Island (5.4 m; 17.6 ft). 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 horsepower ($R^2 = 0.532$) which is seen in Figure 6.18.

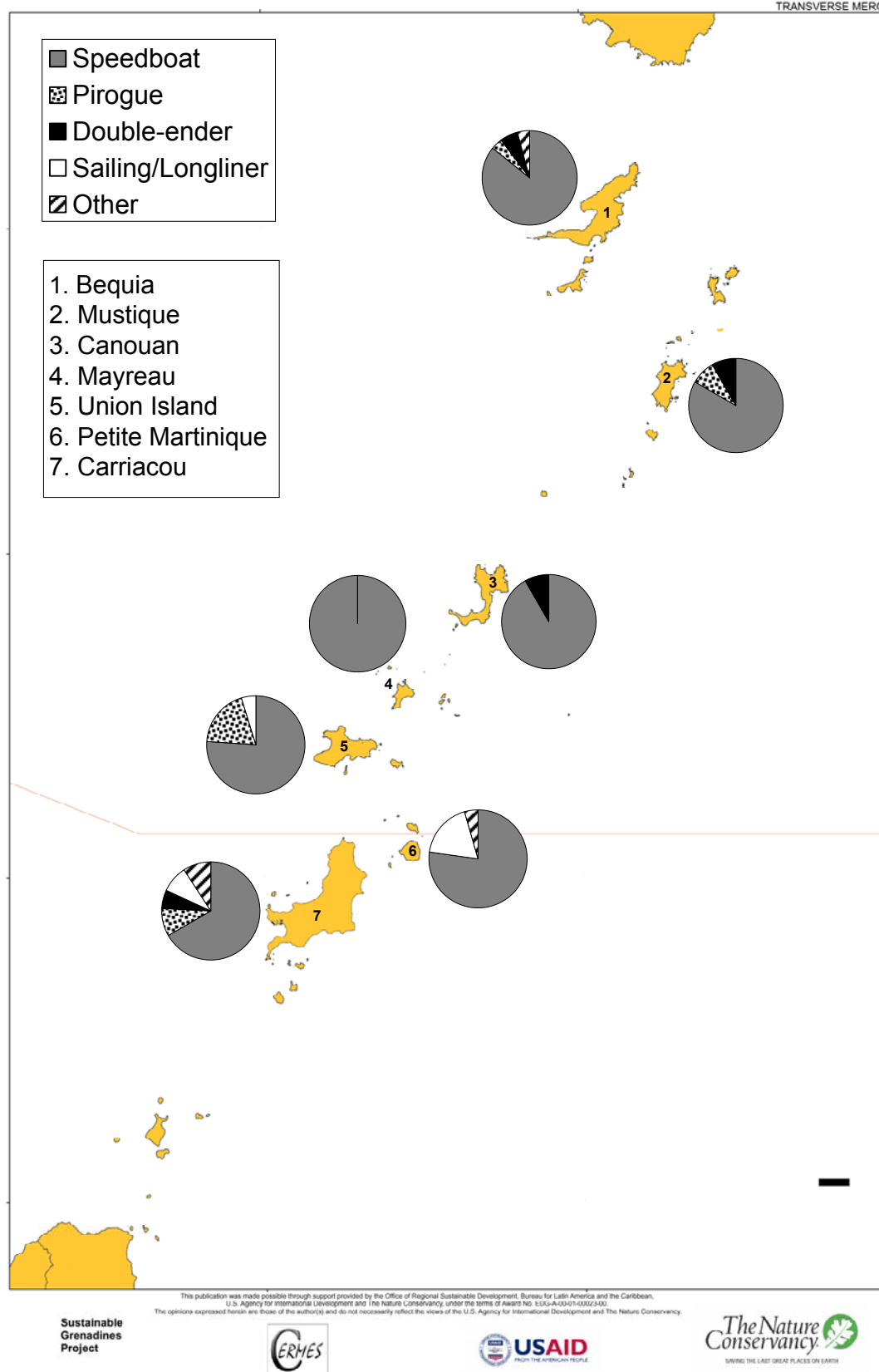


Figure 6.17 Map showing the distribution of boat types in each island surveyed in the Grenadines.

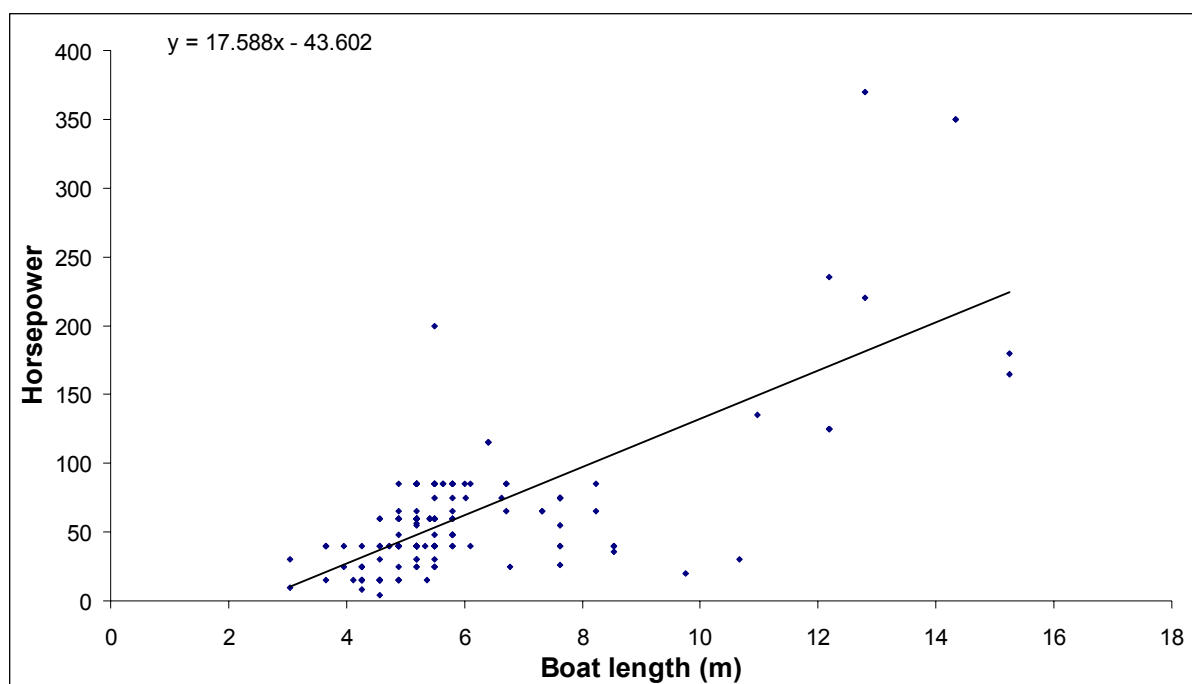


Figure 6.18 The relationship between boat length and engine horse power.

6.2.7 Types of fishing

In each island, handlining was the predominant type of fishing practiced, except for Petite Martinique where spear fishing was the most common (Figure 6.19). In terms of percent frequency within the age groups, handlining exhibits the same distribution as the overall age frequency distribution throughout the Grenadines (Figure 6.20). This illustrates that handlining is more frequently practiced among all the age groups. Previous studies have also shown that this fishing technique, along with trap fishing, are the two most common methods in the Grenadines (Chakalall *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. This unrepresentative distribution of the fishing types observed in Petite Martinique is likely 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 fishers between the ages of 20-40 years (Figure 6.20). 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 form of fishing that older fishers may be more familiar with. According to this initial survey and previous studies, spear fishing is more commonly practiced in the southern Grenadines (Chakalall *et al.* 1994).

Gill nets are not commonly used however this may be due to the confusion between gill nets and the illegal three panel trammel nets. Therefore the data may not give an accurate account of these types of fishing. Beach seine is not commonly practiced in many islands, but is focused mainly in Bequia, Carriacou and Mayreau.

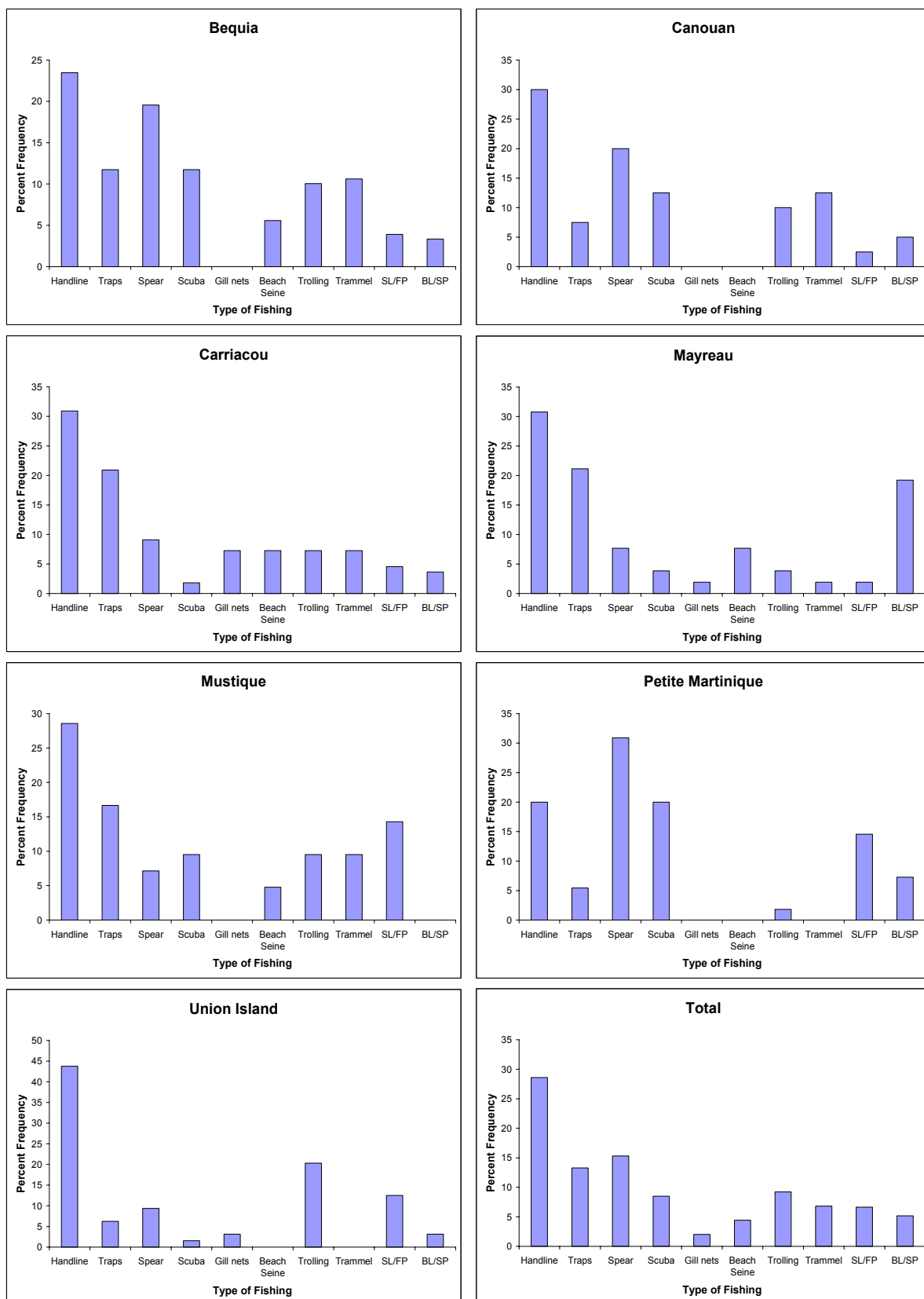


Figure 6.19 Percent frequency of each type of fishing by island (SL/FP: surface longlining/floating palang; BL/SP: bottom longlining/sinking palang)

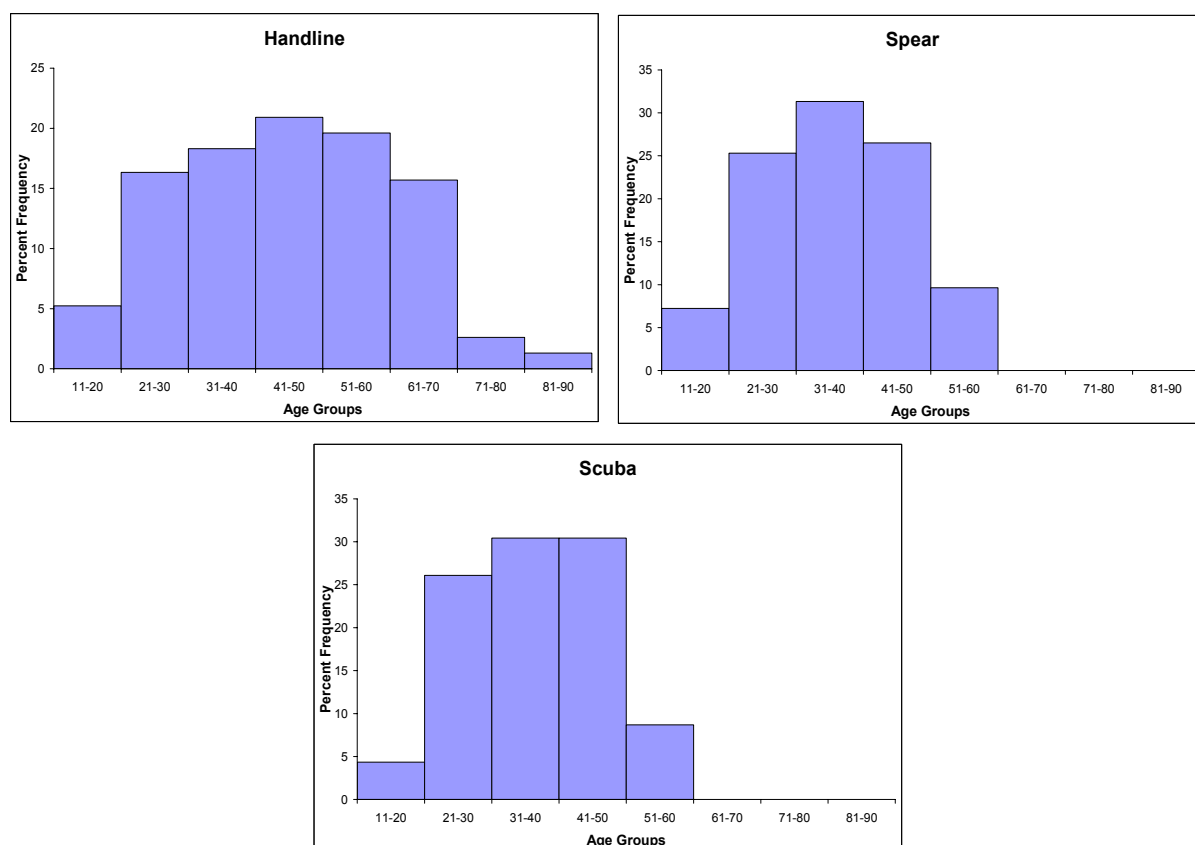


Figure 6.20 Percent frequency of type of fishing by age groups

6.2.8 Fish groups targeted

The majority of fishers interviewed throughout the Grenadines are targeting demersals (Figure 6.21) which are commonly caught using handline and spear, the two most popular fishing techniques in the islands. This finding supports the results of a study conducted in the 1993, where deep-water demersals were found to be the most important species group for 75% of Vincentian Grenadine fishers (Chakalall *et al.* 1994). According to the Grenada Grenadines Fisheries Officer, the Grenada government encouraged fishers from Carriacou and Petite Martinique to enter the longline fishery in order to reduce the fishing effort on the overexploited shallow-shelf 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 if this has reduced fishing pressure on the demersals and studies will have to be performed with regards to the status of these species.

Lobster is an important target species due to its high value per pound. From discussions with key informants within the St. Vincent Fisheries Division, it is likely that amount of lobster fishers found is an underestimate. This is because a large number of fishers enter the fishery only for this species and this study was not conducted during the appropriate season between September to April. Lobsters are located on the shallow shelf and the deep reef and thus are targeted using traps, gill nets and diving (free and scuba) with the use of a small wire noose (McConney 2003).

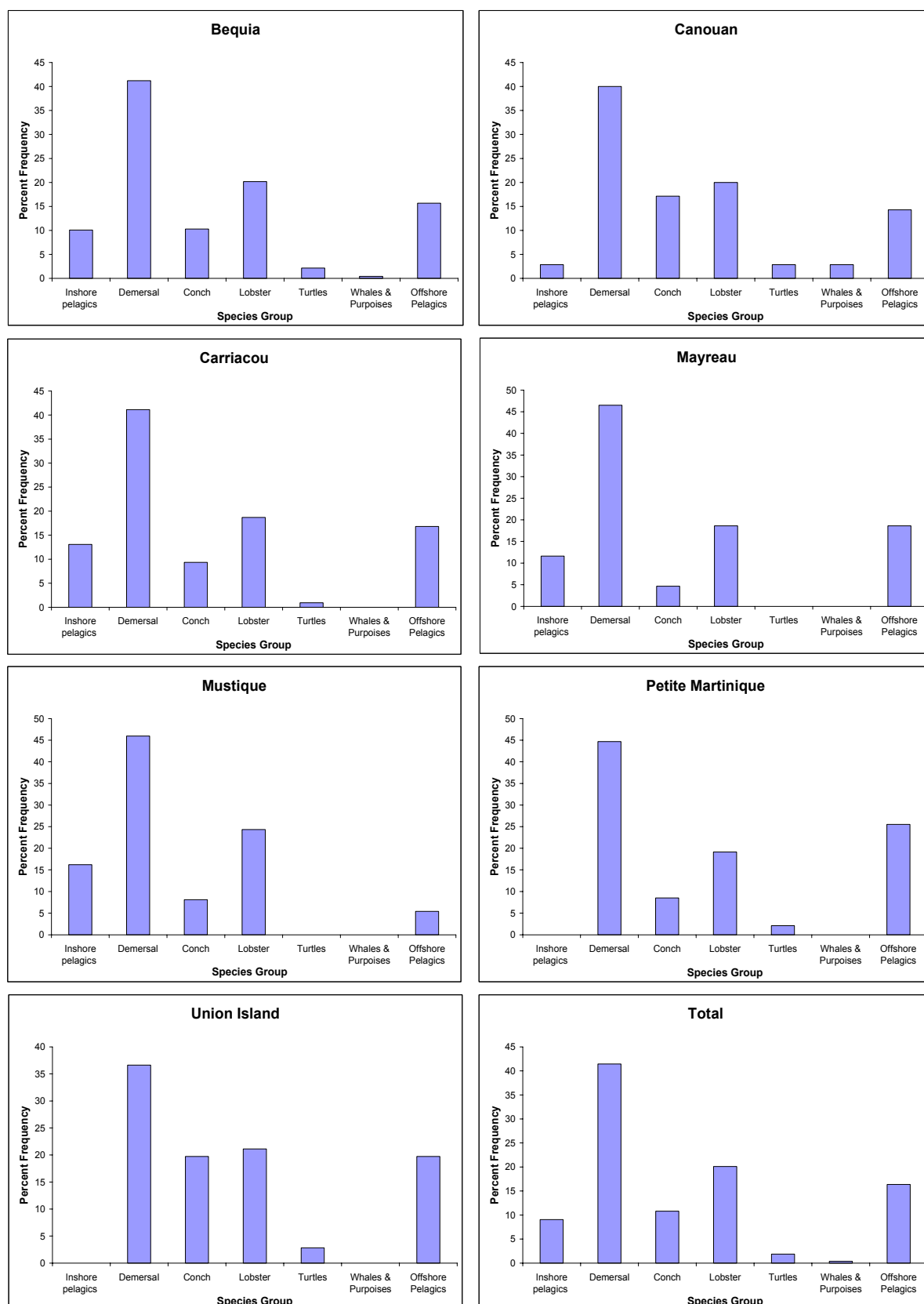


Figure 6.21 Bar graphs showing the proportion of fishers targeting each fish group, by island

Traps were encouraged by the St. Vincent Fisheries Division so as to reduce death and injury of scuba divers going beyond the recommend limits. One fisher had stated to the interviewer 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 for airfare, 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 the dive limits so as to increase their catch per dive and have done repeat dives to 45.7 m or 150 ft.

Offshore pelagics are more important to the southern Grenadines than the northern Grenadines. This again is due to the Grenadian government's encouragement of longline fishing. It was also noted that trolling for this fish group is dominated by older fishers where 43% are above the age of 50. However, as previously mentioned, it is believed that the proportion of fishers targeting these species are much higher than recorded due to the absence of longline fishers from the islands at the time of this study.

All of the fishers who target whales are from Bequia and they are the least pursued species in the Grenadines. Sea turtles were rarely reported to be 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 illegally.

6.2.9 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 Figure 6.22.

- Approximately half of the fishers operating from Bequia fish around the islands of Bequia, Petite Nevis, Isle de Quatre, Mustique, Savan, Pillories, Balliceaux and Batowia (Figure 6.23). These findings confirm previous results which determined that Bequians are the most mobile fishers of the Grenadines (Chakalall *et al.* 1994).
- The majority of the fishers operating out of Canouan (42%) remain close to that island whereas some (13%) venture towards Mayreau. This is logical as most of the fishers at the Canouan Fisheries complex are from Bequia.
- Approximately $\frac{3}{4}$ of the fishers operating out of Mustique, all of whom are from Bequia, fish near Mustique (Figure 6.24). 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 (Figure 6.25).
- Approximately half of the Mayreau fishermen stay near Mayreau and Canouan.
- Petite Martinique fishers remain close to home (34%) and also fish further south in Grenada (19%). This is due to the longline fishing that is practiced on this island.
- Union Island fishers exhibit quite an even distribution of fishing throughout the Grenadines, except for St. Vincent, with 26% fishing closer to Union Island.

Source of fishers

- The majority of fishers fishing near islands in the Eastern Caribbean (e.g. St. Lucia, Barbados, Martinique, etc) are from Union Island. This however may not be an accurate representation of the distribution of longliners but due to the interviewing of crew from one boat. It was difficult to interview the longline fishers from Petite

Martinique because they operate from Grenada and were therefore not on their home island at the time of this study's field survey.

- The majority of fishers in Grenadian waters operate out of the islands from their own country, Carriacou and Petite Martinique.
- There were only three fishermen encountered (two from Bequia and one from Petite Martinique) that fish around St. Vincent.
- Interestingly, the Tobago Cays are 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 the island to fish. This could have implications for the conservation efforts taking place within the Tobago Cays Marine Park.
- Carriacou, Canouan and Mustique, Savan, Pillories, Balliceau, Battowia and 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 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 for the longlining industry, few fishers are venturing beyond the Grenadine bank.

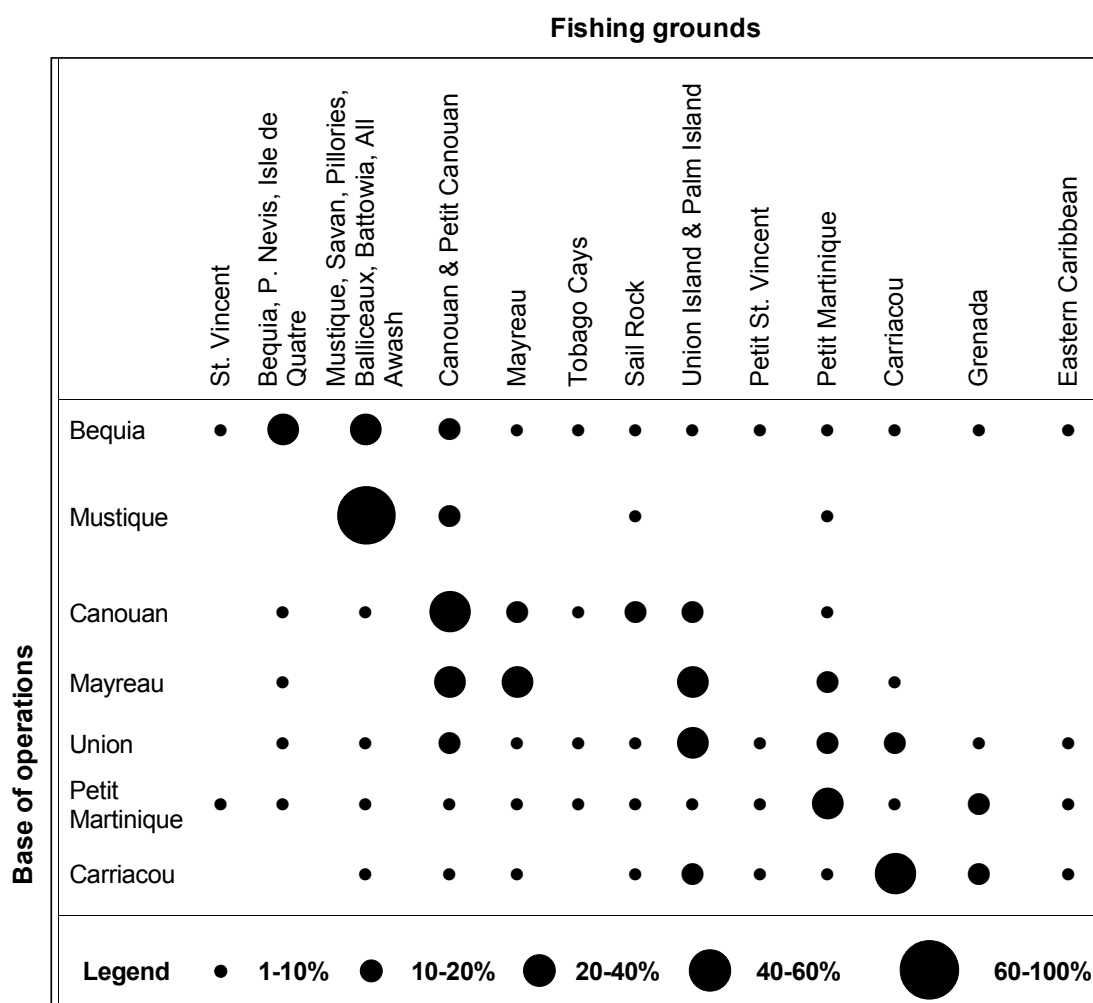
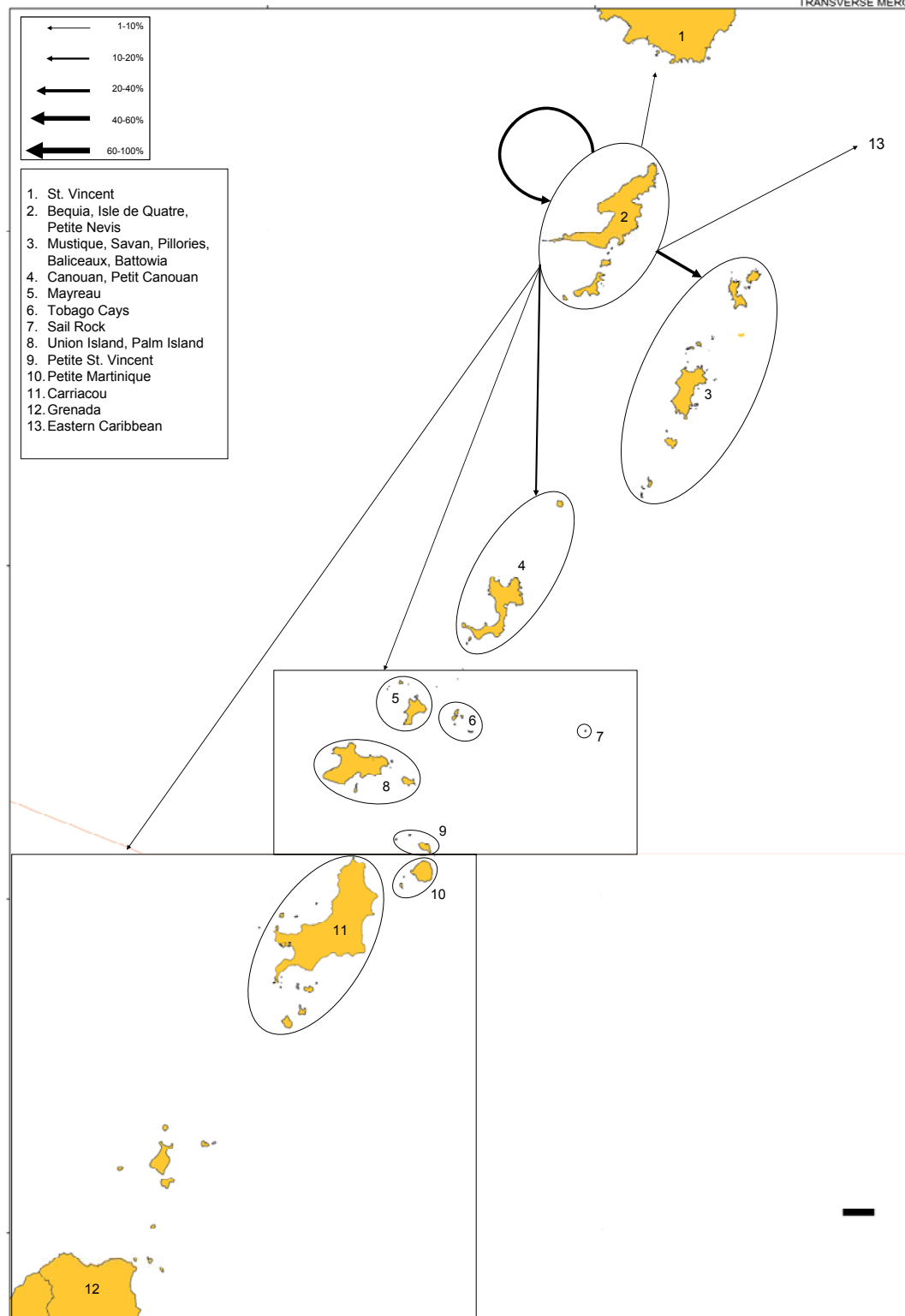


Figure 6.22 Matrix diagram showing the distribution of fishing locations of fishers from each island of operation.



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Figure 6.23 Map illustrating the location and intensity of fishing around the Grenadines, by fishers based in Bequia.

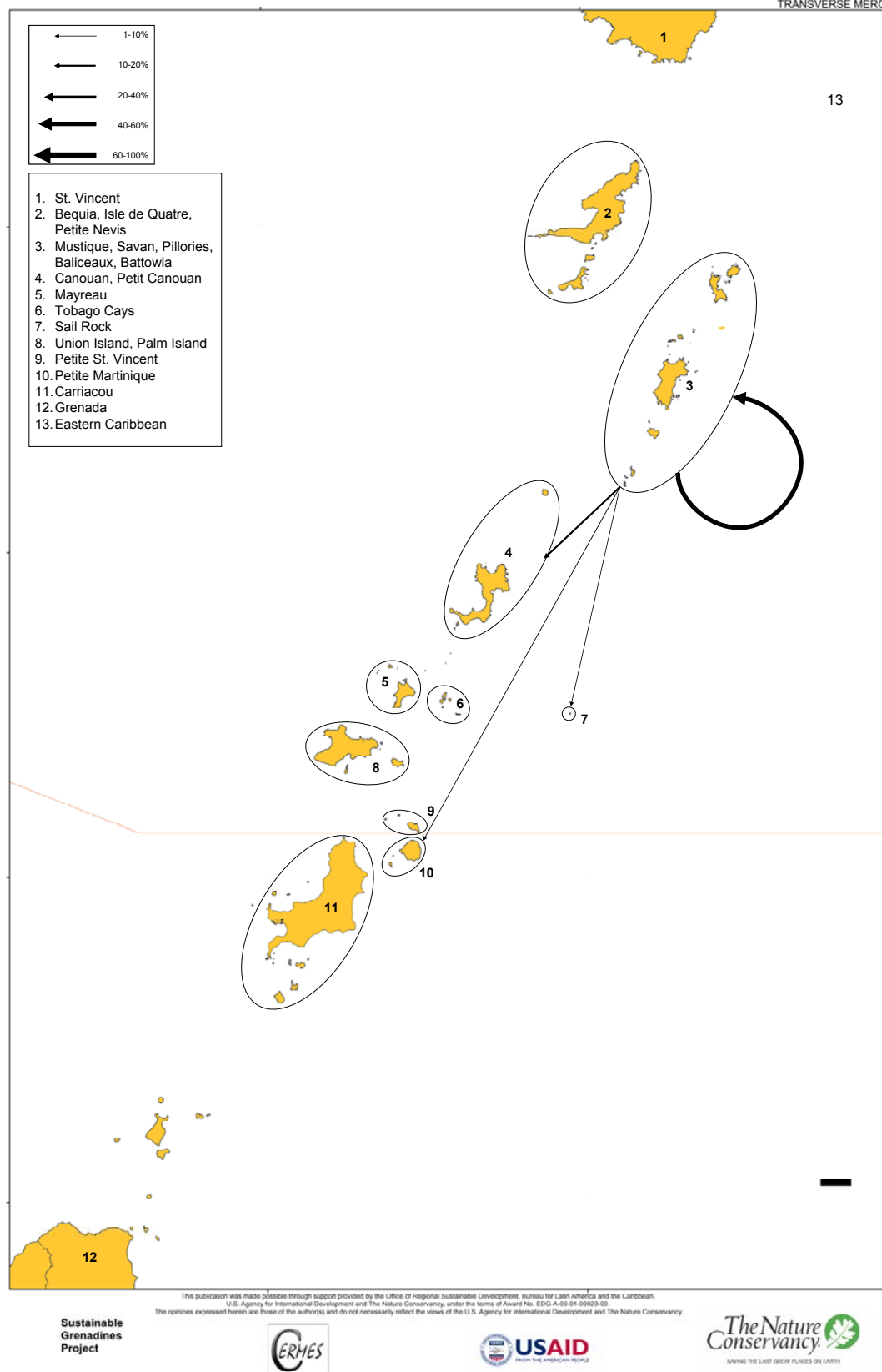


Figure 6.24 Map illustrating the location and intensity of fishing around the Grenadines, by fishers based in Mustique.

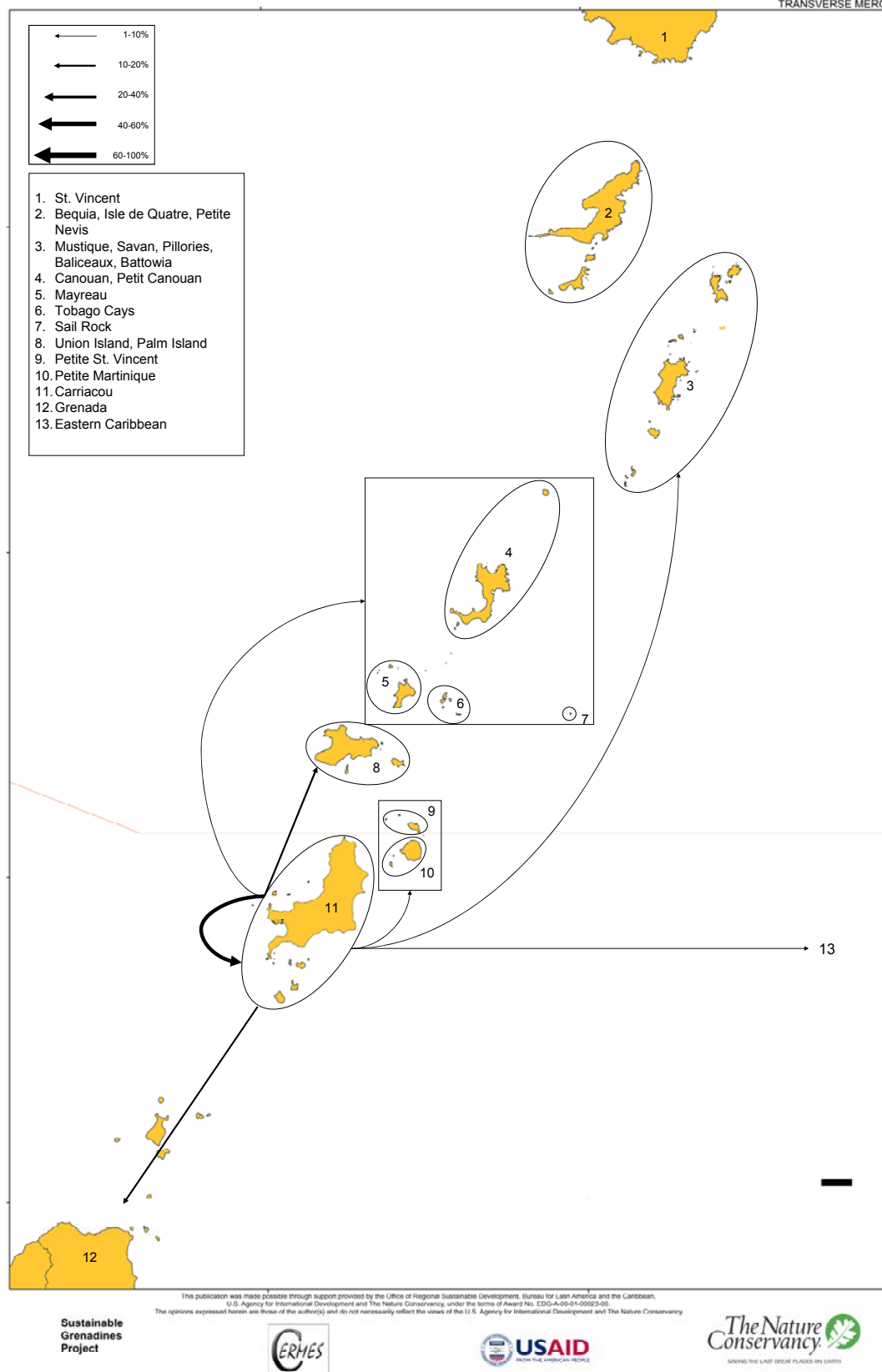


Figure 6.25 Map illustrating the location and intensity of fishing around the Grenadines, by fishers based in Carriacou.

6.3 In-depth livelihoods survey

6.3.1 Sampling structure

A total of 26 fishers were interviewed during the livelihoods analysis phase of this study. Discussions lasted approximately one hour and depending on the interviewee's willingness to share personal information, the conversations may have continued for an additional one or two hours. Table 6.2 below shows the distribution of fishers that were consulted in each island and Figure 6.26 illustrates the percentage that were interviewed both in the initial and in-depth surveys. It is clear that fishers surveyed throughout Phase II, were sampled in relative proportions to those encountered in Phase I.

Table 6.2 Sampling distribution of fishers interviewed in the Grenadines during the livelihoods analysis phase of this project.

Island	Number of respondents	% of respondents
Bequia	8	31
Mustique	3	12
Canouan	1	4
Mayreau	2	8
Union Island	3	12
Petite Martinique	3	12
Carriacou	6	23

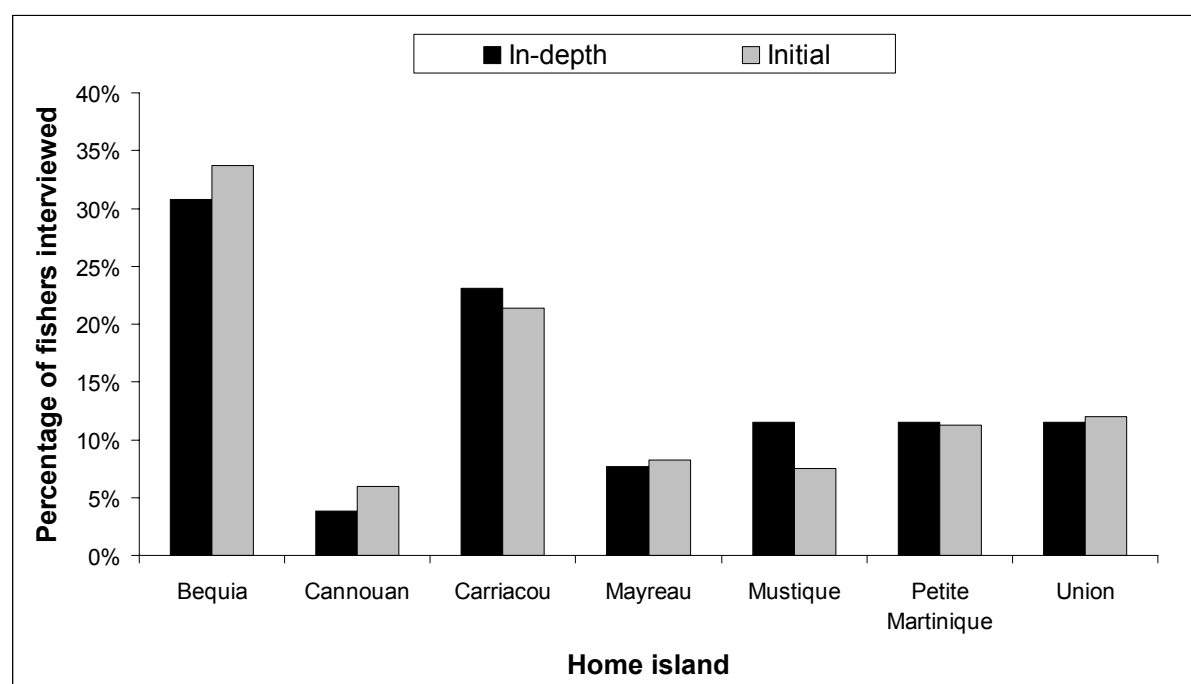


Figure 6.26 Graph showing the proportion of fishers interviewed in the Grenadines, during Phases I and II of this project.

6.3.2 Demographic information: Sex, age and ethnicity

All but one of the respondents in the in-depth survey are male. The single female fisher is originally from Grenada and has temporarily based herself in Union Island where she fishes full-time.

The average age is 46 years which is comparable to the overall mean age of 43 years found in the initial survey. Age groups between 21 to 90 years were surveyed, with only one fisher in the 81-90 age bracket.

Only two ethnic groups were recorded during the second in-depth phase of this study. Eighty five percent of the fishers interviewed were of African/negro/black descent, while the remaining 15% were mixed Caucasian, East Indian and/or African descent.

6.3.3 Boat ownership

The majority of fishers interviewed in the in-depth survey were boat owners (73%). The rationale behind sampling a greater number of boat owners as opposed to crew members is twofold: (1) they expressed greater motivation for participating in the study; (2) the initial survey showed that boat owners have a higher dependency on fishing. Consequently, 35% of fishers in the in-depth survey were boat owners and solely dependent on fishing, whereas only 8% were crew members that are solely dependent on fishing. Greater dependency may also be associated with greater knowledge and experience with the issues that surround this marine based industry. However, including crew members in the analysis was also relevant in order to gain a broader perspective of the livelihoods of both part-time and full-time fishers.

6.3.4 Vulnerability context

“The [v]ulnerability [c]ontext frames the external environment in which people exist (DFID 1999).” Individuals have little control over external factors such as price trends, seasonality of fish species, and the shocks brought on by natural disasters which have a great impact on the status of their livelihood assets. The following will discuss the seasonality associated with fishing in the Grenadines, the natural disasters such as hurricanes which impact fishing operations, insurance measures which may be used to reduce the vulnerability context and fishers’ perceptions of the threats to their livelihoods.

It was determined that demersals, conch, offshore pelagics and inshore pelagics are targeted throughout the year and lobsters are only caught during the designated season from September to April in the Grenadines. Two fishers interviewed in the in-depth survey, who are also water taxi operators, stated that they would fish between the months of May to October and depend on the tourist season for the rest of the year.

Before the approach of severe storms and hurricanes, boats are hauled as far up on land as is possible. Few houses and boats were damaged by Hurricanes Ivan and Emily and these were located mainly in the southern Grenadines. A couple fishers were forced to make roof repairs costing them approximately EC\$ 5,000 (US\$ 1,850) and EC\$ 10,000 (US\$ 3,700). One participant in the livelihoods analysis also had to replace an EC\$ 8,000 (US\$ 2,960) engine as a result of the storms.

An alarming finding from this livelihoods study was that 76% of the fishers do not have any form of insurance in order to reduce risk to their livelihoods. Only three of the six car owners have car insurance, and three persons have employment, house or life insurance.

The majority of Grenadine fishers interviewed in this livelihoods analysis (39%) stated that the only thing that would stop them from fishing is bad health or death (Figure 6.27). Bad weather (17%) and increases in expenses (21%) are also significant reasons for altering livelihoods from fishing. Few mentioned the lack of a market (10%) and reduction of fish abundance (3%) as factors that would force them out of the trade. Other answers included leaving the island or finding another means of earning an income.

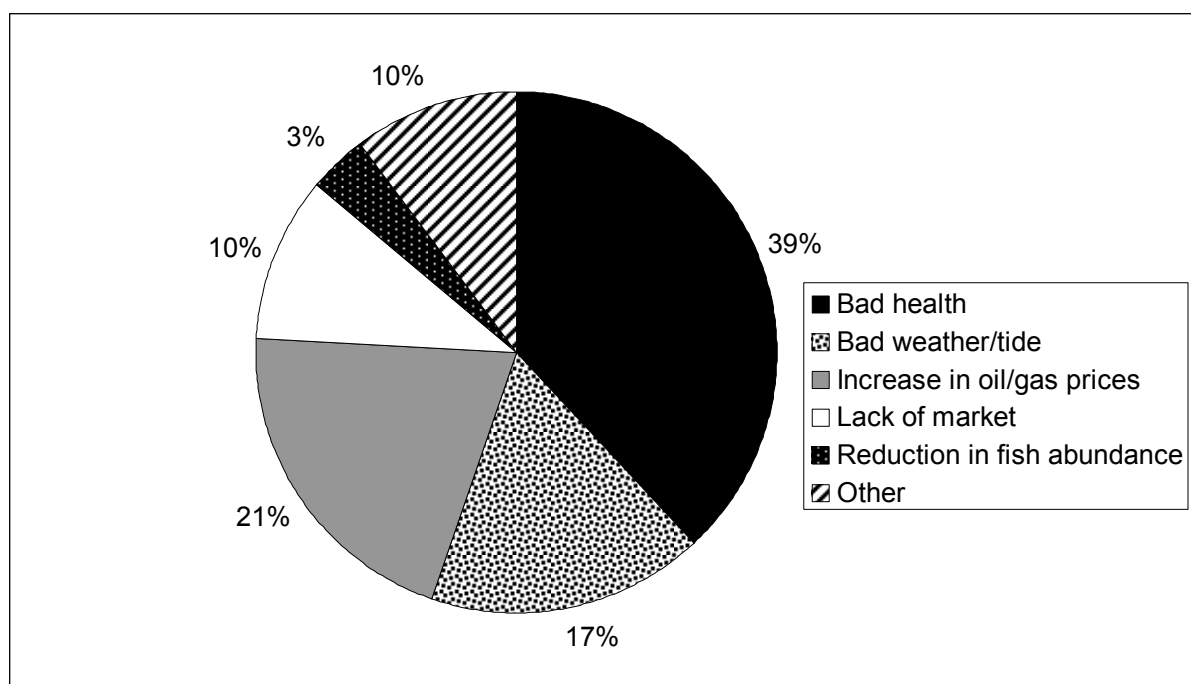


Figure 6.27 Bar chart showing the threats to fishing livelihoods in the Grenadines.

It is clear that these men and woman are very dedicated to their occupation as one of the major factors driving them away from fishing is their own inability to do so. External factors such as weather and expenses are also important however, as one fisher explained that if their costs continue to increase, they would have to raise the price of fish. This trickle down effect may reduce the availability of affordable fish and hence have serious implications for the local communities that the fishing industry supports. Another vulnerability faced by Grenadine fishers is their high dependence on the export market to Martinique for shallow-shelf demersal species. This also contributes toward increasing the fishing pressure on these already overexploited species.

6.3.5 Livelihood assets

Livelihood assets (human, social, natural, physical and financial capital) are required in order to achieve certain livelihood outcomes. Access to these assets is influenced by other elements of the sustainable livelihoods framework such as external factors, institutions and policies and even the complicated relationships between the assets themselves. Also, persons with greater assets tend to have more options and opportunities to switch between multiple strategies in order to sustain their livelihoods (DFID 1999).

Human capital

“Human capital represents the skills, knowledge, ability to do labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives (DFID 1999),” and is required in order to make use of the other four assets. The length of time spent fishing, intergenerational continuity of the trade, levels of education obtained, additional information and training required, religious beliefs, as well as marital status and household characteristics of fishers all contribute towards their human capital which are drawn upon by the individual.

Fishers that participated in the in-depth interviews have been fishing and gaining experience in this trade for an average of 22.8 years, therefore entrance into the Grenadine fishery takes place at an approximate, average age of 23 years. The average hours a week calculated for

these fishers was 36.5 hours, however due to the highly flexible nature of fishing, it was difficult for fishers to specify the average number of hours they would spend fishing in any given week. The time spent fishing is highly dependant on the weather and type of fishing that is practiced on that day or by a particular fisher. For example, a trap fisher may spend 3 hours a day or 12 to 18 hours a week fishing because that is the approximate time required for hauling and re-setting traps alone. Diving, whether free/scuba, can only be practiced for a few hours a day because of the physical exertions that limit this type of fishing. On the other extreme, a longline fisher may spend an entire week out at sea, however the exact number of hours actually spent fishing was not determined. Handlining and trolling would also require time and patience at sea. In addition, there are those fishers who take part in multiple types of fishing in the same day or week and estimated between 12 and 40 hours spent fishing in one week.

This livelihoods analysis of Grenadine fishers also aimed to assess the longevity associated with fishing, or the passing on of invaluable skills and local knowledge. It was discovered that the majority of fishers (58%) were taught the skills and biology of fishing primarily by family members. Others were taught by friends and older members of the community (19%), and there were those who claimed to have learned to fish on their own (23%) through observation and trial and error. Only four fishers expressed that they did not teach anyone their trade, while the remainder was split between assisting friends and family. This is logical because it is in a captain's best interest to ensure that his crew are capable and skilled fishers. Sixty-five percent of respondents have one or more family member who also fishes for their livelihood. These results are evidence of the continuation of fishing throughout the generations. The tradition has carried on through the years and it is likely that it will continue to do so in the future.

Table 6.3 below lists the three observed levels of education that fishers interviewed in Phase II have attained. It is obvious that post-primary education is lacking and this is strongly linked to the fact that islands such as Mustique, Canouan and Mayreau simply did not have access to this level of education until recently.

Table 6.3. Levels of education obtained by fishers in the Grenadines.

Level of Education	Number of Respondents	% of Respondents
Primary	20	77
Secondary	5	19
Technical college	1	4

More than half the Phase II respondents did not feel that they required any additional information with regards to biological characteristics of fish. Those who did respond positively believe that further information on spawning areas and habitats is needed, especially if those in the northern Grenadines plan to branch out into other types of fishing. As 85% of the respondents expressed, it is clear that fishers are very eager to expand their fishing activities by becoming trained in different types of fishing such as longlining. Despite the training and activity in longline fishing in Petite Martinique and Carriacou which was supported by the Grenadian government, fishers from these islands also requested training in longline fishing. A fisher from Bequia made an excellent comment regarding this phenomenon: "What's the point in getting this training if we do not have the right boats?" This presents a subject for further consideration where training may be wasted if fishers do not have the capacity to make efficient use of it.

An issue of possible concern according to the livelihoods interviews is the relatively low need for safety training expressed by the fishers (12%). This may not mean that they do not recognize the importance of safety, however perhaps programmes such as the Safety at Sea programme for water taxi operators should be expanded to include the fishers of the Grenadines in order to promote the practice and use of proper safety techniques. The remaining respondents (39%) were evenly distributed between requiring training in accounting/financing, local knowledge such as reading the tide, new technologies such as GPS, diving and even no additional training required.

Figure 6.28 below identifies Anglican as the dominant religion of fishers interviewed in the in-depth survey. This is closely followed by Roman Catholic and Pentecostal denominations.

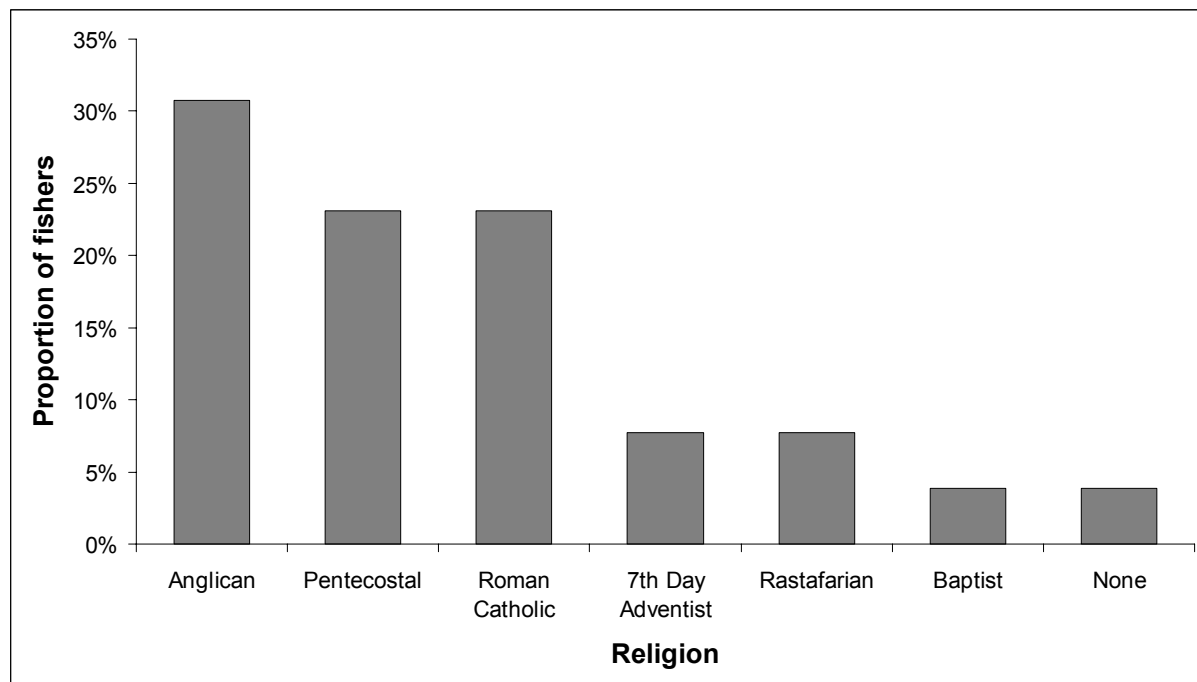


Figure 6.28 Bar chart showing religious denominations of fishers in the Grenadines.

The majority of fishers interviewed in Phase II were either married (34%) or single (34%). Common law relationships and divorce were next in line with 12% of respondents each while only two fishers were widowed (Figure 6.29). The number of children varied between participants. The average number of boys was 2.2 while the average number of girl children reported was 1.6.

Most of the fishers encountered in the in-depth survey live with other family members, such as wives, sons and daughters (62%), while the rest live on their own. Among those who live with family, the average number of people above the working age of 16 living in a household is two. Out of a total of 32 household members, the majority (56%) have a secondary education, while the remainder last attended primary school. This suggests that there has been an improvement in accessibility and attendance to post-primary schools among the children of fishers within the last few decades. An interesting finding was that most of the wives and mothers are housewives or involved in domestic work such as cooking and nursing. Also, almost 20% of the households have more than one fisher living within them and these were always the sons or fathers of fishers that were interviewed. This further supports the finding that fishing is passed on through the generations.

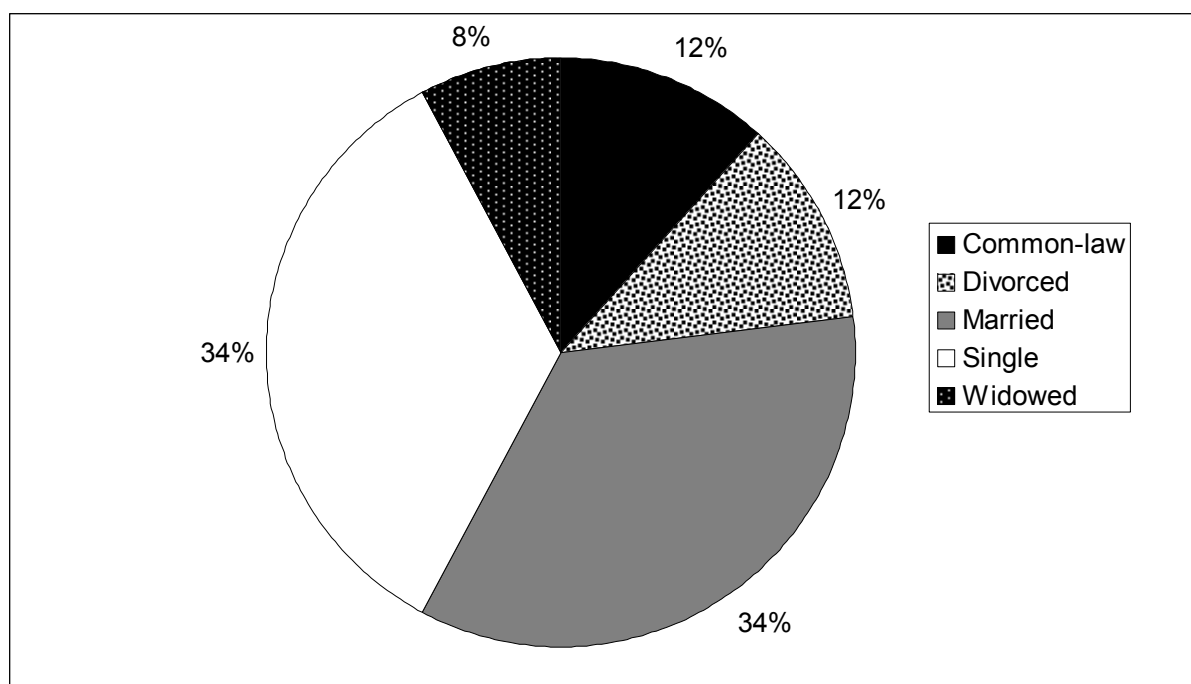


Figure 6.29 Pie chart showing the marital status of fishers in the Grenadines

Social capital

Although there is much debate surrounding the definition of social capital, in the context of livelihoods, it is referred to as the “social resources upon which people draw in pursuit of their livelihood objectives (DFID 1999).” Social networks are created from the community level to the household level, increasing the intensity of trust between individuals and thus reducing their costs of working together. The following will identify what activities Grenadine fishers engage in for enjoyment, what roles they play within their respective communities, the possible conflicts that may arise, and the potential for formal organization of this important resource user group.

The small-scale fishing which takes place in the Grenadines involves much effort, skill and physical endurance. Knowing what takes place at sea and throughout the fish sale process is only half the story, however. It is also important to attain knowledge of social and cultural behaviours of fishers by understanding what they do for recreation and entertainment. This information is relevant for several reasons and can be considered useful when planning to hold community meetings, future studies and/or workshops. Through the livelihoods interviews, it was discovered that at the end of the day, many fishers prefer to simply relax or enjoy a good “lime” whilst playing dominoes and cards. Some like to indulge in alcohol, television, music and attend social events in town. Only a couple mentioned sports activities and hobbies such as football, cycling and racing small sail boats as ways to make use of their spare time. A few even claimed that fishing was their enjoyment.

Community group involvement seemed rather scarce in this in-depth survey as only six fishers mentioned being actively involved in sports, games, community or environmental clubs. The two environmental organizations that a few fishers reported belonging to are Sand Watch in Bequia and the Carriacou Environmental Committee (CEC). They are both involved in cleaning and preserving the environment and the respondents expressed that they enjoy this aspect of their involvement.

Aside from the established community groups that function around goals and memberships, there are social norms which exist with or without organization that reflect on the

community. This livelihoods analysis aimed to determine the roles that fishers play in their communities by identifying how they interact and assist other fishers, friends and family. It was found that there is strong cohesion among fishers which promotes the sharing of bait, gas and fishing grounds; the lending of gear and equipment; giving advice, encouragement and assistance with maintenance, repairs, cleaning fish and hauling boats. This was particularly obvious in Paget Farm, Bequia where fishers and community members alike seem to be highly co-operative. Whereas the interaction between fishers is quite specific, many found it difficult to describe exactly how they assist friends and family. General answers were expected however as there are several ways a person can help another in need, while there are only so many ways that involve fishing. Nevertheless, many fishers were able to state that they assist their family and friends by providing free fish, helping around the house and giving financial support when they can.

Although 39% of the fishers that participated in Phase II of this study stated that there are no problems between them, conflicts, whether large or small in variety, are likely in many, if not all communities. Forty-two percent claimed that disagreements are the result of fishers stealing or damaging each others' gear. One must be sceptical especially with fish traps, however, as natural elements may also be the cause for the loss of equipment. Other interesting findings were that only three fishers stated that conflicts arose over fishing grounds and no one mentioned trans-boundary fishing between the St Vincent and the Grenadines and the Grenada regimes as an issue.

There were even fewer reported conflicts between fishers and other marine resource users such as water taxi operators (WTops) and recreational divers. Only 7 fishers (27%) pointed out concerns such as divers and tourists interfering with pots, the fact that foreign vessels are fishing illegally in their waters and of course issues surrounding maritime boundaries. One fisher from Union Island gave an example of conflict where WTops would purchase fish from the fishers and sell them at higher prices to the yachters. He claimed that this reflects badly on the fishermen and on tourism for the island as a whole, even though the water taxi operator is acting as a middleman to locate a market for the fish.

Despite the very strong cohesion and cooperation observed among fishers of the Grenadines, they are not yet formally organized into groups on any of the islands, with the exception of Petite Martinique. All except one fisher stated that if a co-operative or association did exist they would become a member and take part. The single dissident is from Petite Martinique and he argues that the only operational co-op in the Grenadines does not function properly, and no-one is willing to do the necessary work. The majority, however, believe that the fishers' co-op is a great idea and hope to realise the following benefits: an increase in government investment and financial support into fishing; the provision of duty-free equipment; a reduction in expenses such as gas prices in particular; the institution of a standard price for different varieties of fish; an increase in co-operation and information sharing between fishers themselves; and the support and organization of social events such as birthdays and friendly tournaments between fishers of the different islands. Fishers hope that organization would create one strong voice that can represent their best interests in the world of politics and resource management.

Natural capital

Quite simply, "[n]atural capital is the term used for the natural resource stocks, [in this case, fish] from which resource flows and services, [such as food provision], useful for livelihoods are derived (DFID 1999)." The influence of the vulnerability context on natural capital is great, as natural processes which may even be human induced, can destroy the stocks which comprise the natural capital. This section will identify the fish groups targeted by fishers, and

present their perceptions of stock abundance and issues and solutions surrounding the fishing industry.

As was discovered in Phase I, fishers surveyed in the livelihoods analysis also depend greatly on demersal fish species and lobster. This is clearly illustrated again in Figure 6.30 as all fishers targeted demersals and a large proportion (69%) catch lobsters as well. When asked to rank the fish groups in order of their importance 69% stated that demersals were their number one species, while the remaining 23% and 8% represent lobsters and offshore pelagics respectively.

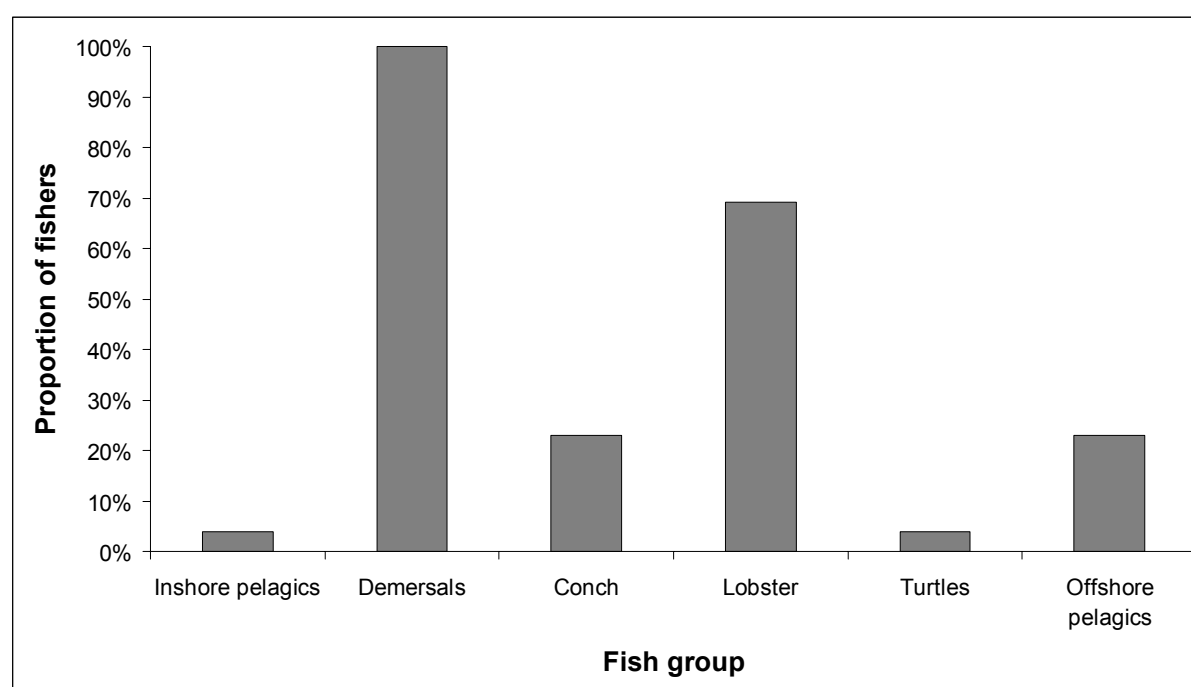


Figure 6.30 Bar graph showing the proportion of fishers that target each fish group

Table 6.4 below demonstrates the fishers' perception of the average abundance of fish groups 5 years ago and today, relative to 10 years ago. It is clear that there is a general downward trend in fish numbers according the fishers of the Grenadines. This is especially true for conch and turtle, however only one fisher targeted sea turtle.

Table 6.4. Fishers' perception of the average abundance of fish groups 5 years ago, and today (relative to 10 years ago).

Fish group	Abundance 5 years ago	Abundance today
Inshore pelagics	Same	Low
Demersals	Low	Low
Conch	Low	Very low
Lobster	Low	Low
Turtles	Low	Very low
Offshore pelagics	Low	Low

Fishers are an important source of information regarding the problems that surround fishing resources. In addition, they are in a position to suggest appropriate solutions to these issues. Table 6.5 summarizes the Grenadine fishers' concerns regarding their fishing livelihoods and their recommendations for solving or dealing with them.

Table 6.5 Issues and solutions recommended by fishers

Issues	Solutions
There has been a reduction in fish abundance over the years due to overfishing, degraded habitats and fishing in spawning areas. This increases a fisher's expenses as they have to travel further to fish.	Establishing protected areas, especially where habitats are destroyed and in areas of spawning aggregations, can help build back the stocks. Fishers and divers must be educated on the importance of having these no fish zones. It may then be possible to return to these areas to fish after stocks have recovered. Another suggestion is to ban the extraction of fish species that are critically low in abundance. In terms of compliance fishers call on the government for better enforcement, and hope that a co-op will also be of assistance.
Vendors and fish vessels take advantage of fishers by not paying for the half kg. As a result, fishers do not get their monies worth for the full weight of their catch.	A possible solution is for the government to step in and institute a standard price for fish, or play middleman by purchasing the fish and then selling them to vendors and exporters.
There is a lack of a market for fish sale and export in the St. Vincent Grenadines. This is due to the poor condition of the St. Vincent fish market which lost them their export license to the European Union (EU). This has led to an increased dependency on Grenada which still has their license with the EU.	Grenadine fishers all agree that it is the St. Vincent government's responsibility to regain the EU market. This can be achieved by ensuring that the physical market is always kept in proper condition and will therefore meet the standards and pass future inspections.
There is a lack of a stable market for fish in the Grenada Grenadines. Fishers claim that the trading vessels do not take all their fish and as a result they are left with rejects. The demand for fish fluctuates to the point where sometimes fishers can't supply enough fish, and other days they can't get the fish sold.	Yet again, fishers call for government assistance with this issue and believe that the authorities should purchase fish at a standard price, in order to ensure a regular and stable market for the fish.
The vast majority of fishers in the St. Vincent Grenadines have expressed their disappointment in the fact that there are no fishers' co-operatives to represent them.	Many fishers suggest that government can assist in this venture towards organization, but also recognise that it is up to the fishers themselves to come together in unity. Both must work together to form and support fishers' co-ops.
Fishers have also stated that there is a lack of reasonably priced fishing materials and safety equipment in the northern Grenadines.	The fishers believe that the formation of a co-op will encourage the government to bring in equipment at duty-free prices. They note that the co-op may even be able to set up financing and funding schemes for their members. It was also suggested that government can promote an increase in competition for suppliers of equipment and materials.
Fishers feel that there is a general lack of support from the government.	The solution to this problem, which was recommended by all who identified the issue, was the formation of a well functioning co-operative so that the fishers' views and concerns can be appropriately represented with one powerful voice.

An interesting finding was the great need expressed by fishers to have a properly functioning co-operative, rather than an association. The fact that there is no formal organization amongst them is an issue, and was identified as a solution to several problems. It is therefore obvious that fishers recognize the importance and benefits of a co-operative and hopefully this will eventually drive them towards establishing a group. It was also observed that fishers place a

lot of onus on the government to address their issues. When this does not happen, they claim that the authorities do not support them and hence they feel neglected. This issue can be addressed with further investigation into both sides of the story so that concerns can be expressed by the fishers, and reasons for particular action or inaction on the government's part, can be understood.

Physical capital

“Physical capital comprises the basic infrastructure and producer goods needed to support livelihoods (DFID 1999).” Infrastructure is usually free public goods and includes roads and vendor stalls, whereas private infrastructure such as an individual's home and its access to water and electricity are paid for privately (DFID 1999). Fishing equipment and facilities in particular, are very important to the success of fishers' operations, and without capital, productivity is reduced.

The majority (79%) of the 19 fishers who took part in the in-depth livelihoods survey and own a fishing vessel, purchased it with their own money, while the remaining 21% used loans from banks, family and friends or a combination of these with their personal funds. One fisher inherited his boat after his father died. As with boats, most fishers finance their engine purchases with their own money (56%), however a significant proportion (33%) said they required a bank loan. In fact, 86% of bank loans mentioned in this study were taken out for engines.

Fishing gear is also predominantly purchased with a fisher's own money or may be received as gifts. The majority of personal funding (40%) was for fishing gear and this is expected because fishing gear is a great deal cheaper than engines or boats, and must be replaced often. Fishers therefore prepare to have this money on hand for quick and easy purchase in order to cover their daily, weekly, or monthly operational costs. Emergency equipment such as radios, life jackets, cell phones and flares were owned by 15 (58%) fishers. Sources of funds include their own money (67%), gifts (13%) and one fisher acquired safety gear with the purchase of their boat.

The average value of the 19 fishing vessels is EC\$ 7,574 (US\$ 2,802) and engines have an average value of EC\$ 7,300 (US\$ 2,701). Fishing gear was valued at a much lower price of approximately EC\$ 1,501 (US\$ 555). It must be noted, however, that while fishers could easily recall the price of a boat or engine, it was difficult for them to specify the exact value of their gear. This is because gear includes the smallest element such as a hook, to something as large as a fish trap. These may have to be replaced on a weekly or monthly basis and fishers are not likely to keep records of every box of hooks or reel of twine that they purchase.

The average value of emergency or safety equipment was reported to be EC\$ 569 (US\$ 211). This low value can be attributed to the following factors: (1) few interviewees had safety or emergency equipment to begin with, (2) many had cell phones which cost approximately EC\$ 200 (US\$ 74) and (3) a couple expensive items like radios were given to the fishers as gifts so they did not know their true value.

Fishers are not only sensitive to the issues and the reduction in fish abundance, but they also have first-hand knowledge of the equipment, materials and facilities that are required to be efficient fishers. According to this in-depth survey, the majority of fishers appreciate the usefulness of technology such as GPS and fish finders (42%), and emergency or safety equipment (35%). Few (12%) mentioned needing specific fishing or dive gear. An interesting response from 31% of the fishers interviewed was that they saw no need for any additional gear. They reasoned that GPS in particular was not suitable for the types of boats that they

have and for the distances that they travel. This information is useful for any initiative to provide fishing gear and equipment for the fishers of the Grenadines. Further research can be conducted to determine exactly what is needed and what can actually be used appropriately. This will promote the efficient use of the gear and a successful outcome of such an initiative.

The facilities required by fishers in each island are described in Table 6.6. Most fishers in the Grenadines mentioned the need for gas, fish storage, selling and equipment locker facilities. However, some of these requests are being fulfilled, for example, a new fishing complex is being constructed near Hillsborough, Carriacou, and the Grenadian government has also funded the building of a ramp and locker facility in Petite Martinique.

Table 6.6. Table describing the facilities needed by fishers in each island.

Island	Facilities needed by fishers
Bequia (Paget Farm)	Gas station Repair facility nearby Additional space for hauling boats
Mustique	Jetty and secure ramp for hauling boats (boats are currently getting damaged by conch shells on the beach)
Canouan	Storage facility needs to operate properly Proper market or shelter to sell fish (not a table on the side of the road)
Mayreau	Ramp and small complex to sell ice and gas
Union Island	Gas station on the island (currently gas is purchased in PM or Canouan for EC\$ 9.50 / gallon and sold by variety stores at EC\$ 12 / gallon) Ramp in Ashton, along with locker facilities for gas tanks and gear
Petite Martinique	Gas station for fishermen Storage facility for fish
Carriacou	Gas station in Harvey Vale Proper ramp for hauling boats Locker facility for tanks and gear Building to sell and store fish

As Figure 6.31 illustrates, the majority of fishers interviewed in this livelihoods analysis own their own homes (54%) or live with family (27%). Very few rent their place of residence (15%) and only one fisher is staying with a friend. Of the fishers who own their homes, 79% financed this large investment with their personal funds while the remainder took out bank loans. Seventy-two percent of fishers own land upon which all have built their homes. An additional 22% own land where they own and operate a bar, and the remaining 17% have land for gardening and farming activities.

It was found in this in-depth survey that the majority of fisher homes are constructed of concrete walls, metal or galvanize roofs, and either wooden or concrete flooring (Figure 6.32).

When examining the material style of life of Grenadine fishers, it was discovered that the majority of households (>60% across the board) have electricity and running water (Figure 6.33). It was not specified if the water was piped or stored in tanks, but field observation can confirm that most homes collect rainwater from their roofs and store it in tanks. Common household appliances such as televisions, fridges, stoves, stereos, DVD and video players were also found in most homes. Half the households were fitted with in-door toilets while 54% use out-door facilities which are still used because of the limited availability of water in the Grenadines. This value is greater than 100% because two households actually had both

in-door and out-door toilets. Only six households (23%) owned vehicles and all of these were located in the bigger islands of Bequia and Carriacou. Only two persons mentioned having computers and lastly, a little over 20% of households have washing/drying machines because the majority of people prefer to hand-wash and hang-dry their clothes. This not only conserves water, but electricity also.

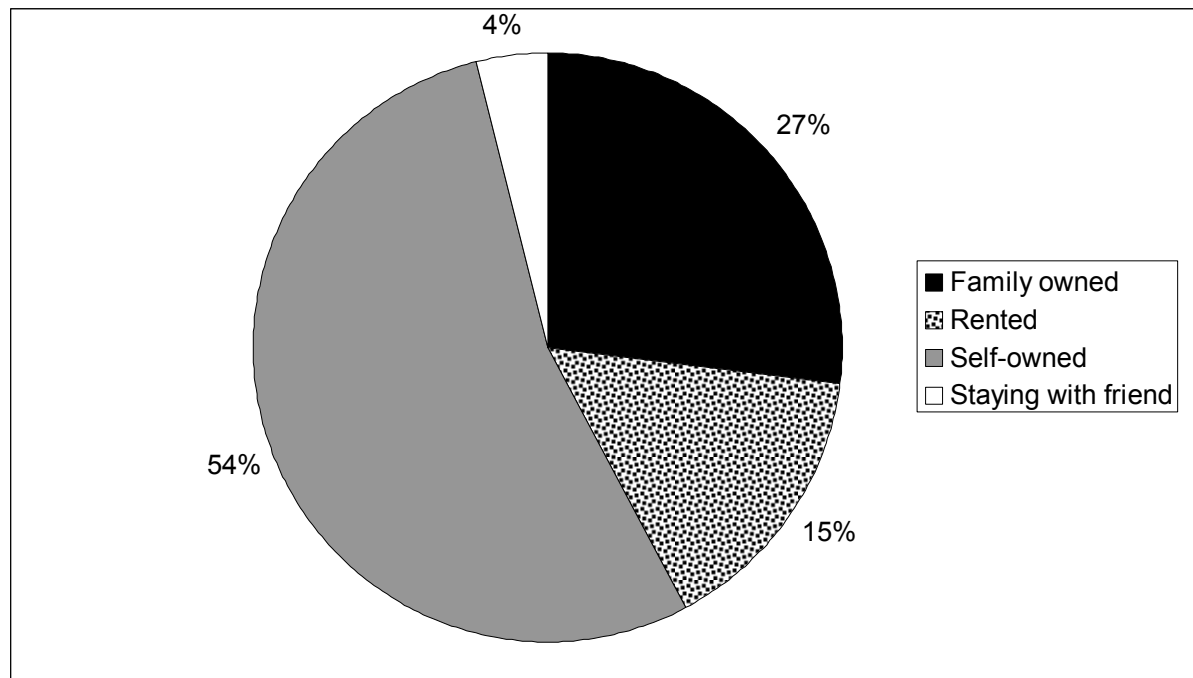


Figure 6.31 Pie chart showing fishers' accommodation situation in the Grenadines

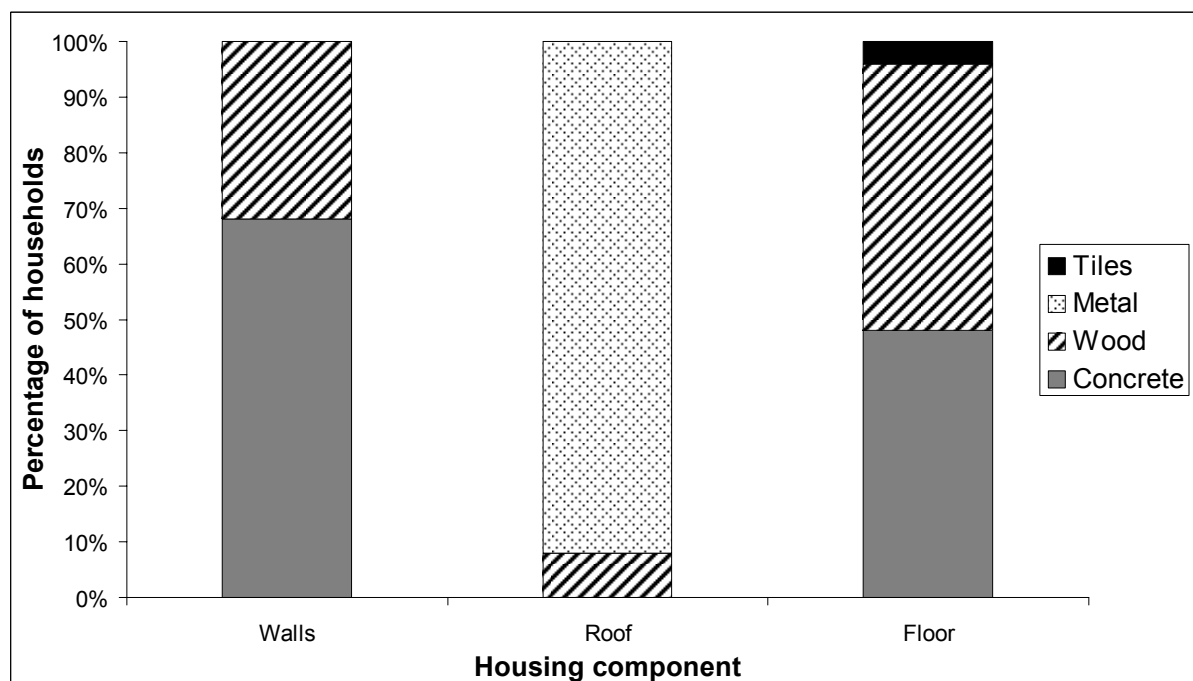


Figure 6.32 Bar graph showing the material make-up of fishers' households in the Grenadines

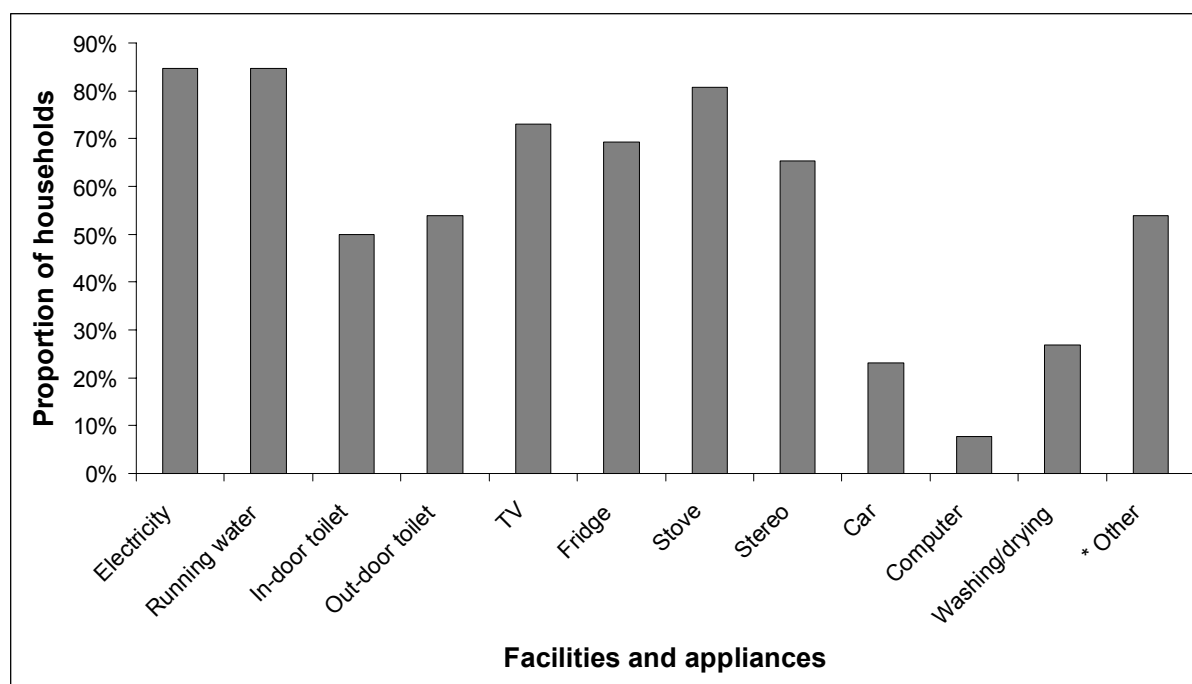


Figure 6.33 Bar graph showing the proportion of fishers' households with certain facilities and appliances in the Grenadines (* Other represents DVD, video players and Playstation)

Financial capital

The last livelihood asset to be covered, financial capital “denotes the financial resources that people use to achieve their livelihood objectives (DFID 1999).” Sources of funds are primarily regular flows from income, and also stocks which are available through saving. Money is a very flexible and influential resource because it can be converted into other forms of capital (DFID 1999). The following section will describe the financial picture of Grenadine fishers. This includes their catch earnings, how they divide up the boat income amongst crew, who their customers are, what their expenses amount to and how they save money.

One of the trials associated with fishing for a livelihood is that supply of and demand for fish is unstable. Fishers do not have a set salary; they earn based on their catch and expenses. Sometimes a profit is earned and other times the catch earnings do not cover their operational costs and result in a loss. One of the most difficult questions in this livelihoods analysis was related to the monetary value of a fisher’s weekly catch. Some could only state what they would make on a “good day” and maintained that on a “bad day” they would simply make nothing. Nevertheless, a range of EC\$ 90-5,000 (US\$ 33-1,850) was determined, and an average of EC\$ 944 (US\$ 349) was calculated as the weekly catch earnings for the respondents of this survey. For a fisher that fishes six days a week, his annual catch is approximately EC\$ 49,000 (US\$ 18,130).

According to Espuet (1992) uncovering a fisher’s true profits or earnings is a complex task because it is not as easy as “Sales – Costs = Profit.” Fishers can place a dollar value on their expenses and sales as items such as gas, oil and fish are paid for on the spot. However, it is difficult to value or put a price tag on the work or labour that is fishing. This, on top of the fact that fishers do not have a fixed salary, makes it difficult to determine exactly how much money was put into the operation in order to calculate the profits. It is very likely that the responses to this question were either overestimated to impress the interviewer, or underestimated for fear of taxation. Examples of questionable responses were from Carriacou where one fisher stated that he earned between EC\$ 90-100 / week (US\$ 33-37 / week), while

the fisher who works with him stated an average EC\$ 550 / week (US\$ 204 / week). In this case, the crew member is making a considerable amount more than the boat owner which is unlikely.

The division of catch income from fishing in the Grenadines follows a share system that may vary depending on the owner of the boat. After the costs for oil and gas, etc. are taken out, the remainder is divided into a combination of 1, 2, and 4, or 3 and 4 as indicated in Table 6.7. Seiners and pot fishers usually take out half of the earnings for the equipment, and then divide the remaining half between the boat, engine and crew.

Table 6.7 Share system for catch earnings in the Grenadines

Item	Number of shares
1. Boat	1 share
2. Engine	1 share or ½ share
3. Boat + Engine	1 share
4. Crew	1 share each

The customers for fish in the Grenadines have been categorized into groups (Table 6.8). Prices also vary depending on the customer and time of year. Demersals are mostly sold ashore to locals and vendors for EC\$ 6-7 / lb (US\$ 2-3 / lb) and at sea to the purchasing vessels seen in Bequia, Carriacou and Petite Martinique for EC\$ 4-4.50 / lb (US\$ 1-2 / lb). The vessels then clean the already gutted fish and freeze them for export. It is not clear why the vessels pay such a low price, however fishers continue to supply them because they are convenient and reliable buyers. Hotels and restaurants are also consistent buyers of demersals and purchase the fish at EC\$ 6-7 / lb (US\$ 2-3 / lb).

Table 6.8. Table showing the proportion of fish sold to the various customers in the Grenadines (* represents sales to locals on shore).

Fish group	Customers (% of fish)						
	*Shore	Restaurants	Hotels	Vessels	Export companies	Tourists	Government
Demersals	35	14	12	35	0	4	0
Lobster	4	32	25	4	21	7	7
Conch	37	27	27	0	9	0	0
Offshore pelagics	31	31	31	0	7	0	0
Inshore pelagics	100	0	0	0	0	0	0

Lobster is predominantly sold to restaurants and hotels at a price range between EC\$ 7-16 / lb (US\$ 3-6 / lb). Export companies also take a large portion and pay between EC\$ 7-15 / lb (US\$ 3-6 / lb). The value of lobster depends on the time of year as early on in the season the price is low, then later increases as the lobster becomes scarce.

Conch is mostly a local delicacy and is sold to some restaurants and hotels at the same price as demersals or EC\$ 4-5 / conch (US\$ 1-2 / conch). Offshore pelagics are evenly distributed between locals and hotels and restaurants for EC\$ 6-7 / lb (US\$ 2-3 / lb). Some go to the exporters for the same price. Only one fisher who targets inshore pelagics was interviewed and he sold all his catch to the local market for EC\$ 4 / lb (US\$ 1 / lb).

Although expenditures are “easier” than earnings to quantify they still vary for fishers of this in-depth survey based on the type of fishing practiced, the time spent fishing, the distance travelled to fish and the type of boat and engine used. Table 6.9 breaks down the average

quantities and costs of oil, gas, ice, bait and food that are used per fishing trip. Cost information obtained from the longline fisher was reported separately to avoid overestimating the average costs of small-scale fishers.

Table 6.9. Approximate costs per fishing trip in the Grenadines.

Type of fishing	Item	Price range (EC\$)	Average quantity per trip	Average cost per trip (EC\$)
Handline, tow, spear, trap, palang	Oil	\$11-12 / bottle	1.5 bottles / 24 oz	\$16.87
	Gas	\$9.50-12 / gallon	1.5 tanks / 9 gallons	\$92.13
	Ice	n/a	1 bag / 5 blocks / 20 lbs	\$10.83
	Bait	n/a	1 bucket / crate	\$68.33
	Food	n/a	Varies	\$12.50
Total				\$200.67
Longline	Oil	\$150 / bucket	2 buckets / 20 gallons	\$300.00
	Diesel	\$7 / gallon	120 gallons	\$1000.00
	Ice	\$0.15 / lb	3000lbs	\$450.00
	Bait	\$2.50 / lb	700lbs	\$1750.00
	Food	n/a	Varies	\$400.00
Total				\$3900.00

Note that fishers who use more than one tank of gas were from Bequia, Union and Mayreau. Carriacou fishers interviewed in this in-depth survey remained closer to their home island as was shown in the initial survey, therefore they use less gas. Quantities of ice, bait and food vary because: (1) not all fishers require ice for their short trips; (2) a lot of them catch their own bait, or sometimes do not buy bait; and (3) some bring food such as sandwiches from home, or do not take food on trips. Those that did use ice however, were from the southern Grenadines, which suggests that either regulations or distance travelled to fish demands such preparations of the fish. Results show that the approximate average cost per trip for a small-scale fisher is EC\$ 200 (US\$ 74) and EC\$ 3,900 (US\$ 1,443) for longline fishers. The approximate yearly costs for a fisher that fishes 6 days a week is therefore EC\$ 62,600 (US\$ 23,162).

Yearly maintenance costs were also difficult for the fishers of this livelihoods analysis to quantify. This is because, with the exception of painting, maintenance on the engine and boat occur on an “as needed” basis, and fishers do not keep records of what was used to get the job done. On top of this, most maintenance is done by the fisher therefore he would not often have to pay for labour.

With engines, for example, most respondents stated that their engine was new and so far, have had no problems with it. A range between EC\$ 200-1,200 (US\$ 74-444) a year was determined for cleaning and taking care of the engine. One fisher stated that it costs him EC\$ 300-400 (US\$ 111-148) to service his engine every six months.

Painting costs vary depending on the size of the boat and the quality of paint that is used. Epoxy and marine paint are the most expensive, and some fishers also make use of regular and cheaper oil paint. The average yearly cost for painting a boat was therefore EC\$ 599 (US\$ 222).

Fishers use fibreglass in order to repair damage to their boats. First, epoxy (EC\$ 280 / gallon; US\$ 104 / gallon) is mixed with sawdust to form a putty. Then the fibreglass cloth (EC\$ 20 /

yard; US\$ 7 / yard) is used to cover the first layer of putty. Finally, fibreglass liquid (EC\$ 85 / quarter gallon; US\$ 31 / quarter gallon) is used to stick and harden. Quantities of each will depend on the damage therefore a yearly average was not attained. One fisher was able to approximate EC\$ 1,000 (US\$ 370) on re-fibreglassing his boat every year. The yearly maintenance costs for a boat owner are therefore approximately EC\$ 1,949 (US\$ 721).

Total expenditures for fishers interviewed in the in-depth survey amount to approximately EC\$ 64,557 (US\$ 23,886) and Table 6.10 summarizes the yearly finances of a boat owner who fishes 6 days a week. The EC\$ 15,476 (US\$ 5,726) loss is a very gross estimation however, and was calculated out of curiosity.

Table 6.10. Summary table for financial status of Grenadine fishers (boat owners) who fish 6 days a week.

	Value (EC\$)
Average and approximate annual catch	\$49,080.72
Average and approximate yearly expenditures	\$64,556.89
Average and approximate loss	-\$15,476.17

All fishers interviewed in this livelihoods analysis save some of their income, mostly in bank accounts, although a couple did keep it at home. Reasons for saving were mainly for emergency, children, boat maintenance, and for reserve in case fishing does not make much.

The majority of fishers (78%) stated that other members of their household contribute towards household income and help with bill payments, etc. In all, except two cases, the fisher was the primary provider for his family.

6.3.6 Livelihood strategies

According to DFID, a livelihood strategy is “the overarching term used to denote the range and combinations of activities and choices that people make in order to achieve their livelihood goals (DFID 1999).” It is a combination of various activities that are used to meet various needs and shows a positive correlation and reinforcing relationship with livelihood assets (DFID 1999). In order to understand the strategies employed by fishers in the Grenadines to sustain their livelihoods and that of their families, this study aimed to determine why fishing is chosen as an occupation and what other activities are used to supplement fishing incomes.

Approximately 85% of the fishers interviewed in Phase II stated that fishing was their main occupation. The remaining four identified the following as their primary occupations: farming, gardening, bar owner/operator and construction worker. Notably these four respondents and their professions are all from Carriacou.

In establishing the reasons why the full-time fishers in this study chose fishing as a livelihood strategy, it was first important to determine what occupations current fishers of the Grenadines were previously engaged in. These are grouped into the same categories that were used in the initial survey (Table 6.11). It is clear that skilled labour, construction in particular, was the most common income earning activity before they began to fish for a living (Table 6.11). This is similar to Phase I findings where, aside from fishing, skilled labour was the dominant occupation. A large percentage of fishers was also previously employed in the maritime and trade industries (35%) whereas only 23% went straight to fishing. Therefore, more than half the respondents were and continue to depend on marine resources and some relied on fishing as their first means of earning an income. Four fishers indicated that tourism, bus driving, working in a store and gardening were their occupations before they turned to fishing.

Table 6.11. Table showing previous occupations of fishers before they began to fish for a livelihood (* Other represents bus driving, working in a store and gardening).

Occupation	Number of Responses	% of Responses
Skilled labour	11	42
Tourism	1	4
Maritime and trade	9	35
None (straight to fishing)	6	23
* Other	3	12

To understand fishing in the Grenadines it is important to understand why fishers chose fishing as a livelihood. Regardless of age and previous occupations, the majority of Phase II participants give a very simple answer to this question: “I enjoy it.” The second most common response is that there are no other options or means of earning an income on the tiny islands of the Grenadines. This is a significant finding and further research of the general population is needed to support the statement. If the fishers’ perception is true then why have the respective governments not put greater effort into (1) providing more employment opportunities for their citizens, or (2) increasing their direct investment in fisheries through training, support and proper management. Other fishers stated that they turned to fishing either because a previous job got slow, they prefer to be self-employed, or they saw more money in fishing.

Forty-two percent of fishers interviewed in Phase II are 100% dependant on fishing as a source of earning an annual income. Another 42% earn half or more of their income from fishing, leaving only 15% that makes most of their income from other occupations such as owning/operating a bar, construction, or farming. Once again it was found that more crew members (75%) have other main jobs, while a large percentage of boat owners (50%) are solely dependent on fishing. Also, half of the respondents who considered fishing as their primary occupation stated that they are in fact solely dependent on the industry.

Construction is the most popular secondary occupation for fishers in the Grenadines and the majority of those who partake in this labourous activity do so when fishing is slow. Others believe that fishing and construction are the only options for both young and adult males in the islands.

7 CONCLUSIONS

7.1 Vulnerability context

Grenadine fishers did not seem to experience much seasonality associated with their operations. This is of course with the exception of fishers who target only lobster, and those who are involved in the tourism sector primarily through water taxiing. The shocks to fishing resources caused by natural disasters that have occurred within recent memory were mainly concentrated in the southern Grenadines due to Hurricanes Ivan and Emily, however, the threat is there each year. The men found that their inability to fish was the greatest threat to their fishing livelihoods, while external factors such as oil/gas prices and market availability also increase their vulnerability. Insurance such as life, house or car insurance are examples of ways to cope with this vulnerability however few fishers invested in reducing their future risks.

7.2 Livelihood assets and strategies

Both human and social capital maintained by fishers in the Grenadines are prominent due to the traditional nature of fishing, and the strong cohesion that is observed and reported within the communities and amongst themselves, despite the lack of formal organization. Financial

capital is limited due to high expenses and poor access to credit. There is also need for new and enhanced physical capital such as fishing facilities and boat ramps. Natural capital i.e. the abundance of fish stocks (shallow-shelf demersals) Grenadine fishers are most reliant upon is on the decline. There is potential however, to branch off into the deep-slope demersal and offshore pelagics fisheries which are not considered to be overexploited. Knowledge of the assets that are already available to fishers can help design and measure the effectiveness of appropriate support programmes. The livelihood assets which fishers of the Grenadines have achieved are summarized in Table 7.1 and seem to be in balance with each other with certain strengths (+) and weaknesses (-) working for and against their livelihoods.

Table 7.1. Table summarizing the livelihood assets of Grenadine fishers (+ represents strengths; - represents weaknesses).

Livelihood Assets	Categories	Status
Human Capital	Traditional knowledge and skills	+
	Post-secondary education	-
	Training in advanced fishing techniques	+/-
Social Capital	Co-operation between fishers and other community members	+
	Conflicts between fishers and other marine resource users	+/-
	Formal organization among fishers	-
Natural Capital	Deep-slope demersals and offshore pelagics fisheries	+
	Shallow-shelf demersals, lobster and conch fisheries	-
Physical Capital	Standard of living	+
	Ownership and financing of own gear and equipment	+
	Additional gear, equipment and facility requirements (safety, GPS, longline vessels, storage and locker facilities)	-
Financial Capital	Saving money	+
	Contribution towards household income	+
	Operational costs (per trip and maintenance)	-
	Capital for investing in physical capital	-

Although fishers of the Grenadines were and are significantly dependent on marine resources this study suggests that there is adaptability as fishers, the younger ones in particular, seek out alternative occupations in order to sustain their livelihoods. Fishing for a livelihood has traditional, cultural, and economic implications, however and this enjoyable, yet strenuous activity will likely continue for generations to come.

7.3 Recommendations

Fishery management in the Grenadines is difficult because there are several islands, cultures, traditions, histories, fish species, fishing techniques and market complexities that are involved. The following are a few general suggestions that may be applied by the relevant authorities to assist in developing a management plan for the fishery located on the Grenada Bank.

- Reduce vulnerability of fishers through the provision of insurance and accessible financial assistance.
- Reduce stress on shallow shelf demersals by diverting fishing efforts towards deep-slope demersals and offshore pelagics.
- Institute appropriate and sustainable management measures for deep-slope demersals and offshore pelagics to ensure sustainability.
- Reduce dependency on EU market for demersals by seeking out other regional and international markets to supplement trade and act as a back-up.
- Provide education and training for fishers in organization, management, conservation and alternative fishing methods such as longlining.
- Assess fishers' requirements for gear and facilities before issuing support in these areas to ensure their efficient use.
- Provide assistance with establishing appropriate organisations, whether these may be associations or co-operatives.
- Promote fisher participation in decision-making, planning and enforcement of resource management.
- Government co-operation between St. Vincent and Grenada.

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9 APPENDICES

Appendix 1: Description of fish species groups targeted in the Grenadines

Demersals

Major species:	Hinds, groupers, butterfishes (<i>Serranidae</i> spp.), snappers (<i>Lutjanidae</i> spp.), parrotfishes (<i>Scaridae</i> spp.)
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 (<i>Coryphaena hippurus</i>), yellowfin tuna (<i>Thunnus albacares</i>) kingfish (<i>Scomberomorus cavalla</i>), barracuda (<i>Sphynaena</i> spp.)
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 (<i>Decapterus</i> sp.), jacks (<i>Carangidae</i>)
Description/ Habitat:	pelagic; found along the coastline
Fishing method/ Gear used:	beach seine, cast net
Seasonality:	All year



Lobster

Major species:	Caribbean spiny lobster (<i>Panulirus argus</i>)
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 (<i>Strombus gigas</i>), milk conch (<i>Strombus costatus</i>).
Description/ Habitat:	benthic; found mainly in sea grass beds
Fishing method/ Gear used:	scuba and free diving
Seasonality:	All year (opportunistic)



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Image Source: <http://www.jaxshells.org/bitgigj.jpg>

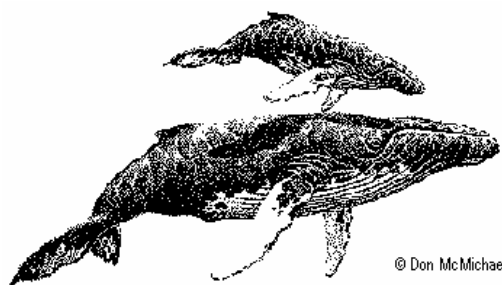
Turtles

Major species:	hawksbill turtle (<i>Eretmochelys imbricata</i>), green turtle (<i>Chelonia mydas</i>)
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



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

Appendix 2: Description of boat types used in the Grenadines

Bow and Stern (Cigarette/Speedboat)

Description:	Pointed bow and flat stern
Length range:	3.4-8.2 m (11-27 ft)
Width range:	0.9-2.1 m (3-7 ft)
Horsepower range:	14-115 hp
Type of fishing:	Handline, trolling, floating and sinking palang, traps, spear (scuba and barewind)



Pirogue

Description:	Higher bow than the speedboat
Length range:	5.8-9.1 m (19-30 ft)
Width range:	1.2-3.0 m (4-10 ft)
Horsepower range:	40-85 hp
Type of fishing:	Trolling & demersals fishery



Double-ender

Description:	Two bows, canoe-shaped
Length range:	3.0-8.8 m (10-29 ft)
Width range:	1.2-2.4 m (4-8 ft)
Horsepower range:	6-48 hp (Mainly oars)
Type of fishing:	Beach seine fishery



Sloop/Longliner

Description:	Most have mechanical equipment for hauling lines on board
Length range:	10.6-14.8 m (34.7-48.5 ft)
Width range:	2.9-4.8 m (9.7-15.9 ft)
Horsepower range:	90-190 hp (inboard diesel engine)
Type of fishing:	Surface longlining for tuna, trolling, and bottom longlining



Appendix 3: 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 4: In-depth survey

A Livelihoods Analysis of Fishermen in the Grenadines

This interview will focus on livelihood assets as well as strategies and vulnerabilities that fishers both utilize and face. The final report on the findings of this study will contribute to my research project for the CERMES MSc degree, and hopefully be used in further decision making regarding fishery resources.

The respondent's name will be kept confidential and separate from the information contained within this interview.

General Information

1.	Respondent #:		2.	Date:	
3.	Location:		4.	Address:	
5.	Sex:	<input type="radio"/> Male <input type="radio"/> Female	6.	Age:	
7.	Boat:	<input type="radio"/> Owner <input type="radio"/> Crew member <input type="radio"/> Captain			

Livelihood Strategies

8. Is fishing your primary occupation? ☐ Yes ☐ No

9. Did you have other occupation(s) before fishing? ☐ Yes ☐ No

a. Previous occupation(s): _____

10. Why did you start fishing?

11. Presently, what are your income-earning activities (in order of importance) and what is their proportion of your total income?

	Income-earning activities	< ½	½	> ½	All
1.					
2.					
3.					

12. Aside from fishing, why have you chosen these activities?

Income-earning activities	Reason(s) for choosing these activities

Livelihood Assets

Human Capital

Knowledge, Education and Skills

13. For how long has fishing earned you an income? _____ years

14. How many hours a week do you spend fishing? _____ hours

15. Who taught you how to fish and about the different types of fishing?

16. How did you learn about the different types of fish and their biology (E.g. spawning/feeding grounds)

17. Are you teaching or have you taught anyone your fishing skills and knowledge?

☐ Yes

☐ No

Relationship:

18. Do you think there is enough information (whether scientific or traditional) available to you, about the fish species you target? ☐ Yes ☐ No

a. If no, what other information is needed?

19. What is the last type of school you attended?

☐ None

☐ Primary

☐ Secondary

☐ Post-secondary / technical

☐ University ☐ Other

20. If additional training and education were made available to fishers, (E.g. Fishing skills, financing, safety etc.) what types would you recommend?

Personal and Family

21. What is your religion?

- ☐ Anglican ☐ Methodist ☐ Roman Catholic ☐ Seventh Day Adventist
☐ Protestant ☐ None ☐ Other _____

22. What is your marital status?

- ☐ Single ☐ Married ☐ Common Law ☐ Widowed ☐ Divorced
☐ Other _____

23. How many children do you have? _____ boys _____ girls

24. How many people over the age of 16 live in your household?

Relationship of HH member to Respondent	Sex	Age	Level of Education	Primary Income source	Secondary Income source

25. Do any of your family members assist you in any aspect of your fishing practices?

- ☐ Yes ☐ No Relationship(s): _____
a. How? (E.g. cleaning fish or going out to fish for their own LH as well etc.)

Social Capital

26. What do you do in your spare time (i.e. when not fishing or doing other jobs)? (E.g. Community festivals, lime at the rum shop, read the papers)

27. Are you a member of any social or community groups (E.g. Church, sports, culture)?

Community Group	Role	Level of activity	Reason for membership

1. Very active

2. Average

3. Not so active

28. If one existed, would you be part of a fishers' organization / co-op? ☐ Yes ☐ No
a. Why?

29. Are you involved or aware of any conflict amongst fishers? ☐ Yes ☐ No
a. Please explain

30. Are you involved or aware of any conflict between fishers and other people?
☐ Yes ☐ No
a. Please explain

31. In times of need or crisis, who would you turn to for help?

Relationship(s): _____

a. Why?

32. Do you assist any of the following when they are in need:

			If yes, How?
a.	Other fishers	<input type="radio"/> Yes <input type="radio"/> No	
b.	Friends within or out of your community	<input type="radio"/> Yes <input type="radio"/> No	
c.	Family	<input type="radio"/> Yes <input type="radio"/> No	

Natural Capital

33. Rank the following fish types that you catch (in order of importance) and the changes in abundance relative to 10 years ago:

Fish Type	Abundance 5 years ago	Abundance Today
() Reef fish		
() Bank fish		
() Lobster		
() Conch/lambie		
() Pelagics		
() Turtle		
() Porpoise / whale		

1. Very low 2. Low 3. Same 4. High 5. Very high

34. In your opinion...

a.	What are some of the issues associated with fishing?	b.	What are some solutions to these issues?

Physical Capital

35. If you are a boat owner:

Source of funds	Boat	Engine	Fishing gear	Emergency equipment	<input type="radio"/> Yes <input type="radio"/> No
Own money					Types:
Bank loan					
Family loan					
Other:					
Value	\$	\$	\$	\$	

36. If you are a crew member or captain:

			a. If own, source of funds		b. Value
Fishing gear	<input type="radio"/> None <input type="radio"/> Borrow	<input type="radio"/> Own <input type="radio"/> Rent	<input type="radio"/> Own \$ <input type="radio"/> Family loan	<input type="radio"/> Bank loan <input type="radio"/> Other:	\$
Emergency equipment	<input type="radio"/> None <input type="radio"/> Borrow	<input type="radio"/> Own <input type="radio"/> Rent	<input type="radio"/> Own \$ <input type="radio"/> Family loan	<input type="radio"/> Bank loan <input type="radio"/> Other:	\$

37. What other gear do you require to be an effective fisherman?

38. What facilities do you use whilst fishing and what are their locations?

	Facility	Location	Improvements?
a.	Jetties		
b.	Moorings		
c.	Gas Stations		
d.			
e.			

39. What new facilities do you think are required?

40. Home ownership:

		a. If own, source of funds:	
<input type="radio"/> Self owned	<input type="radio"/> Rented	<input type="radio"/> Own \$	<input type="radio"/> Bank loan
<input type="radio"/> Family owned	<input type="radio"/> Other:	<input type="radio"/> Family loan	<input type="radio"/> Other:

41. Materials and facilities within your home:

Walls	<input type="radio"/> Concrete	<input type="radio"/> Wood	<input type="radio"/> Other:	
Roof	<input type="radio"/> Tiles	<input type="radio"/> Metal	<input type="radio"/> Other:	
Floor	<input type="radio"/> Concrete	<input type="radio"/> Wood	<input type="radio"/> Carpet	<input type="radio"/> Other:
Facilities	<input type="radio"/> Electricity	<input type="radio"/> Running water	<input type="radio"/> In-door toilet	<input type="radio"/> Out-door toilet

42. Does your household own any of the following:

			a. Source of funding for largest item:	
<input type="radio"/> TV	<input type="radio"/> Fridge	<input type="radio"/> Stove	<input type="radio"/> Own \$	<input type="radio"/> Bank loan
<input type="radio"/> Stereo	<input type="radio"/> Car	<input type="radio"/> Computer	<input type="radio"/> Family loan	<input type="radio"/> Other:
<input type="radio"/> Washing/Drying machines	<input type="radio"/> Other:			

43. Do you own any land? ☐ Yes ☐ No

a. If yes, what activities are carried out on this land?

44. How would you rate the following:

		Accessibility	Quality
a.	Schools		
b.	Health centres		
c.	Fishing facilities		
d.	Enforcement agents		

1. Very good 2. Good 3. Poor 4. Very poor

Financial Capital

45. In an average week, how much will your catch be sold for? _____

46. How are the earnings from fish sale divided up amongst crew members?

47. Customer information:

Species	Customer	Price/lb	Quantity			Reason			
			Most	Half	Few	Reliable Buyer	Price	Convenience	Other

48. What is the average cost per fishing trip?

Item	Amount	Cost
Oil		
Gas		
Ice		
Bait		
Food		

49. What are your maintenance costs like?

Item	Cost per year
Engine	
Painting	
Re-fiberglass	
Seating	
Gear (specify type)	

50. Saving money...

a.	Do you save money?	<input type="radio"/> Yes <input type="radio"/> No
b.	Why (children, don't make enough)?	
c.	If yes, how (bank, etc.)?	
d.	If yes, what are the sources (income, family, etc.)?	

51. Do other members of your HH contribute to HH income? ☐ Yes ☐ No

52. Are you the primary income provider in your household? ☐ Yes ☐ No

Vulnerability Context

53. When are you able to fish for your target species?

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

* 0 for no fishing at all; 1 for some fishing; 2 for high/normal levels

54. During a hurricane where would you store the boat you own or work on?

55. Did you suffer any recent hurricane damages to your...

		Value of damages	Length of time it took to make repairs
a.	Home		
b.	Boat		
c.	Gear		

56. Do you have insurance?

☐ None
 ☐ Life
 ☐ House
 ☐ Boat
 ☐ Car
 ☐ Other:

57. Which of these factors threaten your fishing livelihood the most?

- ☐ Increases in oil/gas prices
- ☐ Reduction in fish abundance
- ☐ Maintenance costs
- ☐ Bad health
- ☐ Lack of market to sell
- ☐ Other factors:

58. How do you think tourism impacts you as a fisherman?