



**FISH EXPORTING IN THE GRENADINE ISLANDS: ACTIVITIES OF TRADING  
VESSELS AND SUPPLYING FISHERS**

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**ABSTRACT**

The Grenadines Bank, which extends from Bequia to Grenada in the Lesser Antilles, is an extensive shallow platform (about 3000 km<sup>2</sup>), consisting of predominantly coralline habitat, exposed to the influence of open oceanic water. The total population of the Grenadines is about 12,000, and is sustained primarily by fishing and tourism. However, within the Grenadines, the market for fish is small. Export markets in neighboring islands are accessed by an indigenous system which has developed at the community level, with most of the catch being supplied to Martinique. Fish is typically purchased year round from island fishers by "trading vessels" which transport it to Martinique. The system was studied by means of questionnaires to fishers, and trading boat operators/owners, by key informant interviews, and by direct observation in all islands.

Bequia in the St. Vincent Grenadines and Petit Martinique in the Grenada Grenadines are the main ports for the trading vessels. Bequia-based vessels typically move around locally in the northern Grenadines to areas of high fishing activity. They purchase fish from supplying fishers daily. Petit Martinique-based vessels typically remain stationary, while fishers from neighboring islands bring fish to them daily. Most vessels spend 5-7 days purchasing fish each trip, and may make 2-4 trips to Martinique per month. The trip to Martinique typically takes 13-15 hours each way. Offloading in Martinique takes between 1-3 days. Reef fishes such as parrotfish (*Saira.vsp.*) and deep demersals such as snappers (*Lutjanus* spp.), and groupers (*Epinephelus* and *Mycteroperca* spp.) are the predominant species exported. Conch, coastal pelagics and large pelagics are also occasionally exported. Detailed data on catches and exports are not systematically collected by local governments owing to the diffuse, vessel-based nature of the operations.

Estimates of total annual fish yield from the Grenadines Bank based on interview data range from 636 to 1182 mt while total annual fish yield based on export and import data range from 288 to 422 mt.

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## 1. INTRODUCTION

Fishery resources have traditionally been, and continue to be, important to the islands of the Lesser Antilles (Chakalall 1990). These fisheries are the major suppliers of fish to the domestic food market and are the principal means of livelihood for the local population in many coastal areas (Chakalall 1990). Fish exports from small-scale fisheries are important sources of foreign exchange for these islands.

Within the Lesser Antilles, the Grenadine islands lie along the Grenadine Bank between 12° 15'-13° 3'N and 61° 5'-61° 30'W (Figure 1). These islands are shared by two sovereign nations, St. Vincent and the Grenadines and Grenada. The Grenadine islands of Bequia, Mustique, Canouan, Mayreau, Tobago Cays, Palm Island and Union Island are part of St. Vincent and the Grenadines while Carriacou and Petit Martinique are part of Grenada.

The Grenadine islands are one of the few areas in the Lesser Antilles with a large shelf area. The Grenadines are surrounded by an extensive shallow platform, the Grenadine Bank (Figure 1), extending over an area of approximately 3000 km<sup>2</sup> exposed to the influence of open oceanic water. Three quarters of the platform is about 37-40 m deep (CCA/IRF 1991). It falls off steeply on its northern, eastern and western edges (CCA/IRF 1991). Shallow coastal areas of this platform (9-12 m) consist of predominantly coralline habitat interspersed with patches of sea grass, sand and rock.

Human populations in the Grenadine islands are small. A population of 9612 residents distributed over an area of 42.7 km<sup>2</sup> is recorded for the entire St. Vincent Grenadines for 1989 (CCA/IRF 1991). Island areas are small relative to the size of the Grenadine Bank (Figure 1).

The economies of the Grenadine islands are marine-based, depending mainly on fishing and tourism. Some 85-95% of adult males in the Grenadines are fishers or active in related sectors (CCA/IRF 1991). A household survey (1990-1991) conducted in the Grenadine communities of Paget Farm (Bequia), Canouan and Union found that fishing was the main source of income for 33%, 25% and 8% of residents in each of these communities respectively (CAN/SVG Fisheries Development Project 1991a). In this survey, employment in tourism was found to account for 25%, 25% and 38% of all employment in the above communities.

Fishery resources within the Lesser Antilles consist of spiny lobster, conch, shallow-shelf reef fish, deep-slope and bank fish, coastal pelagics, large pelagics, flyingfish, sharks, rays, sea turtles and sea urchins (Mahon 1990).

In the Grenadines, deep-slope and shallow-shelf reef fish, lobsters, conch and schooling coastal pelagics are the resources most extensively fished, with deep-slope and bank fish (deepwater demersals) and shallow-reef fisheries being predominant. Deepwater demersals were found to be the most important species group for 75% of St. Vincent and the Grenadines fishers interviewed during a baseline survey (CAN/SVG Fisheries Development Project 1991d). Most demersal fisheries in the Grenadines are small-scale artisanal, with fishers typically operating independently on a subsistence level with little or no organization.

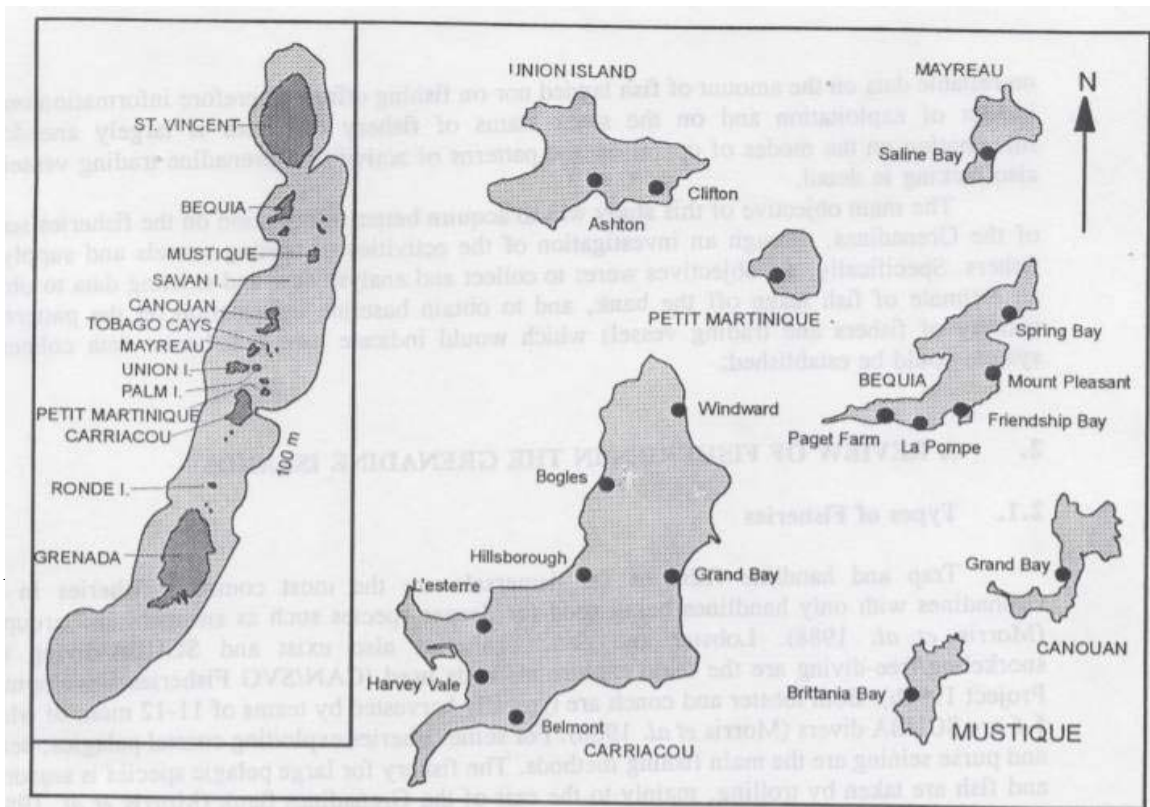


Figure 1. The Grenadine Bank (inset) and islands surveyed showing their fish landing sites

Although demersal species such as snappers (*Lutjanus* spp.) in the inshore waters of the Grenadines are considered as being fully, or in some cases over-exploited (Matthes 1984), potential for expansion of these fisheries is still reported to exist in deeper waters offshore. For Grenada and [the Grenada Grenadines, Kawaguchi and Cortez (1985) considered that there was potential for increasing catches of deepwater snappers and related species along the drop-off of the island and bank (241 km in length).

The small-scale fisheries of the Grenadines are pursued by a variety of gear and vessel types. The gear consist mainly of fish traps, spear guns, handlines, trolling lines, gill nets, beach seines, trammel nets and longlines.

Deepwater demersal and shallow reef fisheries predominate in the Grenadines since the species caught in these fisheries are in high demand for export to Martinique. Morris *et al.* (1988) estimated that 60% of the combined demersal trap and line, seine (coastal pelagic) and reef pelagic catch from the St. Vincent Grenadines is sold directly to trading vessels mainly for export to Martinique, with approximately 10% reaching local consumers. Estimates made by Finlay (1990) indicate that 85% of finfish production from the Grenada Grenadines is exported to Martinique with 10% going to hotels, supermarkets and restaurants, and the remaining 5% going to local consumers. This system of direct marine trans-shipment of fish from fisher to trading vessel in the Grenadine islands is unique in the wider Caribbean region. As a result of the nature of the fish trade (diffuse, vessel-based fish landings) in the Grenadines area, there are no reliable data on the amount of fish landed nor on fishing effort. Therefore information on the impact of exploitation and on the stock status of fishery resources is largely anecdotal. Information

on the modes of operation and patterns of activity of Grenadine trading vessels is also lacking in detail.

The main objective of this study was to acquire better information on the fisheries sector of the Grenadines, through an investigation of the activities of trading vessels and supplying fishers. Specifically, the objectives were: to collect and analyse new and existing data to obtain an estimate of fish taken off the bank, and to obtain baseline information on the pattern of activity of fishers and trading vessels which would indicate how a fisheries data collection system could be established.

## **2. A REVIEW OF FISHERIES IN THE GRENADINE ISLANDS**

### **2.1. Types of Fisheries**

Trap and handline fisheries for demersals are the most common fisheries in the Grenadines with only handlines being used for deeper species such as snappers and groupers (Morris *et al.* 1988). Lobster and conch fisheries also exist and SCUBA-diving and snorkeling/free-diving are the main capture methods used (CAN/SVG Fisheries Development Project 1991b). Both lobster and conch are typically harvested by teams of 11-12 men, of which 5-6 are SCUBA divers (Morris *et al.* 1988). For seine fisheries exploiting coastal pelagics, beach and purse seining are the main fishing methods. The fishery for large pelagic species is seasonal, and fish are taken by trolling, mainly to the east of the Grenadines Bank (Morris *et al.* 1988).

### **2.2. Importance of Fisheries**

The importance of fisheries to the Grenadine islands is indicated by their financial contribution to the economy. In most islands of the Lesser Antilles region, the fishery sector accounts for 4-10% of the GDP (Mahon 1993). This is likely to be a minimum estimate for the Grenadine islands where agriculture is limited by water availability. The economic value of demersal fish production for the St. Vincent Grenadine communities of Canouan, Union, and Paget Farm (Bequia) is estimated to range between EC \$1,386,000-51,726,000 per year which represents between 62.2 and 58.3% of the value of total fish landings (based on figures from boat-owner interviews and fishery cooperative data reported by the CAN/SVG Fisheries Development Project 1991<sup>b</sup>). The value added component from fishery products consumed in the tourist industry is seldom taken into account.

### **2.3 Nature of Island Fisheries**

Grenadine deep-slope and bank, and shallow-reef fisheries are largely small-scale and artisanal. Small-scale island fisheries may be seasonal and often do not provide food nor income on a full-time basis. Thus fishers often seek other means of subsistence such as agriculture, construction and tourism (Chakalall 1990). The small-scale fisheries sub-sector of island states also typically exhibits a general lack of infrastructure and technological development. Landing sites usually lack

facilities for receiving, handling and storing fish, or for berthing and boat repair (Chakalall 1990). The Grenadine islands are no exception.

Fish marketing in small-scale island fisheries characteristically range from individuals who purchase fish as soon as it is landed and sell it in the streets, to sophisticated marketing networks involving middlemen, processing and transportation to distant markets (Stevenson *et al.* 1982). Detailed descriptions of fish marketing pathways in all OECS island states are provided in Mahon and Rosenberg (1988). In many of the island states of the Lesser Antilles, however, marketing systems remain underdeveloped.

## 2.4 Fishing Fleet

Most of the artisanal fishers in the Grenadines use simple coastal fishing craft, 4-10 m in size, equipped with oars, sails or outboard engines. They normally fish in inshore coastal areas, shallow coral reef areas and on deep fore-reef slopes.

The fishing fleet of the Grenada and St. Vincent Grenadines is composed of several types of open or partially decked wooden or fiberglass boats. The Grenadine fleet is composed of double-ender, pirogue, canoe, sloop, launch, and bow and stern type vessels (Finlay *et al.* 1988, Morris *et al.* 1988). Although some boat types specialize in a particular fishery, many boats are used for all types of fishing (Morris 1991). The historical trend in fleet size by island and island community from 1969-1991 for the St. Vincent and Grenada Grenadines is shown in Table 1, the composition of the fleet is shown in Table 2.

Double ender vessels are keeled wooden vessels with no differences in shape of the bow and stern (SVG Fisheries Division 1993). These vessels are designed to be sail powered and are steered by a rudder. Propulsion can also be supplied by an outboard engine (SVG Fisheries Division 1993). The largest double ender vessels are used for seining or whaling, with smaller ones are used to assist seines and for trap and line fishing (Morris 1991). Vessel length varies from 1.9-9.2 m (SVG Fisheries Division 1993).

Pirogues are fiberglass or wooden boats, with a high bow and flat stern, occasionally with a cabin (SVG Fisheries Division 1993), propelled by an outboard motor. In the St. Vincent Grenadines, these vessels are used mainly for exploiting large pelagics (Morris *et al.* 1988).

Canoes are keel-less dugouts ranging in size from 4.5-9.2 m propelled by an outboard motor (SVG Fisheries Division 1993). They are neither maneuverable nor stable and are used mainly for exploiting large pelagics or deep-slope and bank demersals (SVG Fisheries Division 1993).

Sloops are wooden vessels ranging in length from 12-20 m with sail and inboard diesel engines (Czekaj 1984). They are used for fishing offshore pelagics and deep sea demersals (SVG Fisheries Division 1993).

Bow and stern vessels or dories are open, keeled, vessels with flat sterns ranging in size from 2.5-8.8 m (SVG Fisheries Division 1993). In the Grenadines, these vessels are mainly used in the lobster, conch and seine fisheries (Morris 1991) (Table 2).

In the more populated areas, such as on mainland St. Vincent and Grenada, a significant proportion of fish landed is sold locally via the market channels described by Finlay *et al.* (1988) and Morris *et al.* (1988). However, fishers from the Grenadines are largely dependent on trading vessels which purchase selected species for export to Martinique (Anderson *et al.* 1982). Most trading vessels are locally built, single masted, schooner / sloop type wooden vessels, ranging in size from 12-20 m and driven by 120+ horsepower inboard engines augmented by sail. Vessels are typically designed with a wheelhouse and cabin to the stern. Average cargo storage capacity is estimated to range from 3-6 mt (Scott 1988).

**Table 1: Number of fishing vessels by island and by island community for the St. Vincent and Grenadines and Grenada Grenadines**

ISLAND/COMMUNITY	YEAR	TOTAL FISHING FLEET	SOURCE
<u>St. Vincent and the Grenadines</u> St. Vincent Grenadines (Bequia, Canouan, Mayreau, Union, Mustique)	1969	227 (pot and handling fishery)	5
<hr/>			
<u>St. Vincent and the Grenadines</u>			
<hr/>			
St. Vincent Grenadines (Bequia, Canouan, Mayreau, Union, Mustique)	1969	227 (pot and handline fishery)	5
<hr/>			
St. Vincent and the Grenadines	1980	416 (<50% 6-16m)	6
<hr/>			
St. Vincent Grenadines (Bequia, Canouan, Union, Mayreau)	Aug-Dec 1981	305	3
St. Vincent Grenadines	1982	250-300	4
St. Vincent and die Grenadines	1984	537	1
St. Vincent and the Grenadines	1989	635 (85% 6- 16m)	6
<hr/>			
St. Vincent and the Grenadines	?	394	2
Bequia	1991	114	8
Paget Farm Hamilton' }	1991'	25'	8
La Pompe* }			
Lower Bay' }			
Union Island	1991		
Ashton		25	8
Clifton		13	8
<hr/>			
<u>Grenada Grenadines</u>			
Carriacou	?	78	6
Petit Martinique	?	26	6
Carriacou	1983	84	7

1. Mantles. 1984; 2. Tabor. 1990; 3. Fisheries Division, Ministry of Trade, Agriculture and Tourism (SVG), cited by Chakalall. 1982; 4. Anderson *et al.*. 1982; 5. SVG Fisheries Officer, cited by Vidaeus, 1969; 6. Finlay, 1990; 7. Artisanal Fisheries Development Project. Ministry of Agriculture and Fisheries, cited by Kawaguchi and Cortez, 1985 8. CAN. and SVG Fisheries Development Project, 1991' \* Total fishing fleet is a combined value for [he communities of Hamilton, La Pompe and Lower Bay.



Thirteen trading vessels were reported as active in transporting fish to Martinique from Carriacou and Petit Martinique, with each vessel making approximately two trips per month (Finlay *et al.* 1988).

**Table 2: Composition of fishing fleet in total and by island for the St. Vincent Grenadines and Grenada Grenadines**

TYPE OF BOAT									
COUNTRY	YEAR	LAUNCH	PIROGUE	SLOOP	WHALER	BOW and STJ-RN	DOUBLE ENDER	SCHOONER	SOURCE
St. Vincent and the Grenadines	1984	--	50-60	12-15	--	--	600-700	--	1
Bequia	1991	--	--	--	3	12	9	---	3
Canouan	1991		3	1	---	--	10	--	3
Mayreau Union	1991	--	--	2	--	10	16	--	3
Grenada Grenadines									
Carriacou	1998	14	44	18	--	--	3	--	2
Petit Martinique	1988	3	18	7	---	--	--	--	2
Carriacou	?	14	46	18	--	--	--	--	4
Petit Martinique	?	(19- 3 9-11m)	(5-5m) 16 (5-5m)	(9-12m) 7 (9-12m)	--	--	--	--	4

1. Czekaj 1984. 2. Finlay, *et al.* 1988. 3. Morris *et al.* 1988; 4. Finlay 1990, -- None given.

## 2.5. Fishery Resources: Their Exploitation Status and Potential

For the Grenadine island communities of Paget Farm (Bequia), Canouan, Clifton and Ashton (Union Island), the main species fished are parrotfishes, snappers, hinds, jacks, robins and barracudas (boat-owner interviews in the CAN/SVG Fisheries Development Project 1991b). Snappers and hinds are deep-slope and bank species (deepwater demersals), parrotfishes are a shallow reef species, and jacks and robins are coastal pelagic species.

Inshore or shallow demersal reef resources are considered over-exploited. The most recent evidence for over-fishing comes from the CAN/SVG Fisheries Development Project (1991) where 87% of St. Vincent Grenadine fishers interviewed indicated that they catch fewer fish than they did five years ago, and attributed this to an increase in fishing effort, pollution by yachts and exploitation by SCUBA divers. It is believed however that under-exploited or un-exploited grounds for deepwater demersals such as snappers and related species exist offshore. These offshore grounds are not presently exploited by fishers due to limitations in fishing craft and the pattern of fishing operations which is essentially "out in the morning and back in the evening" (Anderson *et al.* 1982). The length of fishing trips with small vessels is often limited by the need to return to the port of operation before the catch spoils, consequently little effort can be expended on distant banks.

Exploratory fishing data from studies undertaken by FAO and UNDP between 1965 and 1970 found that snappers and groupers dominated deep water trap catches, comprising from 43% to 92% by weight in the Lesser Antilles and with highest catch per unit effort from handlines being recorded in the northern Lesser Antilles (Mahon 1990). The study also concluded that the estimated annual production of snappers could be increased between two to four fold by using under or un-fished grounds (Wolf and Rathjen 1974).

Large oceanic pelagics such as tuna and swordfish are also considered to be under-exploited (Mahon 1993). These resources have remained under-exploited because they occur offshore and tend to occur at the depth of the thermocline, requiring well-equipped vessels with sub-surface longlines (Oxenford 1991).

## 2.6. Fish Marketing and Export

The export trade to Martinique has existed for many years with Government approval and is well established (Anderson 1982). There are no precise figures on the quantities of demersal species exported from either the Grenada Grenadines or the St. Vincent Grenadines. Most of what is recorded is estimated. Sources in Martinique give quantities imported as 450 mt annually (Matthes 1984), while estimates based on assumed landings (1984-1986) from the Grenadines place this figure at 539.8 mt or 70% of total Grenadine landed catch (CCA/IRF 1991). A summary of the historical trend in estimates of Grenadine fish exports is provided in Table 3.

**Table 3: Historical trend in estimates of Grenadine fish exports (1968-1990).**

EXPORTING COUNTRY	IMPORTING EXPORT	YEAR OF EXPORTED	QUANTITY SOURCE (mt)	COUNTRY
SVG Grenadines	Martinique	1968	+31.8	1
SVG Grenadines	--	1975	+63.2	2
		1976	+62.2	
		1977	+58.9	
		1978	+300.8	
		1979	+116.6	
		1980	+43.8	
Grenada	Martinique	Nov 1978 -	+20.9	3
	Mar 1979			
SVG Grenadines	Martinique	?	"453.6	4
SVG Grenadines	Martinique	-2	"539.9	5
SVG		1984	+85.9	6
		1990	+234.6	
Grenada Grenadines (Petit Martinique and Caniacou)	Martinique	1984	'273.6	7
		1985	*287.6	
		1986	'422.7	
		1987	'443.2	
		1988	'400.3	

' Based on estimate of 20% Total Grenada production; " Based on estimate of 70% of Total landed catch; "" Estimated value (mt); ? Not specified; \* Officially recorded exports; 1. Vidaeus, 1969; 2. Fisheries Division. Ministry of Agriculture, Trade Tourism cited by Chakalall, 1982; 3. Pena and Wirth. 1979; 4. Matthes. 1984; 5. CCA/IRF. 1991; 6. Morris. 1991; 7. Fmlay, 1990.

Fish, lobster and conch from the St. Vincent Grenadines (predominantly from northern Grenadine islands) are also sold in St. Vincent, sometimes in Grenada and also to local hotels and local residents (CAN/SVG Fisheries Development Project 1991b). Fish periodically enters Grenada and Hillsborough, Carriacou from the St. Vincent Grenadines (Union Island), and consists predominantly of seine caught coastal pelagics for which no local markets can be found. Often, in addition to local sale to residents, hotels, tourists and local yachts, lobster is exported • live by air to Martinique and Barbados.

Fish marketing in Carriacou was considered to be disorganized, with many people handling relatively small quantities of fish, and landings being dispersed around the island (Kawaguchi and Cortez 1985). Coastal communities in this island are typically supplied directly by village fishers (Kawaguchi and Cortez 1985).

Within the St. Vincent Grenadines, landing facilities are generally inadequate and basic facilities for gear storage or for handling, selling and storing fish are absent (Anderson *et al.* 1982, Scott 1988). The situation appears to be similar in Carriacou where no adequate fish marketing facilities are reported to exist in the fishing communities of Harveyvale and Windward (Kawaguchi 1985).

## **2.7 Target Species and Purchase Prices**

Trading vessel buyers in the St. Vincent Grenadines are reported to be selective and to restrict their purchase to prime species. These buyers are known to pay for favoured species, about twice that which can be obtained in St. Vincent (Anderson *et al.* 1982). Between June and October, when pelagics from foreign sources can be accepted in Martinique, small pelagics such as jacks and robins are sold to trading vessels (CAN/SVG Fisheries Development Project 1991d).

Purchase prices paid to Grenadine fishers by trading vessel operators have increased steadily through the years. Current prices are listed at EC \$8.00 per kilogram for grouper and hind, EC \$7.00 per kilogram for hind and butterfish and EC \$3.00-4.00 per kilogram for whitefish/seine fish (CAN/SVG Artisanal Fisheries Development Project 1991b). Scott (1988) reported prices of EC \$6.00 per kilogram for Grade 1 fish (snappers and groupers) and EC \$5.00 per kilogram for Grade 2 fish (all other species). Wholesale selling prices in Martinique were EC \$12.50 per kilogram for Grade 1 fish and EC \$9.00 per kilogram for Grade 2 respectively (Scott 1988). It is important to note, however that no formal grades nor standards exist for fish exported from the Grenadines. For the St. Vincent Grenadines, transactions between traders and fishers are informal and verbal (Scott 1988). Historical trends in reported trading vessel fish purchasing prices (1982-1991) and retail prices in Martinique (1979-1990), are shown in Tables 4 and 5.

## **2.8 Demersal Fishing Activity and Seasonality in Fishing**

Fishing for shallow water reef and deep demersal species is a year round activity for Grenadine fishers (CCA/IRF 1991). Lobster, conch, turtle, and sea egg resources have closed seasons during which ail fishing is prohibited. From December/January to May/June a "high season" is observed for fishers from St. Vincent and the Grenadines due to increased landings from large offshore migratory pelagics such as dolphin (*Coryphaena hippurus*), yellowfin tuna (*Thunnus albacares*) and

kingfish (*Scomberomorus cavatta*) (CCA/IRF 1991). In the "low season", landings are lower and more coastal pelagic species such as jacks (*Selar crumenophthalmus*) and cero mackerel (*Scomberomorus regallis*) are landed. This seasonality is also observed for Grenada and the Grenada Grenadines.

From comparative surveys of existing literature, it appears that fishers from the islands of Bequia, Canouan, Mayreau, and Union in the St. Vincent Grenadines and those from Petit Martinique and Carriacou in the Grenada Grenadines all exhibit similar patterns in their demersal fishing, handling and marketing activity. Daily modes of operation are virtually the same for fishers in all these islands.

Demersal fishing is typically undertaken on a daily basis with fishers going out early in the morning and returning in the early or mid-afternoon period, with trip duration averaging between 6-8 hours. Maximum distance travelled to demersal fishing grounds for Canouan and Page! Farm (St. Vincent Grenadines) fishers is about 6.4 km (4 miles) (CAN/SVG Fisheries Development Project 1991b). Most fishers surveyed in St. Vincent and the Grenadines indicated that on average 5-6 days of the week are spent fishing (CAN/SVG Fisheries Development Project 1991b, Tabor 1990). For Grenada, the average number of days fished per week reported by fishers was 3 (Tabor 1990). Adverse weather conditions, strong tides and the absence of trading vessels were all cited as factors affecting the number of days spent fishing by fishers in most of the Grenadine islands (CAN/SVG Fisheries Development Project 1991b).

Reports on average catch of demersal fish species per week varies. For the majority of fishers surveyed, average daily catch quantities of between 11.4-13.6 kg, 13.6-22.7 kg, and 23.2-31.8 kg were reported per fisher, from the islands of Union, Bequia, and Canouan respectively (CAN/SVG Fisheries Development Project 1991d). Scott (1988) reported that the average weekly catch of demersals ranges between 91-227 kg for fishers of St. Vincent and the

**Table 4: Trading vessel fish purchasing prices (1982 - 1991) in St. Vincent and the Grenadines**

YEAR	FISH CATEGORY	PRICE RANGE (SEC per kg)	SOURCE
1982	Grade 1 (snapper and grouper)	5.50	1
1984	All fish species	6.60	2
1984	Grade 1 (snapper and grouper)	5.50 - 8.00	3
	lobster	11.00	3
1987-88	Grade 1 (snapper and grouper)	6.00	4
	Grade 2	5.00	4
	conch	7.00	4
	lobster	16.00 - 20.00	4
1991	Demersal species (hinds, snappers)	7.00 - 8.00	5
	jacks	4.40 - 5.50	5
	robins	3.30 - 4.40	5

1. Brana-Shute, 1982; 2. Czekaj, 1984; 3. Matthes, 1984; 4. Scott, 1988; 5. CAN. and SVG Fisheries Development Project. 1991.!

**Table 5: Trading vessel fish retailing prices per kg (1979-1980) in Martinique**

YEAR	FISH CATEGORY	PRICE RANGE	SOURCE
1979	bonito	\$FF 15.00-20.00	1
		\$EC 9.24 - 12.32	
1982	Grade 1 (snapper and grouper)	\$EC 13.20- 19.80	2
1984	All fish species	\$FF 19.00-30.00	3
		\$EC 6.85- 11.60	
1984	sea eggs	\$EC 55.00	3
1987	Grade 1 (snapper and grouper)	\$EC 12.50kg/\$FF 35.40	4
	Grade 2		
		\$EC 9.00 kg/\$FF 25.00	4
	conchs		4
		\$EC 10.00 - 12.50	
		\$FF 30.00 - 35.00	
	lobsters		4
		\$EC 28.50	
		\$FF 80.00	
1984-1990	All fish species	\$EC 4. 40- 11.55	5
1984-1990	lobsters	\$EC 15.40 - 55.00	5
1984-1990	conch	\$EC 6.60- 11.00	5

1. Pefta and Worth 1979, 2, Brana-Shme 1982. 3. Matthes 1984. Scon 1988. 5. Morris 1991

**Table 6: Demersal fish production for Grenada, Grenada Grenadines and St. Vincent Grenadines.**

YEAR	LOCATION	DEMERSAL FISH LANDINGS (mi)	SOURCE
1980	Grenada	126.7	1
1981	Grenada	130.4	1
1982	Grenada	82.8	1
1983	Grenada	252.1	1
1984	Grenada	204.1	2
	Canouan	37.7 - 52.7	2
	Union	29.5-42.2	2
	Paget Farm	122.6 - 145.3	2
1978	Grenada	93.8	3
1979	Grenada	115.9	3
1980	Grenada	36.6	3
1981	Grenada	71.0	3
1982	Grenada	60.2	3
1983	Grenada	133.6	3
1984	Grenada	120.3	3
1985	Grenada	132.7	3
1986	Grenada	203.4	3
1987	Grenada	227.2	3

1. Anisnal Fisheries Development Project. Mm. of Agnc. and Fisheries, cited by Kawaguchi and Cortez 1985. 2. Boat-owner Interviews. Goodwill Coop., and Kingstown Fish Market (CCA/IRF 1991). 3. Finlay 1990.

Grenadines. Assuming a 5 day fishing week, the average fish catch reported by Scott (1988) is 18-45 kg per day. Trends in demersal fish production for Grenada, Grenada Grenadines and the St. Vincent Grenadines are shown in Table 6.

## 2.9 Fishing Gear and Methods

Fishing gear used is generally simple, small scale and of low efficiency (Matthes 1984). Gear materials are mostly purchased locally, often from trading vessels which bring them in (also on request) (Matthes 1984). Handlining methods include trolling lines and droplines. Fifty seven percent and 79% of fishers from Paget Farm (Bequia) and Canouan respectively, indicated that handlining was the most important type of fishing (CAN/SVG Fisheries Development Project 1991b).

Hand-operated trolling lines are made of monofilament nylon with several types of hooks and lures attached (Matthes 1984). When trolling, two to four lines baited with sprat are towed behind the boat (Matthes 1984). Fast outboard boats are preferred for trolling. Trolling lines mainly catch tunas, kingfish, dolphin fish and barracuda.

Droplines are used mostly in deep-slope and bank areas. They consist of a weighted line (weighted by an easily detachable sinker) with 3-5 hooks attached by short extensions to the main line. Hooks are typically baited with sprat, and carnivorous reef fish such as snappers and groupers are the main species targeted. Boats fishing with droplines either drift over the shelf area being fished or go "banking" where the boat tries to remain over a particular area and depth by rowing constantly (Matthes 1984).

Palang or bottom-set longlines are also used in the Grenadines. These lines are usually laid along the bottom, but are sometimes hung vertically down the shelf slope or bank edge (Mahon and Mahon 1990).

Trap fishing is done with traditional wire traps made of hexagonal mesh wire stretched over a wooden frame (Matthes 1984). Some are set in shallow water for subsistence catches while most are set deeper (> 18-27m) and catch a large variety of reef fish including snappers, groupers, and parrotfish (Matthes 1984). Traps are typically checked every 5-7 days (Chakalall 1982). Thirty-nine percent of fishers from Union stated that trap fishing for demersals was their main fishing activity (CAN/SVG Fisheries Development Project 1991b).

Seine nets are used to catch coastal pelagics. Seines are typically used in two ways: close inshore, by pulling the net onto a beach, or just offshore by encircling the fish (purse seining) and hauling the net up into a boat (Mahon and Mahon 1990). Beach seining is done in sheltered coastal areas where the seafloor is smooth and gently sloping (Mahon and Mahon 1990). One end of the beach seine is secured on shore while the remaining portion is "fed out" in a semicircular fashion from a seine boat which is usually rowed. The net is then gradually hauled in towards the shore carrying trapped fish with it.

Gillnets are made from monofilament nylon, not easily detected visually by fish. They can be set fixed at any depth, or left to drift at the surface (Mahon and Mahon 1990). Gillnets are commonly arranged circularly, or semi-circularly open to the beach while schools of fish are driven towards the

mesh where they are trapped, usually by their gills. These nets are used to catch pelagic fishes (Mahon and Mahon 1990).

Spearfishing is another common harvesting method in the Grenadines. Spearguns are used (while snorkeling/SCUBA diving) for some demersal fish species and turtles. Wire snares attached to the end of hand held wooden sticks (1m in length) are used while diving for capturing lobster (Morris *et al.* 1988) I

## **2.10 Fish Landings**

Over the past decade fish catch or landing records for the St. Vincent and Grenada Grenadines have always been scant, unreliable (Holness 1981) or unavailable (Anderson *et al.* g 1982). Trends in annual fish landing estimates for St. Vincent and the Grenadines and Grenada are given in Table 7. Chakalall (1982) emphasizes that the quantitative information on domestic landings is unsatisfactory, with estimates being made using assumptions which have never been evaluated. This results from the difficulties in data collection. Accessibility to landings which occur directly on to trading vessels is the main constraint to fisheries data collection in St. Vincent and the Grenadines (Morris *et al.* 1988). Fish landing sites by island are given in Figure1 and Table 8. The lack of manpower for sampling is another constraint to fisheries data collection.

The multispecies nature of reef fisheries, in addition to the scarcity of information on landings, fishing effort and size of exploited stock, makes it difficult to reliably estimate sustainable yields for the fisheries of St. Vincent and the Grenadines and other Eastern Caribbean nations (Goodwin 1985).

## **2.11 Crew Structure and Catch Sharing**

Worldwide, fishing crews are typically organized to spread the financial risk of fishing, with fishers being paid a portion of the catch rather than a fee or wage (Acheson 1981). Share systems may increase crew motivation by making them partners in the enterprise and may reduce the risk to boat owners by ensuring that they do not have to pay fixed wages if catches are poor (Forman 1970 cited in Acheson 1981). This type of crew organization and catch sharing is common in the Grenadines.

Crew structures for Grenadine fishers vary according to the fishing method used. For demersal handlining operations in the St. Vincent Grenadines, two persons per boat is most common (CAN/SVG Fisheries Development Project 1991b). Crews of three, four or even five fishers are also not uncommon and fishers tending traps or gill nets usually take one crew member (CAN/SVG Fisheries Development Project 1991b).

For fishers from the St. Vincent Grenadines, catch is typically shared with fuel costs subtracted, with a share for the boat, half a share or a full share for the engine, half share for SCUBA tanks if relevant and the balance among the fishers themselves (CAN/SVG Fisheries

**Table 7: Estimates of annual fish landings (mt).**

COUNTRY	YEAR	FISH LANDINGS	SOURCE
St. Vincent	1968	'394.6	1
St. Vincent and the Grenadines	1968	"157.8	1
St. Vincent and the Grenadines	1981	29S.S - 363.6	2
St. Vincent	1982	363.6	3
St. Vincent and the Grenadines	1975	""55.3	4
	1976	""770.5	4
	1977	-771.7	4
	1978	""805.3	4
	1979	""592.1	4
	1980	""740.1	4
Grenada	1980	1704.3	5
	1981	1614.2	5
	1982	1069.0	5
	1983	1690.2	5
	1984	1487.4	5
Grenada	1985	1584	6
	1985	1100	7
	1986	2338	8
	1987	4881	8
St. Vincent and the Grenadines	1985	547	6
	1985	1700	7
	1986	547	8
	1987	547	8
	1991-92	336-435.8	9
	1984-86	1700-1800	10
St. Vincent Grenadines	1984-86	850	10
Grenada	1979	1330.9	11
	1980	1260.5	11
	1981	652.4	11
	1982	872.7	11
	1983	1339.5	11
	1984	1841	11
	1985	2237	11
	1986	3508.4	11
	1987	3281.5	11
	1988	3022.3	11
St. Vincent and the Grenadines	1979	514.7	11
	1980	466.3	11
	1981	401.5	11
	1982	503	11
	1983	489.2	11
	1984	697.8	11
	1985	482.9	11
	1986	598.7	11
	1987	703.5	11
	1988	712.4	11
Grenada and Grenadines	1984	406.9	12
Camacau	1985	688.0	12
	1986	1068.9	12
	1987	933.0	12
	1988	736.2	12

\* - Based on the assumption that 60% of fish passing through the Kingstown Fish Market represents 60% of total quantity landed around the island of St. Vincent either by local boats or boats from the St. Vincent Grenadines; " - Based on the assumption that 40% of fish landed during this period was landed by boats from the Grenadines; ""\* - Estimates total production based on the assumption that fish landed at Kingstown Fish Market is 45% of total fish catch on the island of St. Vincent. Sources: 1. Vidæus 1969, 2. Holness 1981. 3. Anderson *et al.* 1982, 4. Fisheries Division, Ministry of Agriculture, Trade and Tourism (SVG) cited in Chakalall, 1982: 5. Artisanal Fisheries Development Project. Ministry of Agriculture, Fisheries, cited in Kawaguchi and Cortez 1985. 6. FAO 1985. 7. WECAFC 1986. 8. FAO 1986, 9. CAN/ SVG Fisheries Development Project 1991 d. 10. CCA 1991. 11. OECS Fisheries Desk, cited in Tabor 1990; 12. Finlay 1990.



**Table 8: Fish landing sites by island**

<b>ISLAND</b>	<b>FISH LANDING SITE</b>
<hr/>	
ST. VINCENT and GRENADINES	
Bequia	Paget Farm La Pompe Friendship Bay Mount Pleasant Spring Bay Admiralty Bay
Mustique Canouan Mayreau Union Island	Britannia Bay Grand Bay Saline Bay Ashton Clifton
GRENADA GRENADINES	
Petit Martinique Carriacou	Mount Pleasant Grand Bay Belmont Harvey Vale L'Esterre Hillsborough Bogles Windward
<hr/>	

Sources: Moms *et al.* 1988 and Finlay *et al.* 1988, -- No name determined.

Development Project 1991b). Variations in these arrangements are known to occur however. This was found to be particularly true for some fishers in Union Island where it was found that trap fishing enterprises often allocated half the catch to the owner of the traps, with the balance I divided among the crew (CAN/SVG Fisheries Development Project 1991b). Some fishers were also known to operate more individually, with each crewman retaining catch obtained with his own gear, and providing a third of it to the boat owner (CAN/SVG Fisheries Development Project 1991b).

In Grenada, two share systems are recognised. In the first system, fuel cost is subtracted from the proceeds of the catch with a third of the remainder each going to the boat captain and the bowman or second fisher, respectively (Finlay and Rennie 1985). In the other system, four equal shares are recognised. In this system half the gross catch is allocated to the boat (owner) with fuel being supplied from this portion and half is equally divided between the captain and the bowman or second fisher (Finlay and Rennie 1985).

## **2.12 Fisher Population**

Estimates of the number of active fishers in the Grenadines vary as there is no recent census. About 5,000-6,000 fishers are estimated to be in St. Vincent and the Grenadines (Matthes 1984. Tabor 1990), 3,000 of which are probably full time fishers (Czekaj 1984).

For the St. Vincent Grenadines alone, 85-95% of the adult males are reported to be fishers or active in related sectors (CCA/IRF 1991). In 1982, the active fisher population for the Grenadine islands of Bequia, Canouan, Mayreau and Union totalled 800 (Fisheries Division Data, St. Vincent and the Grenadines cited in Chakalall 1982).

Lower estimates of the number of active fishers have also been reported. Berwick, (1986) cited by CCA (1991) based on information from the Chief Fisheries Officer gave an estimate of 2500 full time and 1000 part time fishers for St. Vincent and the St. Vincent Grenadines. For the Grenada Grenadines islands of Carriacou and Petit Martinique, active fisher population has been reported as 191 (Kawaguchi and Cortez 1985) and 70 (Finlay *et al.* 1988, Finlay 1990) respectively. Trends in total fisher population by community for St. Vincent, the St. Vincent Grenadines and Grenada Grenadines, and trends in total fisher population of St. Vincent and the Grenadines and Grenada (1982-1987) are provided Tables 9 and 10.

## **2.13 Current Status of Fishery Resource Monitoring**

While it has been acknowledged that a substantial component of the Grenadian fishery operates in the Grenadines, the fishery has remained difficult to monitor from Grenada (Finlay *et al.* 1988). In order to remedy this traditional inability to collect data for monitoring, particularly from fish traders, the use of export forms and purchase slips has been proposed. Grenada has considered requesting that fish trading vessels fill in purchase slips for fish procured from supplying fishers (Finlay *et al.* 1988). These purchase slips are expected to provide basic statistics on total catch by species and some price information.

Export permits are currently required for export of fish, lobster and conch from Grenada and the Grenada Grenadines (Finlay *et al.* 1988). Under-reporting of exports to Martinique is suspected, as it reduces the amount of duty paid on landing the fish in Martinique (Finlay *et al.* 1988).

In St. Vincent and the Grenadines, export permits stating amounts of each species group to be exported are also required by fish traders prior to each trip (Morris *et al.* 1988). Under-reporting was believed to occur due to the existence of a tariff of \$1.10 per kg (\$0.50 per lb.) on fish, \$2.20 per kg (\$1.00 per lb.) on lobster and \$1.10 per kg (\$0.50 per lb.) on conch (Morris *et al.* 1988). In addition to export permits, fish for export from St. Vincent and the Grenadines also require health certification.

## 2.14 Historical Trends in Grenadine Demersal Fishing and Fish Trading

The earliest documented evidence of Grenadine demersal fish trading, particularly to the island of Martinique, is reported by Vidaeus (1969). In this report he indicated that fish caught by Canouan and Bequia fishers constituted the majority of fish exported from the St. Vincent Grenadines to Martinique and Guadeloupe, with virtually none being exported from mainland St. Vincent. Martinique has traditionally been a large importer of fish with all types being imported and high prices fetched (Pena and Worth 1979).

**Table 9: Trend in total fisher population by community *for St. Vincent and the Grenadines and Grenada Grenadines.***

COMMUNITY	FISHER POPULATION SIZE	YEAR	SOURCE
<u>St. Vincent and Grenadines</u>			
Bequia	600	Aug-Dec 1981	1
Paquet Farm, Bequia	150-200	1982	2
	140	1991	5
<u>Grenada Grenadines</u>			
Canouan	80	Aug-Dec 1981	1
	42-45	1991	5
Mayreau	40	Aug-Dec 1981	1
Union Island	80	Aug-Dec 1981	1
	50	1991	5
Carriacou	191	1983	6
Harvey Vale	13	1988	6
L'Esterre	36	1988	6
Hillsborough	35	1988	6
Bogles	10	1988	6
Windward	53	1988	6
Mount Pleasant	4	1988	6
Grand Bay	8	1988	6
Belmont	4	1988	6
<u>Pent Maninigug</u>	70	1990	6
	70	1988	4

1. Fisheries Division, Ministry of Trade, Agriculture and Tourism (SVG), cited by Chakalall, 1982;
2. Brana-Shute, 1982;
3. Artisanal Fisheries Development Project, Ministry of Agriculture and Fisheries cited by Kawaguchi and Cortez, 1985;
4. Finlay, *et. al.*, 1988.;
5. CAN and SVG Fisheries Development Project, 1991<sup>d</sup>.;
6. Finlay, 1990.;

**Table 10: Trend in total Fisher population of St. Vincent and the Grenadines and Grenada.**

COUNTRY	FISHER POPULATION SIZE	YEAR	SOURCE
St. Vincent and the Grenadines	2800	1982	1
	3000	1984	2
	5000-6000 (3000 hill-time)	1984	3
	1255	1986-87	4
	3500 (2500 fall-time)	1986	5
	6000		6
Grenada	1749		6

1. Holness 1982, 2. Czekaj 1984. 3. FAO Fisheries Development study. 1984 cited in CCA 1991. 4. Draft Report. Workshop on Data Collection Systems in Eastern Caribbean OECS Unit 1987. 5. Berwick, cited in CCA 1991. 6. Tabor 1990.

For the year 1968 the fish exported from the St. Vincent Grenadines to Martinique and Guadelope was recorded as approximately 70,000 lbs (32 mt) (Vidaeus 1969). Statistics from the Ministry of Agriculture, Trade and Tourism, St. Vincent and the Grenadines, cited in Chakalall (1982) indicates that this figure increased steadily through the 1970s peaking at 301 mt and 9117 mt in the years 1978 and 1979 respectively. Demersal fish exports from Grenada to Martinique for the period November 1978 to March 1979 were recorded as (21 mt) (Pena and Worth 1979).

During the late 1960s, the period in Grenadine fish trade is believed to have been initiated, the trade was conducted primarily by French entrepreneurs. These entrepreneurs, in addition to some locals, were noted as making the "lion's share" of profits by purchasing fish locally at "rock bottom" prices and re-selling it in the French islands (Branan-Shute 1982). Fish was purchased by the French primarily from French vessels off the Grenadine islands.

Much of the Grenadine fish trading by French entrepreneurs was illegal. Evidence of this came from reports of the observation of fish exportation from Canouan by expatriate (French) residents without export licenses (Field Report, Chief Fisheries Officer, SVG. 1981). Reports of past demersal fishing by French vessels in the waters of Grenada and Carriacou have also been made (Pena and Wirth 1979).

As early as the 1940s, commercial demersal fishing activity was recorded. Fishing activity was typified by Carriacou decked-sloops (Brown 1945), probably similar in basic design to the present day trading vessels. These vessels were known to fish night and day at sea (according to tide, ground and weather) using handfines with catch being "corned on board and dried in the rigging until it could be sold on Saturday, market day in Grenada" (Brown 1945).

The characteristics of the Grenadine Islands are summarized in Tables 11 and 12.

### **3. METHODS**

#### **3.1 Initial Reconnaissance**

The intended approach to data collection consisted of three components: regular broadscale sweeps of the area using Government Fisheries Division outboard boats to monitor the activities of the trading vessels, interviews and sampling alongside trading vessels, and interviews of fishers ashore.

During the first week of the study the feasibility of the intended data collection approach was evaluated. The broad-scale sweeps were found to be impractical since the SVG Fisheries Division boat in Union Island could only cover the area during calm sea conditions. Furthermore, the estimated cost of fuel for sweeps of the entire area using this vessel was prohibitive. The survey vessel anticipated for the northern Grenadines was not available for use during the time of the study. The alternative of vessel charter or rental for survey sweeps proved to be too costly. Therefore, the boat sweep survey to determine the activities of the trading vessels during the study period was replaced by a system of informants and by direct observation by the investigator.

Table 11: Summary of key island profile characteristics for the St. Vincent and Grenada Grenadines.

ISLAND PROFILE CHARACTERISTICS (CURRENT)	ST. VINCENT							GRENADA		
	BEQUIA	MUSTIQUE	CANOUAN	MAYTREAU	UNION ISLAND	PALM ISLAND	PETTIT ST. VINCENT	PETTIT MARTINIQUE	CARRIACOU	
Area (km <sup>2</sup> )	8.12 <sup>1</sup>	5.18 <sup>1</sup>	7.77 <sup>1</sup>	2.59 <sup>1</sup>	8.28 <sup>2</sup>	0.52 <sup>2</sup>	0.52 <sup>2</sup>	2.00 <sup>3</sup>	34 <sup>3</sup>	
Population	4420 <sup>1</sup>	1290 <sup>1</sup>	1832 <sup>1</sup>	170 <sup>1</sup>	1900 <sup>1</sup>	1900 <sup>1</sup>	1900 <sup>1</sup>	--	--	
Population Density/km <sup>2</sup>	243.92	249.03	235.78	65.64	203.86	203.86	203.86	--	--	
Fisher Population	600	--	42-45 <sup>4</sup>	40 <sup>4</sup>	50	--	--	70	171 <sup>5</sup>	
Capital Towns	Port Elizabeth	--	--	--	Clifton	--	--	Hillsborough	--	
Main Fishing Areas	Paget Farm La Pompe Friendship Bay Mount Pleasant Spring Bay Admiralty Bay	Britannia Bay	Grand Bay	Saline Bay	Ashton Clifton	--	--	Mount Pleasant Grand Bay Belmont Harvey Vale L'Esterre Hillsborough Boyle Windward	--	

<sup>1</sup>CCA, 1991; <sup>2</sup>OSVG 1991 Census cited in CCA, 1991; <sup>3</sup>Peda and Wirth; <sup>4</sup>Fisheries Division, Ministry of Trade and Tourism (SVG) cited by Chabotat, 1982; <sup>5</sup>CAN and SVG Fisheries Development Project, 1991 Vol IV, Friday 1990.

**Table 12: Historical trend in total population size of St. Vincent and the Grenadines (1960-1980).**

YEAR	COUNTRY	POPULATION SIZE	SOURCE
1960	St. Vincent and the Grenadines	4,964	1
	Bequia Battawia Bafliceau and Mustique	3,030	1
	Petil Martinique Savan	118	1
	Canouan	542	1
	Mayreau	127	1
	Union Island	1,147	1
	1980	Bequia Mustique Balliceau Battawia	5,718
	Canouan Mayreau Union Island Palm Island Petit St. Vincent	3,230	2

1. 1960 SVG Population Census, cited by Vidaeus, 1969; 2. Central Statistical Unit, SVG, cited by Chakalall, 1982

During the first three weeks of the study a Reconnaissance of the study area was conducted. This included: initiating contact with fishers, trading vessel operators and other possible informants; field testing questionnaires/interviews; identifying key areas of fishing and fish marketing activity; estimating number of fishers active in each area; listing active trading vessels and evaluating the feasibility of using the proposed data gathering techniques.

### **3.2. Data Collection**

The methodology used in this study included elements of an emerging technique known as Rapid Rural Appraisal (RRA). Rapid Rural Appraisal is a process for expeditious acquisition of knowledge about rural conditions (Grandstaff *et al.* 1985).

Rapid Rural Appraisals consists of interview methods and approaches by which outsiders can gather information about rural conditions in a cost effective manner. It characteristically employs a variety of methods, tools and techniques selected to enhance understanding of rural conditions, with particular emphasis on tapping the knowledge of local inhabitants and combining this knowledge with scientific technical information (Grandstaff *et at.* 1985). Such methods seek an optimal balance

between cost of collection, learning, relevance, timeliness, accuracy, and application of findings (Chambers 1985).

In this study, a multifaceted approach to information gathering was employed, where the same questions/issues were investigated using different methods and the results cross-checked to provide a more accurate account of trading vessel and supplying fisher activity. In Rapid Rural Appraisal, research is usually compressed in time and respondent sampling is normally less than that required for statistical confidence (Grandstaff *et al.* 1985).

The techniques employed in this study were: survey questionnaires directed at fishers and trading vessel operators (Appendix), informal key informant interviews, direct observation, and analysis of existing available data.

### 3.2.1. Fisher Interviews

A list of landing areas and estimates of the number of fishers at each was compiled during the Reconnaissance mission and used as a basis for sampling. A sample of about 150 fishers was considered optimal. Survey questionnaires were to be administered among landing sites approximately in proportion to the numbers of fishers. Sampling of fishers was to be opportunistic. During the exploratory period several approaches for eliciting responses from supplying fishers and trading vessel operators for survey data acquisition were field tested. The most successful approach was to initiate general dialogue with a minimum period for respondent confidence building and trust of interviewer when time permitted. This was typically followed by a session where questionnaire information was subtly elicited by purposeful manipulation of casual/general conversation. Survey questions were memorized and delivered by the interviewer without the physical presence of the questionnaire document. The questionnaire was then completed from memory after the interview session.

This technique of administering the survey questionnaire worked well. It was implemented for the full duration of the study period, primarily because extremely high levels of suspicion and aggression towards the researcher's presence were frequently encountered. Questionnaire administration with the questionnaire document in the view of the interviewee was not successful. Information flowed more freely when conversations were not perceived by the fisher as being unidirectionally extractive towards the interviewer, but more as an interactive exchange of ideas and experiences. Active researcher assistance of the fishers with their routine activities such as fishing or hauling up boats enhanced the probability of obtaining interviews. Interviews were solicited at locations commonly frequented by fishers, e.g. rum shops and shore areas where boats, were hauled up.

### 3.2.2 Trading Vessel Interviews

These interviews were conducted on an opportunistic basis, ashore or aboard the trading vessels. Trading vessels were selected for interviews on the basis of a preliminary list of all active trading vessels compiled during the Reconnaissance mission. The probability of access to trading vessel interviews increases at locations where trading vessels anchor to purchase fish or at docksides where ice is normally purchased. Out of a total of 12 active vessels, 5 interviews were successful.



### 3.2.3. Structured Key Informant Interviews

These interviews were conducted informally with non-fishing individuals who have been established in the island communities for many years, and who were knowledgeable about fishery and trading boat activity, e.g. civic leaders, extension officers, shop-keepers, school teachers, and fishery cooperative personnel. Approximately 14 key informants were targeted, i.e. two from each island. Apart from their knowledge of the fishery, key informants were selected on the basis of their willingness to communicate along with the ability to do so clearly. Informant interviews were not as rigidly formatted as the survey questionnaires. However, most of the same issues were addressed. Eight informants who were willing to participate in the study were located (Table 13).

### 3.2.4. Informant System

A system of telephone contacts was established and was polled weekly (August 18 to September 22) to elicit information on the patterns of movement of trading vessels. Data gathering concentrated on islands which represented the main hubs of activity for trading vessels. Contacts in Bequia were telephoned once or twice weekly to determine which boats had departed for Martinique during the preceding week and the date of departure. Dates of vessel arrival or expected arrival from Martinique were also solicited during these weekly calls. Information gathering on trading vessel turnover in Bequia was conducted by telephone from Union Island, the base of operations of the researcher. In Petit Martinique, no telephone contacts were established due to high hostility and suspicion. Trading vessel turnover data from Petit Martinique were collected by the Fisheries Extension Officer from Carriacou (August 26 to October 3) during his weekly visit.

This method of data collection was supplemented by observing trading vessels during travel to the islands. During these trips enquiries as to vessel activity during the previous week were also made. The duration of data collection was constrained by a delay in installation of telephone services to facilitate communication from the base of operations.

### 3.2.5. Direct Observation

The activity and mode of operation for both trading vessels and supplying fishers were directly observed during travel between islands. Much of the observation of trading vessel activity and their purchasing transactions with fishers were made ashore, adjacent to mooring locations.

**Table 13: Grenadine key informants, their locations and their individual profiles.**

<b>INFORMANT#</b>	<b>LOCATION</b>	<b>PROFILE</b>
1	La Pompe, Bequia	<b>Profession:</b> Retired whaler and fisher <b>Age:</b> 70's <b>Association with fishing activity:</b> Fisher in the past. Commercial involvement and family connections with trading vessels
2.	Paget Farm, Bequia	<b>Profession:</b> Retired fisher/general store shopkeeper/seine boat owner. <b>Age:</b> 60's
3.	Canouan	<b>Association with fishing activity:</b> Involved in seine fishing <b>Profession:</b> Proprietor of a guest house and bar <b>Age:</b> late 50's <b>Association with fishing activity:</b> Observes trading boats and interacts socially with fishers
4.	Mayreau	<b>Profession:</b> Artist/businessman. (Expatriate resident). <b>Age:</b> Late 40's <b>Association with fishing activity:</b> Observes fisher activity at landing sites. Frequently interacts socially with fishers
5.	Clifton, Union Island	<b>Profession:</b> Schoolteacher/U.W.I. student <b>Age:</b> 27 <b>Association with fishing activity:</b> Immediate past secretary of Union Island Fishing Cooperative
6.	Ashton, Union Island	<b>Profession:</b> Civil servant <b>Age:</b> late 40's <b>Association with fishing activity:</b> Works with fishers and fisher development activities
7.	Hillsborough, Caniacou	<b>Profession:</b> Civil servant <b>Age:</b> 30's <b>Association with fishing activity:</b> Works with fishers and fisher development activities
8.	Hillsborougn, Caniacou	<b>Profession:</b> Senior civil servant <b>Age:</b> 40's <b>Association with fishing activity:</b> Grew up and currently lives in main fisher community

### 3.2.6. Export Data

Health certificate records from St. Vincent and the Grenadines contain export information. These data and export data from Carriacou and Petit Martinique were accessed, computerised and analysed to determine trends in activity. Health certificate data from St. Vincent and the Grenadines which recorded individual export shipments of less than 45.4 kg (100 lbs) were not included in the analysis as these shipments appeared to be personal use, rather than commercial. The export data available for Carriacou and Petit Martinique are data for trading vessel fish exports from 1988-1993, as recorded by the Fisheries Extension Officer in Carriacou. Export data for 1985-1992 from St. Vincent and the Grenadines are derived from health certificates and includes all fishery exports, both by aeroplane and by trading vessel.

### 3.2.7 Import Data

Data on fish imports into Martinique were acquired from the Statistics Bureau of Martinique Ecosystems.

### 3.3 Interview Data Analysis

For fisher interview data the G-test (which is based on the Chi-square distribution) was used to determine if the proportions of responses differed significantly among areas of operation (Sokal and Rohlf 1981, Ch. 17). Since the sample size of Carriacou (Grenada) respondents was small (5) the data from this island were pooled with those of the southern St. Vincent Grenadines for use with the G test. Thus the test is for significant differences between the northern and southern Grenadines with Carriacou being considered as a southern Grenadine.

### 3.4 Fish Description Categories

Throughout this study reference is made to fish by general categories and sometimes by local Grenadine common names. Equivalent official (FAO) common and scientific names are provided in Table 14.

For export data, the categories reef/demersal (r/d), large pelagics (lp), seine fish (sn) mixed fish (mix), lobster (lob), conch (conc), and other (oth) are used. The category reef/demersal refers to reef fish species such as *Scarus* spp., *Holocentrus* spp. and demersal species such as *Lutjanus* and *Epinephelus* spp. The category large pelagics refers to large migratory pelagic species such as *Thunnus* and *Coryphaena* spp. and the category seine fish refers to schooling coastal pelagic species such as *Selar crumenophthalmus* and *Decapterus macarellus*. Lobster, conch and other categories refer to *Panulirus argus*, *Strombus gigas* and other aquatic invertebrates such as *Tripnustes ventricosus*, respectively. The category mixed fish is used in reference to shipments of seine fish, large pelagic and reef/demersal categories combined.

Redfish and whitefish are also two common Grenadine fish description categories encountered. The category redfish includes all deep and shallow demersal species exhibiting red pigmentation such as *Holocentrus*, *Epinephelus* and *Lutjanus* spp. The category white fish refers to all small pelagics species, particularly those species caught by seine. Occasionally some large pelagic species are included in the category whitefish.

### 3.5 Computation of Fish Yield from the Grenadine Bank

Two independent estimates of annual fish yield from the Grenadine Bank were derived from key informant, giving fisher and trading vessel data using the two formulae, given below:

$$(1) Y = VC \times TM \times AV \times MA$$

$$(2) Y = VC \times (365/DP + DT + DO) \times AV$$

**Table 14: Local, official common and scientific names of fish species commonly traded in the Grenadine Islands.**

GRENADINE COMMON NAME	OFFICIAL COMMON NAME (FAO)	SCIENTIFIC NAME
albacore, yellow whip	yellowfin tuna	<i>Thunnus albacares</i>
amber cavalli	greater amberjack	<i>Seriola dumerili</i>
barracuda	barracuda	<i>Sphyræna barracuda</i>
bonito	blackfm tuna	<i>Thiamus atlanticus</i>
greenback cavalli	blue runner	<i>Caranx cryos</i>
horseeye cavalli	horseeye cavalli	<i>Caranx latus</i>
dolphin	dolphinfish	<i>Coryphaena hippurus</i>
grouper	grouper	<i>Epinephelus</i> spp.
king fish (mulatto)	king mackerel	<i>Scomberomorus cavalla</i>
ocean gar	Atlantic sailfish	<i>Istiophorus platypterus</i>
salmon	rainbow runner	<i>Elagatis bipinulatus</i>
red hind	red hind	<i>Epinephelus guttatus</i>
mackerel	cero	<i>Scomberomorus regalis</i>
jacks	big eye scad	<i>Selar crumenophthalmus</i>
robins	mackerel scad	<i>Decapterus macarellus</i>
rock hind	rock hind	<i>Epinephelus adscensionis</i>
porgy	white margate	<i>Haemulon album</i>
balahoo	balao halfbeak	<i>Hemiramphus balao</i>
goat fish	goatfish	<i>Pseudupeneus</i> spp.
old wife	queen triggerfish	<i>Balistes vetula</i>
doctor fish	doctor fish	<i>Acanthurus chirurgus</i>
blem	queen snapper	<i>Etelis oculatus</i>
chub/caca belly	parrotfish	<i>Scarus</i> spp.
redman/memon/kitti	squirrel fish	<i>Holocentrus ascensionis</i>
red snapper/red fish	red snapper	<i>Lutjanus purpureus</i> .
yellow tail	yellowtail snapper	<i>Ocyurus chrysurus</i>
grunt	grunt	<i>Haemulon</i> spp.
grey snapper	grey snapper	<i>Lutjanus griseus</i>
jew fish	giant grouper	<i>Epinephelus itajara</i>
butterfish	coney	<i>Epinephelus fulvus</i>
butterfish	graysby	<i>Epinephelus cruentatus</i>
gar	flat needlefish	<i>Ablennes hians</i>
skip jack	skipjack tuna	<i>Katsuwonus pelamis</i>
kingfish (wahoo)	wahoo	<i>Acanthocybium solanderi</i>
red kitti	black-bar soldier fish	<i>Myripristis jacobus</i>

where:

**Y** = Fish yield (mt)

**TM** = Avg. # of trading vessel trips to Martinique per month

**VC** = Avg. vessel capacity (mt)

**AV** = *ff* of active vessels in each major area of operation

**DP** = Duration of fish purchase per trip (days)

**MA** = # of months per year during which vessel active

**DT** = Duration of trading vessel transport per trip (days)

**DO** = Duration of fish offloading per trip (days)

Estimates calculated using formulae 1 and 2 given are based on the majority response of fishers, trading vessel operators and key informants with respect to component data variables.

#### 3.5.1 Estimates Based on Key Informant Data

Key informants provided data on: average number of trading vessel trips to Martinique per month (TM), estimated average vessel capacity (VC), numbers of active vessels in each major area of operation (AV), duration of fish purchase (DP), duration of fish offloading (DO), and duration of trading vessel transport (DT).

The number of months per year that vessels are active (MA) was not given by key informants. An assumption of 12 months was therefore used since both trading vessels and supplying fishers reported that vessels actively purchased fish over an entire year, but with higher frequency in some months.

Minimum and maximum estimates were made using formula 1 for the southern and northern Grenadines based on the values of the least and most (average) number of trips per month (TM) reported by a majority of informants. Minimum and maximum estimates using formula 2 are based on the least and most (average) number of days spent offloading fish (DO).

#### 3.5.2. Estimates Based on Supplying Fisher Data

Supplying fishers provided data on the average quantity of fish caught daily (FC), the duration of fish purchase (DP), the number of active vessels known in each area of operation (AV), the average trips per month (TM), the estimated maximum loading capacity per vessel trip to Martinique (VC), and the number of months per year vessel active (MA). Since DO, DT, and VC were not provided by fishers, values given by key informants were used.

#### 3.5.3. Estimates Based on Trading Vessel Operator Interview Data

Trading vessel operators provided data (as did key informants and fishers) on the duration of fish purchase (DP), the number of active vessels known in each area of operation (AV), the average number of trips per month (TM), the estimated maximum vessel loading capacity to Martinique per vessel trip (VC) and the number of months per year vessel active (MA). Since DT and DO were not provided by fishers, values given by key informants were used.

#### 3.5.4. Estimates from Export Data

Estimates of the total annual fish yield from the Grenadine Bank were also calculated from export data using the actual recorded values of annual exports. Annual fish export data from St. Vincent and the Grenadines were available from 1985 to 1992, and from Carriacou from 1989 to 1993. Estimates were calculated based on the average annual export quantity for the entire period of record, and on the average annual export quantity for the last two years of available data.

### 3.5.5 Estimates from Import Data

Estimates of the total annual fish yield from the Grenadine Bank were also calculated from Martinique import data using the actual recorded values of annual imports. Annual fish import data were available from 1980 to 1993. Again, estimates were calculated based on the average total annual import quantity from Grenada and St. Vincent and the Grenadines for the entire period, and the average annual import quantity for the last two years for which a full data set was available {1991 and 1992}.

## 4. RESULTS

The results of fisher interviews, trading vessel interviews, key informant interviews and personal observation are presented together in the following section under topic headings. When reporting on the operational characteristics of trading vessels and fishers, the results of fisher interviews are presented first, followed by results of interviews from trading vessels and key informants (Sections 4.2). When reporting on activity at the destination market and historical activities the results from key informants are presented first, followed by personal observations (Sections 4.3). Estimates of fish yield from the Grenadine Bank based on data collected from supplying fisher, key informant, trading vessel operator and export records are presented in the final section.

Fifty-two fishers were interviewed overall in Bequia, Mustique, Canouan, Mayreau, Petit Tabac (Tobago Cays), Union Island, and Carriacou. For analysis, the interview results (survey questionnaire responses) were separated into three main areas: northern Grenadines (Bequia, Mustique and Canouan), southern Grenadines (Mayreau, Petit Tabac (Tobago Cays), and Union Island) and Carriacou. The general receptivity to survey interviews across all Grenadine islands was hostile. No fishers from Petit Martinique could be interviewed because of high levels of hostility and suspicion.

Of a total of 15 trading vessels for the entire Grenadines area (as reported by fishers in survey questionnaire responses), 12 were confirmed as operationally active by direct personal observation. From these, five were interviewed. Three of the vessels which provided interviews were from the southern Grenadines, based in Petit Martinique, and two were from the northern St. Vincent Grenadines, based in Bequia.

Active cooperation for interviews was obtained from 8 key informants in the Grenadines, two each for the islands of Bequia, Carriacou and Union and one each for Canouan and Mayreau (Table 13). No key informants were found in Petit Martinique or Mustique. In addition, three key informants from Martinique were interviewed, a sanitary health inspector and two officials from the Statistics Bureau of Martinique Customs.

## 4.1. Supplying Fisher Operational Characteristics

### 4.1.1. Fisher Distribution by Community of Residence and Port of Operation

The cross-tabulation of island of residence by port of operation shows that all fishers except Bequians operate primarily around their own islands or community (Table 15). Bequian fishers

**Table 15: The percentage distribution of fishers for each community of residence by port of operation.**

ISLAND	PORT OF OPERATION	COMMUNITY OF RESIDENCE				
		UNION	MAYRKAU	BEQUIA	CANOUAN	CARRIACOU
Union Island	Ashton	42	0	0	0	0
	Clifton	58	0	0	0	0
Mayreau	Saline Bay	0	100	0	0	0
Carriacou	Windward	0	0	0	0	100
Tobago Cays	Petit Tabac	0	0	19	0	0
Bejjim	Paget Farm	0	0	28	0	0
	Friendship Bay	0	0	5	0	0
Mustique	Brittania Bay	0	0	47	0	0
Canuuan	Grand Bay	0	0	0	100	0

appear to be highly mobile, travelling to and operating in other islands as far as Mustique in the northern zone and Petit Tabac in the southern zone. The majority (47%) of Bequian fishers interviewed fish out of Mustique, and 19% fish out of Petit Tabac in the Tobago Cays while the remaining 28% and 5% respectively, fish out of Paget Farm, and Friendship Bay in Bequia itself. These results confirm the popular observation that the Bequian fishers are the most far-ranging fishers within the Grenadines.

### 4.1.2. Employment Status in Fishing

The proportion of full-time fishers is higher in the northern St. Vincent Grenadines (82 %) than in the southern St. Vincent Grenadines (67%). In Carriacou 60% of fishers are full-time.

### 4.1.3. Methods of Fish Capture

Half of the fishers interviewed in the southern St. Vincent Grenadines indicated that their primary fishing method was by spear gun, while 18% fished using seine and an additional 18% used lines. Trap fishing was the least used method by fishers in the southern St. Vincent Grenadines, being the primary gear for 14% and the secondary gear for 9% of the fishers (Table 16).

In the northern St. Vincent Grenadines, 48% of fishers indicated that their primary fishing method was seine, with 40% and 12% of fishers fishing by spear gun and by line respectively (Table 16).

For Carriacou fishers, the predominant primary fishing method reported by fishers was line. This was reported by 60% of all fishers interviewed. Gill netting and spear fishing were the only other primary methods of fish capture reported by fishers in Carriacou (Table 16).

#### 4.1.4 Average Quantity of Fish Caught Daily

In the northern St. Vincent Grenadines the average quantity of fish caught daily was reported by fishers as ranging between 10-20 kg for demersal and reef fish and 40-1000 kg for coastal pelagic fish (although most (84%) reported coastal pelagic catches of 500-1000 kilograms per day) (Table 17).

**Table 16: Percentage fisher response as to Primary (P), Secondary (S) and Tertiary (T) methods of fish capture utilized in each of the three main areas of operation.**

METHOD OF FISH CAPTURE	NORTHERN GRENADINES (St. Vincent)			SOUTHERN GRENADINES (St. Vincent)			CARRIACOU (Grenada)		
	P	S	T	P	S	T	P	S	T
Spear gun	40	0	0	50	18	0	20	0	0
Seine	48	0	0	18	5	5	0	0	0
Line	12	0	0	18	0	0	60	0	0
Trap	0	0	0	14	9	0	0	0	0
Gill net	0	0	0	0	0	0	20	0	0

**Table 17: Percentage response in the Grenadines of survey respondents for each of the three major areas of operation as to the average quantity of fish caught daily.**

AVERAGE QUANTITY OF FISH CAUGHT DAILY (kg) - AS REPORTED BY SURVEY RESPONDENTS	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
Demersal and Reef Fish			
5-10	0	5	0
10-15	50	42	40
15-20	50	42	20
20-30	0	11	40
Coastal Pelagic Fish			
40-50	5	4	0
50-100	8	28	0
100-500	0	68	0
500-1000	84	0	0



In the southern St. Vincent Grenadines the average quantity of fish caught daily ranges from 5-30kg for demersal and reef fish species and 40-500kg for coastal pelagics (Table 17).

In all St. Vincent Grenadine islands, the average quantities of fish caught varies with the method of capture. Higher quantities were reported by fishers who fish for coastal pelagic species.

In Carriacou, only demersal and reef fish species are landed and fishers reported average daily catch quantities of 10-30 kilograms (Table 17).

#### 4.1.5 Daily Fishing and Fish Selling Practices

Personal observations indicated that supplying fishers go out early in the morning and return during early to mid afternoon (6.00 am - 3.00 pm.). Fish is sold in the vicinity of the home port of operation if trading vessels are nearby. If no trading vessels are in the vicinity of the home port of operation, fishers travel to those islands where trading vessels are buying fish. This is a common occurrence for Union Island and some Carriacou fishers who frequently travel to Petit Martinique to sell their catch, if no vessels are present at Union, nearby Palm Island or at Carriacou respectively.

Personal observations indicated that during purchasing transactions fishers typically come alongside and transfer their catch to trading vessels. The catch is then laid on deck and fish that can be taken are selected and weighed whole, i.e. without being gutted first. Fishers are then paid per kilogram for the fish selected.

Informant #2 suggested that fishers are underpaid as trading vessel operators pay them per kilogram using a rough conversion rate of 2 lbs = 1 kilogram while at the same time, recording fish weights using the standard rate of 2.2 lbs = 1 kilogram.

Observations also indicate that supplying fishers do not fish if trading vessels are absent or are not actively purchasing fish.

### **4.2. Trading Vessel Operational Characteristics**

#### 4.2.1 Fish Marketing Locations and Purchasers

For both the southern and northern St. Vincent Grenadines, the major primary purchasers of fish were trading vessels, whilst in Carriacou restaurants/hotels and trading vessels were both reported as important primary purchasers (Figure 2, Table 18). Most fishers interviewed in the southern and northern St. Vincent Grenadines (83% and 100% respectively) ranked trading vessels first as purchasers of fish. A majority in both these zones indicated that there were no major secondary or tertiary buyers of fish catch. In Carriacou, trading vessels were reported to be the most significant secondary purchasers (Figure 2, Table 18).

For all the Grenadine islands combined, primary fish purchasers were ranked as follows: trading vessel > restaurant/hotel > local consumer. Trading vessels therefore constitute the single most important market for Grenadine fishers.

All vessels and all key informants interviewed indicated that the fish purchased in the Grenadines was always sold in Forte de France, Martinique (Table 19). All vessels reported that their fish was sold solely to fish purchasing agents who act as both wholesalers and retailers in Martinique.

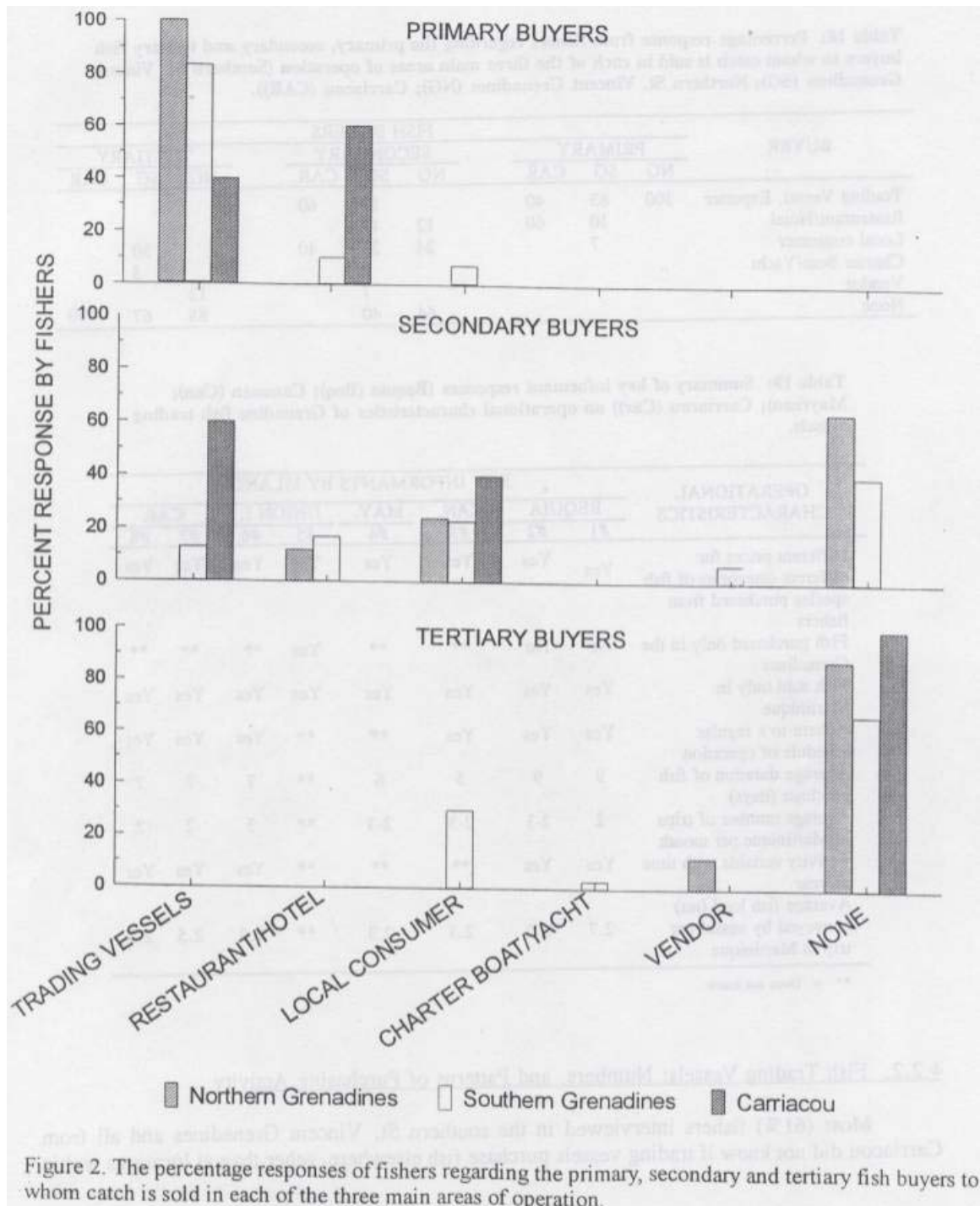


Figure 2. The percentage responses of fishers regarding the primary, secondary and tertiary fish buyers to whom catch is sold in each of the three main areas of operation.

**Table 18: Percentage response from fishers regarding the primary, secondary and tertiary fish buyers to whom catch is sold in each of the three main areas of operation (Southern St. Vincent Grenadines (SG); Northern St. Vincent Grenadines (NG); Carriacou (CAR)).**

BUYER	FISH BUYERS								
	PRIMARY			SECONDARY			TERTIARY		
	NG	SG	CAR	NG	SG	CAR	NG	SG	CAR
Trading Vessel, Exporter	100	83	40/60	12	13/17	60			
Restaurant/Hotel	10								
Local consumer	7			24	23	40		30	
Charter Boat/Yacht								3	
Vendor None				64	7		12	67	100
					40		88		

**Table 19: Summary of key informant responses (Bequia (Beq); Canouan (Can); Mayreau); Carriacou (Car)) on operational characteristics of Grenadine fish trading vessels.**

OPERATIONAL CHARACTERISTICS	KEY INFORMANTS BY ISLAND									
	BEQUIA		CAN.		MAY.		UNION I.		CAR	
	#1	#2	#3	#4	#5	#6	#7	#8		
Different prices for different categories of fish species purchased from fishers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Fish purchased only in the Grenadines	No	No	**	**	Yes	**	**	**	**	
Fish sold only in Martinique	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Adhere to a regular schedule of operation	Yes	Yes	Yes	**	**	Yes	Yes	Yes	Yes	
Average duration of fish purchase (days)	9	9	5	6	**	7	7	7		
Average number of trips to Martinique per month	2	2-3	2-3	2-3	**	3	2	2		
Activity variable with time of year	Yes	Yes	**	**	**	Yes	Yes	Yes		
Average fish load (mt) conveyed by vessel per trip to Martinique	2.7	2.0	2.3	2.3	**	2.5	2.5	2.5		

\*\* = Does not know.

#### 4.2.2. Fish Trading Vessels: Numbers, and Patterns of Purchasing. Activity

Most (61%) fishers interviewed in the southern St. Vincent Grenadines and all from Carriacou did not know if trading vessels purchase fish elsewhere, other than at locations within the Grenadine islands (Table 20). The results from Carriacou, however, may not be a true representation, due to the small sample size. Eighty-one percent of fisher respondents from the northern St. Vincent Grenadines responded that trading vessels also purchased fish from mainland St. Vincent.

In all of the Grenadine locations, vessel names were seldom known by fishers (Table 21). Instead, fishers typically referred to vessels by the names of their captains or owners. A list of named trading vessels known to be active is given in Table 21. In some cases where the captain's name is used, the associated vessel name could not be determined. However, care was taken to avoid overlap, i.e. the inclusion of a vessel name and a corresponding captain's name as distinct vessels.

**Table 20: Percentage responses of fishers from each main area of operation as to whether trading vessels purchase fish in locations other than the Grenadine islands**

RESPONSE	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
No other locations Mainland	13	13	0
St. Vincent	81	26	0
Don't Know	6	61	100

For both the southern St. Vincent Grenadines and Carriacou, the majority of fishers interviewed indicated that six trading vessels were operating (Table 21). This is not surprising, since vessels that service fishers from the southern St. Vincent Grenadine islands of Mayreau, Petit Tabac, and Union also service the Grenada Grenadines of Petit Martinique and Carriacou. For the northern Grenadine islands, the majority of fishers indicated that four vessels were in operation (Table 21).

Trading vessels to which fish are most often sold by fishers in the northern and southern St. Vincent Grenadines and Carriacou are listed in Table 22. It is clear that trading vessels have discrete operational areas and are not well known by fishers outside these areas (Tables 21 and 22). The vessels Racio, Content II, Five Nails, Stranger Man and Trafalgar Star are all reported by fishers as purchasing fish from the northern St. Vincent Grenadines and do not typically have fishers from the southern Grenadines or Carriacou selling to them.

Trading vessels servicing southern Grenadine locations, e.g. Comment, Gipsy Moth, Minnerva, Leonora S. and Deliver Us, were similarly not well known by survey respondents in the northern St. Vincent Grenadines (Tables 21 and 22). Five Nails is the only vessel from the northern zone that is known to operate in the southern zone, and Clariann B is the only southern-based vessel which operates occasionally in the northern zone. Almost all fishers from Carriacou sell only to the vessels Leonora S., Minnerva and Deliver Us.

These results indicate clearly that vessels servicing northern St. Vincent Grenadines, southern St. Vincent Grenadines and Carriacou locations basically operate within discrete, spatially separated areas, with one vessel from each area occasionally overlapping in its area of operation.

In the southern St. Vincent Grenadines, Clariann B. is the most frequently visiting vessel, while in the northern St. Vincent Grenadines, Content II visits most frequently (Table 23). Leonora S, and Minnerva appear most frequently in Carriacou.

Both vessels interviewed from the northern St. Vincent Grenadines (based at Bequia) reported that they also purchased fish from mainland St. Vincent. The three vessels interviewed from the southern Grenadines (based at Petit Martinique) all reported that they only purchased fish within the Grenadine islands.

**Table 21: Percentage of fishers in each major area of operation indicating the number and names of trading vessels known<sup>1</sup>.**

NUMBER OF TRADING VESSELS KNOWN TO OPERATE	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
2	0	17	0
3	0	7	0
4	82	20	0
5	18	13	40
6	0	33	60
7	10	10	0
<b>NAMES OF TRADING VESSELS KNOWN TO OPERATE</b>			
Comment	2	15	18
Gipsy Modi	0	8	18
Dowline*	2	11	0
Clariann B.	2	25	11
Minnerva	0	14	18
Deliver Us	2	8	18
Matthew'	0	1	0
Lenora S.	0	6	18
Jeffery	0	1	0
My Kindness	0	3	0
Racio	23	0	0
Content II	23	0	0
Five Nails	23	5	0
Stranger Man	21	0	0
Trafalgar Star	3	0	0
Don't know all names	2	5	0

- - Vessels names undetermined. Known by names of captains.
- - Discrepancies occur between fisher knowledge of number of vessels known, operating and names of trading vessels known. This occurs because many of the fishers did not know all the vessels names.

Both northern St. Vincent Grenadine vessels indicated that they make several purchasing stops per trip before leaving for Martinique. Operators of both these vessels indicated that they purchased fish in Paget Farm, Petit Nevis, and Friendship Bay in Bequia and in Britannia Bay, Mustique (Figure 1). Only one of the southern Grenadine vessels reported making multiple purchasing stops per trip to Martinique. This vessel

indicated that it purchased fish from Union Island, Palm Island, Mayreau, Canouan and also from its home base in Petit Martinique. The two remaining vessels purchase fish from Petit Martinique only.

All informants from Union, Carriacou and Mayreau reported that, owing to the proximity of the islands, fishers, particularly those in the southern Grenadines, may travel to other islands where trading vessels are anchored if none are present at their fishing locations.

Both of the northern Grenadine vessels indicated that all other vessels known within their area typically worked the same route as they did, with the exception of a single vessel which also services Canouan (Table 24).

**Table 22: Percentage response of fishers in each major area of operation on their vessels of choice for selling fish catch.**

VESSEL NAMES TO WHICH FISH CATCH IS SOLD	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
Comment	2	21	8
Gipsy Moth	0	8	8
Dowline*	2	10	0
Clariann B.	2	29	0
Minnerva	0	6	39
Deliver Us	0	6	39
Matthew	0	2	0
Leonora S.	0	0	39
Jeffery	0	0	0
My Kindness	23	0	0
Racio	23	0	0
Content II	23	0	0
Five Nails	21	8	0
Stranger Man	3	0	0
Trafalgar Star		0	0
Don't know all Vessels names	0		0
Sell to all vessels existing in our area (Don't know any Vessel names	2		0
Don't know	0	2	0

\* - Vessel *names* unknown. Known by names of captains.

Two of the three southern Grenadine vessel operators interviewed indicated that all other vessels known in that area worked the same route as they did. The remaining vessel which services Union Island/Palm Island, Mayreau, Canouan in addition to Petit Martinique is the only one which follows this route.

Personal observations indicated that trading vessels predominantly anchor near areas of heavy fishing activity where fish is easily accessible and the probability of loading turnover is high. Bequia in the northern Grenadines and Petit Martinique in the southern Grenadines are the main loading areas for the trading vessels (Table 25).

Bequian trading vessels purchase fish at several locations around Bequia. Personal observations indicated that the main anchoring locations were at Paget Farm, Petit Nevis and Friendship Bay. Some vessels may move around to several of these locations during a day. A few of the Bequian trading vessels also anchor at

Indian Bay and Kingstown, mainland St. Vincent and at Britannia Bay, Mustique.

The Bequia key informants both indicated the existence of five trading vessels for the northern Grenadines (Table 25). The vessels cited are, Content II, Racio, Stranger Man, Five Nails and Trafalgar Star. Five Nails is currently the only vessel from the northern Grenadines known to also service the southernmost islands of the northern Grenadine area, i.e. Savanne and Canouan.

**Table 23: Percentage of fishers by each area of operation indicating that a particular vessel frequently stops at their fishing location.**

NAMES OF VESSELS WHICH STOP AT THESE FISHING LOCATIONS MOST FREQUENTLY	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
Comment	0	4	0
Gipsy Moth	0	0	0
Dowline'	0	4	0
Clariann B.	3	64	0
Minnerva	0	13	40
Deliver Us	0	4	0
Matthew*	0	0	56
Leonora S.	0	0	0
Jeffrey	0	0	0
Mv Kindness	0	0	0
Racio	15	0	0
Content II	46	0	0
Five Nails	15	11	0
Stranger Man	12	0	0
Trafalgar Star	6	0	0
Don't know ail	3	0	0

\* - Vessel names unknown. Known by names of captains.

Key informants indicated that Petit Martinique vessels typically remain there, purchasing fish at the main anchoring site on the leeward side of the island.

The Canouan informant indicated that Canouan fishers are serviced by only two trading vessels, one from each of the main areas of activity: Five Nails from the north and Clariann B from the south. They anchor and purchase fish in Grand Bay. These two vessels are the only two vessels from each of the main areas of activity which cover other areas in their purchasing movements. They are also the only vessels from the two main areas of activity which overlap by taking fish from the islands located between the main areas. Clariann B., although belonging to Petit Martinique, a Grenada Grenadine, can also purchase fish from the islands in the St. Vincent Grenadines, as it is registered in St. Vincent and the Grenadines.

**Table 24: Numbers and names of trading vessels known by each of 5 trading vessels sampled.**

TRADING VESSELS	SOUTHERN NORTHERN GRENADINES			GRENADINES	
	1	2	3	4	5
Number of other trading vessels known	5	5	6	4	4
Names of trading vessels	Comment	Gypsy Moth	Content II	Content II	Stranger Man
	Clariann B.	Clariann B.	Dowler	Stranger	Racio
	Dowler	Dowler	Deliver Us	Man	gar
	Deli	Deli	Minerva	Trafal	Nails
	Minerva	Minerva	Gypsy Moth	Star	Five
			Nails		

**Table 25 : A summary of vessels by island purchasing fish as indicated from key informant accounts and personal observation.**

ISLANDS	VESSELS PURCHASING FISH
Bequia**	Content II / Racio / Five Nails / Stranger Man /Trafalgar Star
Mustique	Content II / Racio / Stranger Man / Five Nails
Canouan	Five Nails / Clariann B.
Mayreau*	Clariann B.
Union*	My kindness / Dignity / Comment / Minnerva / Deliver Us
Petit Martinique**	Gypsy Moth / Clariann B.
Carriacou*	Leonora S. / Minnerva

\* - Fishers from *these* islands predominantly sell their fish to vessels stationed in Petit Martinique;  
 \*\* - Islands constituting the main centers of activity for trading vessels.

According to the Mayreau key informant, Mayreauan fishers are serviced by trading vessels in two ways. They may travel to Petit Martinique and sell their fish directly to vessels there or they may sell to the Clariann B. which stops and purchases fish for a few hours daily when making its purchasing rounds. Personal observation confirmed this as the only mobile vessel of the Petit Martinique area.

Key informants 6 and 7 from Union Island reported that most fishers from this island sell their catch to trading vessels in Petit Martinique, although the Clariann B. may sometimes anchor to purchase fish in Union Island or nearby Palm Island. Carriacou informants indicated that fishers from that island sell



their catch to a single trading vessel based in Carriacou, Leonora S., which specifically caters to them. Alternatively, they sell to the trading vessels in neighbouring Petit Martinique. It is reported that one vessel, Minnerva, based in Petit Martinique, occasionally moves across to Carriacou to service fishers, primarily at Windward. The Leonora S. normally anchors at Hillsborough Bay, Carriacou sometimes moving to Watering Bay, Windward Carriacou. Informants from Carriacou also reported six trading vessels operating in Petit Martinique. The vessels known are: Comment, Minnerva, Deliver Us, My Kindness, Clariann B. and Dignity.

None of the informants interviewed, except those from Bequia and informant #5 from Union Island, knew if trading vessels purchased fish at locations outside the Grenadines. The Bequia informants both indicated that trading vessels also purchased fish from mainland St. Vincent.

#### 4.2.3. Vessel Schedules

All fishers interviewed in the southern St. Vincent Grenadines, northern St. Vincent Grenadines and Carriacou indicated that trading vessels operate on a regular schedule. From the perspective of a Grenadine fisher, "regular" means that vessels consistently purchase fish for a fixed number of times each month, without, necessarily purchasing fish at exactly the same times each month.

Availability of fish to trading vessels and market demand in Martinique are both important factors affecting trading vessel operational schedules across all main areas of operation (Table 26). Factors affecting schedules did not differ significantly among areas of operation (G-test,  $G = 0.45$   $p > 0.50$ ).

**Table 26: Percentage of fishers from each of three main areas of operation indicating the principal factors affecting trading vessel schedule.**

FACTORS AFFECTING SCHEDULE	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES CARRJACOU (St. Vincent)	(Grenada)
Fish availability	50	42	46
Market demand	47	53	46
Other	3	5	9

All vessels surveyed indicated that they maintained a regular schedule of operation. "Regular" from the perspective of a vessel operator is the same as described for fishers above.

All vessels from the southern Grenadines indicated that vessels there purchase fish on a rotational basis, so that all vessels are never either purchasing fish or absent at the same time. Usually only one, but occasionally two or more vessels (when fish availability is good), ever purchase fish at a time. This pattern of operation is arranged among trading vessel operators.

Three of the trading vessels sampled (one from Petit Martinique and two from Bequia) indicated that market demand, fish availability and other factors such as telephone calls from fish purchasing agents requesting particular species at a particular time are all factors affecting the operational schedules of their trading vessels. It should be noted that these factors are not mutually exclusive. The remaining trading vessels sampled indicated that market demand and fish availability are the only factors

affecting the operational schedules of their trading vessels.

Key informants indicated that vessels keep to a regular schedule (Table 19), meaning that they purchase fish about the same number of limes per month but not necessarily at the same times each month. Also, all key informants responded that market demand and fish availability are two important factors influencing the schedules of operation of trading vessels. The informants from Carriacou, Union, and Mayreau all suggested that telephone communication from Martinique fish purchasing agents calling vessels to the market is another factor affecting schedule.

Carriacou informants also reported the existence of an "unsigned agreement" or mutual understanding between trading vessels such that they purchase fish on a rotational basis with only one or two vessels actively purchasing at any one time.

#### 4.2.4. Duration of Fish Purchase

Eighty four percent of fishers from the southern St. Vincent Grenadines responded that the duration of purchase by trading vessels was somewhere between five and eight days (Table 27). In the northern St. Vincent Grenadines, the majority (50%) of fishers interviewed indicated that trading vessels typically spend eight days purchasing fish, whereas in Carriacou, 60% of fishers indicated that purchasing duration was six days.

**Table 27: Duration of purchasing stops by trading vessels as indicated by fishers for each of the three main areas of operation.**

NUMBER OF DAYS TYPICALLY PURCHASED FISH	AREA OF OPERATION -		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	Grenada
4.5	0	0	10
5.0	0	0	36
5.5	0	0	13
6.0	0	0	10
7.0	0	0	3
7.5	6	3	0
8.0	50	19	0
8.5	0	7	20
9.0	13	0	0
10.0	31	0	0

All of the southern Grenadine-based vessels reported that they purchased fish for three to four days prior to departure for Martinique. The two northern St. Vincent Grenadine-based vessels reported that they purchased fish for five to seven and eight to nine days respectively.

The duration of fish purchase reported by key informants ranged from five to nine days (Table 19). The informants from Carriacou and Union Island indicated that the average duration of fish purchase was seven days, while informants from Bequia indicated that it was nine days (Table 19). Informants from islands falling between the two main island hubs for trading vessel activity, i.e. Canouan and Mayreau, responded that the average duration of fish purchase was five to six days. Duration of purchasing stops differed between areas of operation (G-test,  $G = 46.14$ ,  $p < 0.05$ ) indicating on average a shorter purchasing time for

the southern Grenadines.

#### 4.2.5 Number of Marketing Trips Per Month

From the informant system results, the average number of trading vessel marketing trips per month was found to be between two to three for trading vessels both in the northern Grenadines and the southern Grenadines. The vessels Content II and Trafalgar Star made more trips (3) than other vessels between August 18 to September 18 (Table 28). Two export (marketing) trips each were confirmed for the vessels Racio, and Five Nails, and one trip was confirmed for the vessel, Stranger Man during this period. Between August 18 to September 22, two export trips to Martinique were confirmed for the vessel Trafalgar Star.

Most of the Petit Martinique-based vessels made at least two trips to Martinique over the period August 26 to October 03 (Table 29). Only two of the vessels, Deliver Us and Comment, appeared to make three trips.

**Table 28: Trading vessel turnover in Bequia for the period August 18 to September 22.**

<b>VESSEL NAME</b>	<b>DATE OF ARRIVAL</b>	<b>DATE OF DEPARTURE</b>
Content II	*	Wednesday August 18
Stranger Man	*	Sunday August 22
Trafalgar Star	*	Sunday August 22
Racio	*	Wednesday August 25
Content II	Sunday August 22	Thursday September 02
Trafalgar Star	Thursday August 26	*
Stranger Man	Wednesday August 25	*
Five Nails	*	Sunday September 05
Content II	Saturday September 11	Saturday September 18
Racio	Sunday September 05	Monday September 20
Five Nails	Saturday September 11	*
Trafalgar Star	Wednesday September	*
Five Nails	22	*
	Friday September 17	

Source: Corroborated key informant accounts.

- \*> Exact date during week in question unknown.

Fishers from both the northern and southern St. Vincent Grenadines indicated that the number of trading vessel marketing trips made per month to Martinique varies between two to four (Table 30). The majority of fishers interviewed, 65% from the southern St. Vincent Grenadines, 63% from the northern St. Vincent Grenadines and 100% from Carriacou, all reported three trading vessel trips per month. The number of market trips per month did not differ significantly between areas of operation (G-test,  $G = 2.94$   $p > 0.05$ ). The two northern St. Vincent Grenadine vessels reported an average of three and three to four trips per month to Martinique. The three southern Grenadine-based vessels each reported the average number of trips per month to Martinique as three to four.

**Table 29: Trading vessel turnover in Petit Martinique for the period August 26 to October 03.**

WEEK	NAMES OF VESSELS PURCHASING FISH
93/8/26-93/9/1	Clariann B. Deliver Us
93/9/1 - 93/9/8	Comment My Kindness Dignity
93/9/8 - 93/9/15	Minerva Deliver us Leonora S.
93/9/15 -93/9/29	Clariann B. Comment My
93/9/29 -93/10/03	Kindness Minerva Deliver us Dignity Comment

Source: Data collected by Fisheries Extension Officer tot Carriacou.

**Table 30: Number of trading vessel marketing trips to Martinique per month as reported by fishers for each of the three main areas of operation in the Grenadines.**

NUMBER OF TRIPS TO MARKET PER MONTH	% RESPONSE BY AREA OF OPERATION		
	NORTHERN GRENADINES Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU Grenada
2	31	19	0
3	63	65	100
4	6	16	0

All key informants, except informant #5 from Union Island, reported that the average number of trading vessel trips to Martinique was two to three per month (Table 19).

#### 4.2.6. Variation in Vessel Purchasing Activity

The majority of fishers from Carriacou (100%), the southern St. Vincent Grenadines (94%) and the northern St. Vincent Grenadines (88%) indicated that trading vessel purchasing activity varies with time of the year, with the remainder not knowing if trading vessel purchasing activity varied.

The majority of fishers in all three main areas of operation indicated that the months of highest vessel purchasing activity were from July to November/December with January to June being the months of lowest vessel purchasing activity.

All vessels sampled indicated that their fish purchasing activity varied with the time of the year, with highest activity being recorded between the months of July to December. This is the season when importation of pelagic fishes in Martinique is permitted.

Key informants also indicated that purchasing activity varies with season (Table 19).

#### 4.2.7 Loading Capacity per Vessel

A majority (26% and 38%) of southern St. Vincent Grenadine and northern St. Vincent Grenadine fishers respectively reported trading vessel loading capacity as ranging between 2 to 2.5 mt (Table 31). For Carriacou fishers, the majority (60%) reported the average loading capacity of trading vessels to be higher, ranging from 2.5 to 3 mt (Table 31).

The two northern Grenadine vessels reported that the average quantity of fish taken to Martinique is 1.8 to 2.7 mt and 4.5 to 5.4 mt respectively. Two of the southern Grenadine vessels reported fish loads as 1.8 mt, and one reported it as between 1.8 and 2.7 mt.

Key informant #2 from Bequia reported that the average quantity of fish taken per vessel per trip is 2 mt (Table 19). Informants #3 and #4 from Canouan and Mayreau each perceived average quantities exported per vessel per trip as 2.3 mt, while informants #6, #7 and #8 from Union and Carriacou believed it to be 2.5 mt (Table 19).

#### 4.2.8. Factors Affecting Loading, Cessation and Departure

For fishers in each of the three major areas of operation, fullness of hold, availability of fish, condition of cargo and other factors all appear to be important in affecting loading cessation and departure of trading vessels (Table 32). Factors affecting loading cessation and departure did not differ among areas of operation (G-test,  $G = 0.44$ ,  $p > 0.05$ ). In all instances the other factor was cited by all responding fishers to be telephone communication from Martinique fish purchasing agents requesting stated quantities of certain species at specific times.

For fishers of the southern St. Vincent Grenadine area of operation, fullness of hold was the most important factor affecting loading cessation and departure, with availability of fish and condition of cargo following in descending order of importance. Fishers in the northern St. Vincent Grenadines area of operation reported the most important factor affecting loading cessation

and departure as the availability of fish, with fullness of hold, other factors and availability of fish following in descending order of importance. Carriacou fishers gave equal value to all factors affecting loading cessation and departure onset.

All of the trading vessels surveyed indicated that the availability of fish, fullness of hold and factors such as telephone calls from Martinique fish purchasing agents and vessel favouritism among supplying fishers are the major factors affecting when vessels will stop loading and move out.

MAXIMAL LOADING CAPACITY (mt)	% RESPONSE BY AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
0.5- 1.0	0	16	0
1.0- 1.5	13	6	20
1.5-2.0	0	0	0
2.0 - 2.5	38	26	0
2.5-3.0	25	3	60
3.0-3.5	19	0	20
3.5 – 4.0	0	23	0
4.0-4.5	0	0	0
4.5-5.0	6	6	0
5.0-5.5	0	0	0
5.5 - 6.0	0	0	0
6.0 - 6.5	0	7	0
6.5 - 7.0	0	10	0

**Table 31:  
Perceptions of  
average loading  
capacity of trading  
vessels by supplying  
fishers from each  
major area of  
operation in the  
Grenadines.**

**Table 32: Percentage of fishers for each of the three main areas of operation identifying different principal factors affecting cessation of loading and onset of departure for trading vessels (factors are not mutually exclusive).**

FACTORS AFFECTING LOADING CESSATION AND DEPARTURE	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
Availability of fish	30	22	25
Condition of Cargo	15	19	25
Fullness of Hold Other	28	35	25
	28	25	25

Informants #7 from Carriacou, #6 from Union and those from Canouan and Mayreau all suggested that the availability of fish obtained from supplying fishers is an important factor which determines when the vessel ceases loading and departs for Martinique. Availability of fish from supplying fishers depends largely on their ability to catch fish. This ability is typically affected when there are temporal fluctuations in abundance of some species, i.e. when fishers are unlucky or experience difficulty in catching fish because they are "not running." Key informant #2, from Bequia, both informants from Carriacou and the informants from Mayreau and Union island all reported that calls from the Martinique fish purchasing agents affected when vessels ceased taking on fish and departed. All informants, with the exception of those from Bequia, believed that the condition of the existing cargo was another important factor. These informants did not believe that fish spoilage occurred to the extent to warrant mention as an affecting factor. The Canouan informant stressed, however, that condition of cargo occasionally affected loading cessation and departure. Only the informants from Bequia, Carriacou, Canouan and Union considered condition of cargo to be an affecting factor. Trading vessels depart for market when the hold is full or when it is felt that sufficient fish has been acquired to provide an adequate profit.

#### 4.2.9 Fish Acquisition

Onshore observations made in Petit Martinique opposite the main trading vessel purchasing location and informal discussions with supplying fishers determined that fish is generally purchased from fishermen daily, primarily during late morning and early afternoon (10.00 a.m.-4.00 p.m.).

#### 4.2.10. Composition of Fish Species Purchased from Fishers

Virtually all fishers interviewed in each of the three major areas of operation indicated that reef/demersal species, conch and small pelagics are purchased by the trading vessels (Table 33).

These results confirm that trading vessels trade predominantly in these species groups, and that there is apparently negligible trade in lobster, large pelagics and turtles (Table 33). Sea eggs appear to be only taken from the southern St. Vincent Grenadines area. Categories of fish taken by trading vessels differed significantly among areas of operation (G-test,  $G = 8.91$ ,  $p < 0.05$ ).

From responses in all three major areas of operation, the deep demersal species, e.g. snapper and grouper, and some reef fish species, e.g. parrotfish, hinds, are the species preferred by trading vessels (Table 34). Small pelagics species, in particular jacks, robins and mackerels, are also taken frequently, but are more commonly listed as accepted or sometimes taken rather than preferred (Table 34).

Both of the northern Grenadine vessels interviewed indicated that they purchase conch, reef/demersal species and whitefish, i.e. small pelagics, for export to Martinique. All three vessels interviewed in the southern Grenadines purchase the same categories of fish, as well as large pelagic species (Table 35).

Two of the southern Grenadine vessels indicated that they may stop purchasing conch soon due to restrictive import license requirements for Martinique purchasing agents and proof of export requirements imposed by Martinique. Both of these trading vessel operators perceived these requirements *as* a ploy to decrease the market share of Grenadine trading vessels in Martinique.

Informants from all islands surveyed indicated that trading vessels are extremely selective in the fish they purchase, both in terms of species and catch quality. Deep demersal species such as snappers (*Lutjanus* spp.), and grouper (*Epinephelus* spp. and *Mycteroperca* spp.), along with reef fish species such as hind and coney (*Epinephelus* spp.) are preferentially purchased. Some other reef fish species such as parrotfish (*Sparisoma* spp., *Scarus* spp.), squirrelfish (*Holocentrus* spp.), and goatfish (*Mulloidichthys*, *Pseudupeneus* spp.) are also purchased.

**Table 33: Fishers response regarding the categories of fish taken by trading vessels within each of the three major areas of operation in the Grenadines.**

FISH CATEGORIES TAKEN BY TRADING VESSELS	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
	% YES	%YES	%YES
Conch	100	100	100
Reef/demersal	100	100	100
Small pelagics	100	93	100
Sea urchins	0	13	0
Lobster	6	7	0
Large pelagics	6	7	0
Turtles	0	0	0



Small coastal pelagics or white fish such as jacks (*Caranx* spp.) and robins (*Decapterus* spp.) are also purchased seasonally when sale in Martinique is permitted.

Personal observations made on the trip to Martinique suggest that fish consumption per individual in Martinique is very high with redfish ("poisson rouge") being highly favoured.

#### 4.2.11 Fish Purchasing Criteria

All of the survey respondents in the southern St. Vincent Grenadines, northern St. Vincent Grenadines and Carriacou indicated that catch quality is an important factor in determining what fish trading vessels buy (Table 36). Fishers regard catch of poor quality to be comprised of stale (not fresh), "badly shot" or damaged or net chafed fish. Only fish of good quality is purchased by trading vessels.

Processing, i.e. when the fish are gutted, is another important fish selection criterion for trading vessels, indicated by 73 % and 80 % of survey respondents from the southern St. Vincent Grenadines and Carriacou respectively (Table 36). In contrast, respondents in the northern St. Vincent Grenadines do not appear to consider processing to be an important criterion in trading vessel fish selection.

Three of the vessels surveyed (one from the northern Grenadines and two from the southern Grenadines) indicated that the quality of fish and whether or not it has been processed, influences whether fish is purchased from fishers. The remaining two vessels sampled only considered fish quality as a factor influencing their willingness to purchase.



**Table 36: Fishers responses to the criteria utilized by trading vessels in purchasing fish.**

CRITERIA FOR FISH PURCHASE	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
	% YES	% YES	% YES
Quality	100	100	100
Processing	24	73	80
Other	41	3	40

Informants from Carriacou, Bequia and Union all indicated that only fresh fish of good quality is accepted for purchase. Bruised, net chafed or poorly shot fish is not accepted. Species of fish which have a reputation for rapid spoilage, even when stored on ice, such as bonito (*Thunnus atlanticus*), are not purchased. Informant #2 from Bequia is the only informant indicating that demersal species purchased by trading vessels must be gutted. Informant #2 from Bequia also indicated that the minimum size of fish taken by trading vessels is 15 to 20 centimetres.

#### 4.2.12. Pricing Systems

All respondents in the northern St. Vincent Grenadines and Carriacou and 93% of the respondents in the southern St. Vincent Grenadines indicated that trading vessels pay different prices for different categories of fish (Table 37). Prices are determined solely by the species of fish supplied rather than by their size (Table 37).

A majority (35 %) of all fishers interviewed indicated that they were aware of three main price categories of fish purchased by trading vessels (Table 38). Twenty five percent of respondents indicated that they were only aware of the two categories, red fish and seine fish, while 33 % of respondents indicated that they were only aware that trading vessels purchased red.

A majority (53%) of fishers indicated that, for the red fish/snappers/deep demersals category, lower prices were set at EC \$7.00 per kg while upper prices were EC \$8.00 per kg (Table 39). However, some respondents (36% and 21%) indicated that higher prices for this category were sometimes as high as EC \$9.00 or \$10.00 respectively (Table 39). For the reef fish/caca belly category, a majority of respondents again stated that lower prices were set at EC \$7.00 per kg while upper prices were set at EC \$8.00 per kg. However, unlike the redfish category, few respondents indicated ever getting higher prices than this. A majority of respondents indicated that a single price of EC \$7.00 per kg was paid for white fish /seine fish, fish and reef fish species.

**Table 37: Fisher responses by area of operation regarding differential pricing employed by trading vessels for fish.**

QUESTION	AREA OF OPERATION		
	NORTHERN GRENADINES (St. Vincent)	SOUTHERN GRENADINES (St. Vincent)	CARRIACOU (Grenada)
	% YES	% YES	% YES
Are DIFFERENT PRICES paid by trading vessels for different categories of fish? If so: Are prices determined by the <u>SPECIES</u> of fish? If so: Are prices determined by die <u>SIZE</u> of the fish?	100	93	100
	100	93	100
	0	0	0

**Table 38: Percentage of fishers interviewed describing specific categories of fish for which trading vessels have different purchase prices.**

NUMBER OF CATEGORIES	FISH CATEGORIES	PERCENTAGE OF FISHERS KNOWING CATEGORIES
3	- Redfish/snappers/deep demersal species - Reef fish species/caca belly - White fish/seine fish	35
2	- Redfish/snappers/deep demersal species - White fish/seine fish	25
2	- Redfish/snappers/deep demersal species - Reef fish species/caca belly	33
1	- Whitefish/seine fish	2
1	- Redfish/snappers/deep demersal species	2
0	- No categories exist	4

All five of the trading vessels sampled indicated that different prices are paid for different categories of fish, with all prices being determined entirely by species rather than by size. Both the trading vessels based in Bequia reported that there were two main fish purchasing categories, "redfish" and "mixed fish". Prices were reported at EC \$8.00 per kg for redfish and EC \$7.00 per kg for mixed fish. All three trading vessels based in Petit Martinique reported the same two main fish purchasing categories as the northern Grenadine based vessels. Two of these vessels reported the price of redfish at EC \$8.0049,00 per kg and mixed fish at EC \$7.00 per kg, while the remaining vessel reported prices of EC \$8.0049.00 per kg for redfish and EC \$7.0048.00 per kg for mixed fish.

All key informants reported that trading vessels pay different prices for different categories of fish (Table 19). These informants identified two main categories of fish purchased from trading vessels: redfish and whitefish. Personal observations indicate that an intermediate

category known as mixed fish also exists. Only key informants #7 and #8 from Carriacou were able to state the average prices paid per category of fish. These informants reported that redfish was purchased from supplying fishers at EC \$8.0049.00 per kg and whitefish at EC \$7.00-\$8.00 per kg. Prices awarded during fish purchase were reported by all informants as being determined by species rather than by size.

Table 39: Percentage of fishers **interviewed** reporting lower and upper prices **paid** per kilogram by trading vessels for fish from different categories ECS2.71 = US\$1.00.

PRICES PAID PER KG (EC\$)	FISH CATEGORIES	PURCHASED BY TRADING VESSELS	
		Red fish/Snappers/Deep demersal species	Reef fish species/Caca Belly
Lowest price			
4		0	7
6		0	0
7		53	9
8		6	47
9		32	35
10		2	9
			0
			3
Highest price			
6		0	7
7		0	47
8		43	68
9		36	15
10		21	0
			3

#### 4.2.13. Duration of Fish Transport

One vessel from Bequia and one from Carriacou indicated that the trip to Martinique typically lasted 13-15 hours.

Key informants from Bequia also indicated that the trip to Martinique (approximately 210 km) typically takes 13-15 hours each way. Offloading in Martinique usually takes between 1-3 days but may take slightly longer if there are many vessels waiting to offload.

#### 4.2.14. Storage and Transportation

Informant #8 from Carriacou indicated that purchased fish is kept on flake ice in the "pockets" of the insulated hold. These "pockets" are packed so as to minimize damage to fish when the vessel rolls at sea. A layer of ice about 30 cm thick is usually laid on the galvanized metal surface of the hold. Board is placed over this ice layer and another layer of ice is laid. Fish is then packed consecutively between layers of ice. Saltwater ice may sometimes be used because it keeps longer since it is made at a lower temperature.

Much of the ice is purchased in Martinique, as block ice, and traders may utilize as much as 150 x 45kg (100 lb) blocks (Matthes 1984). This ice also serves as ballast for the southward leg of the journey. Informants from Bequia indicate that northern St. Vincent Grenadine vessels also purchase flake ice from Kingstown and Bequia, while Carriacou informants indicated that southern Grenadine vessels "topped up" their holds with ice from Windward, Carriacou and Petit Martinique.

#### 4.2.15 Fishing by Trading Vessels

None of the trading vessels indicated that they did any fishing of their own.

All key informants, except key informant #1 from Bequia, indicated that trading vessels did no fishing of their own. Key informant #1 reported that one of the trading vessels from Bequia does some fishing.

#### 4.2.16 Vessel Ownership

All five of the trading vessels interviewed reported that they were owned by individuals or families. None were owned by companies, cooperatives or other entities.

### **4.3 Activity at Destination Market**

Officials from the Statistics Bureau of Martinique Customs indicated that Grenadine trading vessels are required to pay docking fees upon arrival in the port at Forte de France. These fees are based upon the tonnage of the vessel, time in port and frequency of trips. If vessels travel to Martinique frequently, the cost of docking for the vessels is lower.

Export clearance and health certification are required from Grenadine trading vessels by Martinique customs agents before any retail transactions can occur. Sanitary health inspectors also board arriving vessels and assess the condition of the cargo.

After Grenadine vessels secure clearance from Martinique Customs authorities, they are then free to sell their fish. Key informants from the Martinique Statistics Bureau indicate that all fish from the Grenadines and other countries are sold only to fish purchasing agents in Martinique. These fish purchasing agents are the primary fish distributors in Martinique. They retail and wholesale fish to vendors, supermarkets and local fish shops. Key informants from the Statistics Bureau, state that most, if not all, of the fish from the Grenadines is consumed locally.

According to key informants from the Statistics Bureau fish purchasing agents are required to pay several duties and taxes on imports. For fish these duties and taxes total to 13.1% of the value of the fish and transport costs. This 13.1 % of tax levied is composed of: the "Octroi de Mer" a 10% tax on the value of fish, molluscs and crustacean species; an "additional tax" (taxe additionnelle) of 1 %; and a value added tax (VAT) of 2.1 %.

Key informants at the Statistics Bureau of Customs confirmed the existence of fish purchasing quotas for purchasing agents. This occurs during the "Miquelon" season (January-

June) when the importers in Martinique are not allowed to import pelagic species. During this period, large pelagic species are banned and the quotas for other species change.

Observations indicate that purchasing transactions between fish importers and Grenadine traders occur on the dock. First, the fish are transferred from the insulated hold to pre-weighed plastic tubs. Weights and species are then recorded by a crewman/captain of the vessel retailing the fish, by the fish purchasing agent and by the customs agent. The agents pay the captain for the fish, then transport it away in refrigerated trucks.

Health inspection officials at the dock indicate that on average Grenadine trading boats come to Martinique twice a month and typically take one to five days to sell their fish. Fish is sold to the fish purchasing agents who offer the best prices.

#### **4.4 Historical Perspectives on Trading Vessel Activities**

Key informants from Bequia, Union Island and Carriacou all indicated that the Grenadine fish trade with Martinique started in the late 1970s, with vessel trading activity peaking by the early to mid-1980s and declining subsequently to the present period. Although the informants from Canouan and Mayreau did not know when fish trading activity started, they shared the view that the trade has been declining.

Key informant #2 from Bequia suggested that the same number of trading vessels are currently involved in the Bequia fish trade as previously, but that the quantities of fish shipped and the frequency of trading vessel trips have declined markedly. This informant responded that, during the peak years of the trade, purchasing time could be as short as 1 to 2 days.

The informants from Union island and Carriacou stated that the fish trade for the islands of the southern Grenadines began out of Union Island, with fish being purchased by Martinique owned boats operating with local (Grenadine) captains and crews. They also reported that some of these initial entrepreneurs eventually stopped their fish trading operations while others were subsequently displaced by locally owned and operated vessels. Key informant #5 from Union Island stated that, by 1983/1984, all 4-5 vessels operating from Union had ceased fish trading.

##### **4.4.1 Overcapitalization and Financial Mismanagement**

Most key informants, except those from Bequia and Canouan, identified poor financial management and overcapitalization as the principal factors causing the decline in fish trading boat activity from the early years of the trade. Informants from Carriacou, Union Island and Mayreau were of the opinion that during the initial years of fish trading to Martinique, investment in new trading vessels increased beyond that which the supply of fish could sustain. This was believed to be, in part, a consequence of the perception that trading vessel ventures to Martinique were highly lucrative. This was supported by the apparent affluence of successful pioneer trading vessel operators.

Key informant #4 from Mayreau suggested that the trade initially declined when many vessels rapidly became involved in the trade. Key informants from Carriacou and Union

Island held similar views. Carriacou informants cited a drop off in the total number of trading vessels (for Petit Martinique and Carriacou) in 1984 and 1985 from approximately 10-15 to 6 in 1993 as evidence for the decline in trade.

#### 4.4.2 Reduction in Fish Availability

Some of the key informants, specifically #2 from Bequia and #8 from Carriacou perceived reductions in fish availability as another long-term causal factor responsible for the decline in Grenadine fish trading activity. Key informant #2 from Bequia attributed overall reductions in fish availability to overfishing.

Key informant #1 from Bequia held the opposite view. He did not attribute the decline in fish trade to overfishing, but rather to a decay in "fishing attitude," i.e. diligence in fishing effort exhibited. He believed that in the past, before the advent of engines, some fishers would fish even during the night, and that comparatively, fishers do not presently appear to be as serious or as motivated as in the past.

#### 4.4.3 Factors Perceived as Currently Affecting Trade

Most informants (except #5, #3, #4 ) responded that competition in Martinique may be a major contributing factor to the declining trend currently perceived as occurring in the trade. They indicated that the competition experienced by Grenadine vessels occurred mainly from Venezuelan fish traders, who are reportedly capable of supplying large quantities of size-sorted fish at lower prices than Grenadine fish traders.

Informants from Bequia, Union and Carriacou all reported that the recently (1988) implemented purchasing agent import quota system limits the capacity of Grenadine fish traders to sell fish in Martinique. When purchasing agents use their import quotas to purchase fish from Venezuelan trading vessels, the Grenadine vessels are disadvantaged.

All informants suggested that the market demand for fish in Martinique is an important factor influencing the trade. Uncertainty in the market also affects fish trading activity. Personal observations confirm this. Trading vessels in Petit Martinique ceased their purchase of fish from supplying fishers during the week after tropical storm Cindy hit Martinique- Sea conditions after the passage of the storm may have also restricted trading vessel travel to Martinique.

Personal observations indicated that trading vessel operators may be benefiting more from the return leg of the trip from Martinique. Trading vessel operators may purchase consumer goods for retail at home bases. In some instances these vessels may be supplying commercial establishments. Trading vessels are able to supply consumer goods at cheaper prices, since they may evade import duties or taxes. The profits from the return leg from Martinique may now represent a greater driving force for the current existence of the Grenadine fish trade.

All informants interviewed indicated that the availability of good quality fish was a currently a major factor influencing trade. They all stated that when fishes are not "running", i.e. abundance in fishing areas, trading vessel turnover periods are longer.



Carriacou informant #8 indicated that instabilities and unpredictability of the value of the French franc, coupled with the effect that this has on franc to EC currency conversions, is believed to be another factor affecting the fish trade. When such situations arise, the incentive to sell fish in an already competitive market declines.

## 4.5 Export Data

The export records used are exports both from mainland St. Vincent (17.5% of total shipments from 1985-1992) and the St. Vincent Grenadines (82.5% of total shipments from 1985-1992). For the Grenada Grenadines, the records used refer only to exports from Carriacou and Petit Martinique.

### 4.5.1 Annual Fish Exports

St. Vincent Government Fishery Division records show that the total amount of fish (shellfish included) exported annually from St. Vincent and the Grenadines increased steadily from 47 mt in 1985 to a peak of 167 mt in 1988 then declined in subsequent years to 98 mt in 1991 before increasing again to 137 mt in 1992 (Table 40, Figure 3).

**Table 40: Annual fish exports from St Vincent and the Grenadines (1985-1992) shown separately by category. Data are from St. Vincent and the Grenadines Government Fisheries Division.**

CATEGORY	YEAR								
		1985	1986	1987	1988	1989	1990	1991	1992
TOTAL FISH EXPORTS BY CATEGORY (mt)	R/D	29	54	101	110	61	66	68	94
	LP	0	0.2	0	0	1	8	11	9
	SN	2	17	23	42	60	23	6	15
	MIX	13	13	13	5	14	1	11	14
	LOB	<1	1	2	5	5	5	2	5
	CON	1	<1	<1	5	3	3	0	5
	OTH	1	0	<1	0	<1	0	0	0
PERCENTAGE COMPOSITION BY CATEGORY	R/D	62	63	73	66	42	62	69	66
	LP	0	<1	0	0	<1	8	11	6
	SN	4	20	17	25	42	22	6	11
	MIX	28	15	9	3	10	1	11	10
	LOB	1	1	1	3	3	5	2	4
	CON	2	<1	<1	3	2	3	0	4
	OTH	2	0	<1	0	<1	0	0	0
TOTAL EXPORTS (mt)		47	86	139	167	144	106	98	142

R/D - Reef/Demersal fish; LP - Large Pelagics; SN - Seine fish; MIX - Mixed fish; LOB - Lobster, CON - Conch; OTH - Other

Reef/demersal fish are by far the most important category of exported fish, accounting for between 42 and 73% of all exports (Table 40). Exports of reef/demersal fish increased steadily from 29 mt in 1985, reaching a peak in 1988 at 110 mt. They then declined in

subsequent years, with export levels ranging from 61 to 68 mt until 1992, when they rose again to 94 mt (Table 40, Figure 3). Exports of large pelagic species have only become significant since 1990, now accounting for around 10% of the total annual exports (Table 40). Exports of seine-caught fish species increased from 2 mt in 1985 to a maximum of 60 mt in 1989 and have since declined to 15 mt by 1992 (Table 40, Figure 3). Lobster, conch, and other exports are of relatively minor importance throughout the time series, generally accounting for less than 2.5 % combined (Table 40).

Grenada Government Fishery Division (Carriacou Office) records show that total exports of fish and shellfish from the Grenada Grenadines (Carriacou and Petit Martinique) rose from 44 mt in 1988 to a maximum of 272 mt in 1991 (Table 41, Figure 4). There appears to have been a decline in 1993, but data are incomplete. No data are available on species composition of Grenada Grenadine exports.

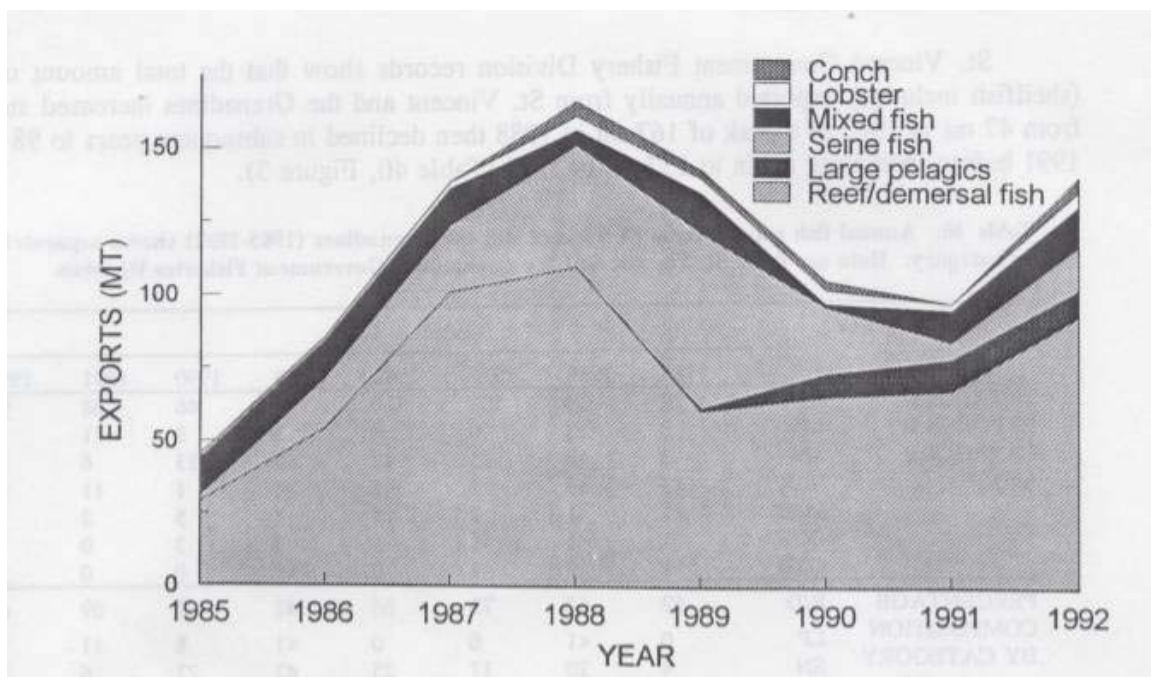


Figure 3. Annual exports of fishery products by category from St. Vincent and the Grenadines

#### 4.5.2 Number and Size of Shipments

The number and size of export shipments of fish by category from St. Vincent and the Grenadines are given in Table 42. The total annual number of trips rose to a peak of 168 in 1988 and has since declined to around 100 (Table 42). The median size of shipments of reef/demersal species differed significantly among years with no trend (Kruskal Wallis Test:  $H = 62.3$ ,  $p < 0.05$ ). They increased from 953 kg in 1985, remained constant at 1000 kg through 1986-1990, and peaked at 1100 kg in 1991 and 1992 (Table 42). The median shipment size of large pelagics increased approximately 11 fold, from 125 kg in 1986 to 1362 kg by 1989, and declined to 681 kg by 1992 (Table 42). However, owing to the high degree of variability within years, they did not differ significantly among years (Kruskal Wallis Test:  $H = 7.8$ ,  $p > 0.05$ ). The median shipment sizes of seine fish did not differ significantly among

years (Kruskal Wallis Test:  $H = 13.6, p > 0.05$ ).

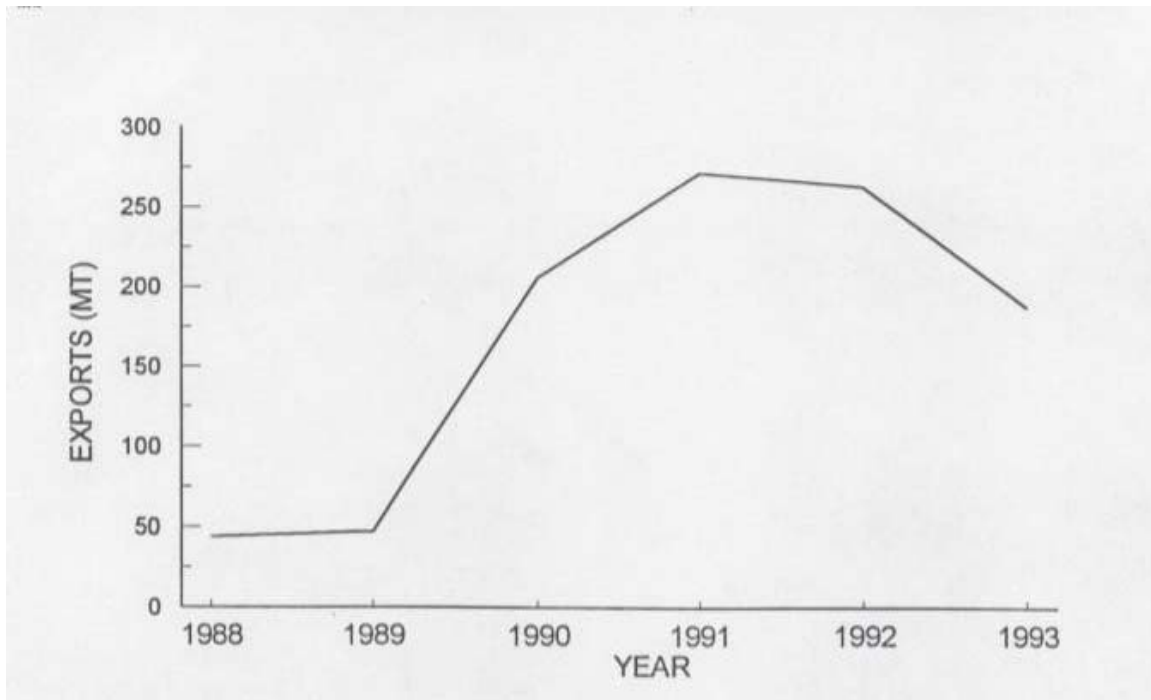
For mixed fish, the median shipment size did not differ significantly among years (Kruskal Wallis Test:  $H = 12.1, p > 0.05$ ). The median shipment size of lobster differed significantly among years (Kruskal Wallis Test:  $H = 40.0, p < 0.05$ ), but with no apparent trend (Table 42). The median shipment sizes of conch varied significantly among years (Kruskal Wallis Test:  $H = 25.0, p < 0.05$ ) with an apparent trend towards larger shipments in later years (Table 42).

**Table 41: Annual fish exports from Carriacou and Petit Martinique (1988-1993), from export records collected by Grenada Government Fisheries Division Extension Officer, in Carriacou.**

Year	1988	1989	1990	1991	1992	**1993
Total fish and shellfish (mt)	44	47	206	272	263	188

- Only five months of data were available for 1989. Therefore the total amount of fish and shellfish shown here represents a pro-rated annual value based on a mean percentage of the total amount of fish and shellfish exported from January to May in 1988 and 1990-1993. Calculated mean percentage of fish and shellfish exports during this period is 51%. The actual amount of exports recorded in 1989 is 24 mt;

- Only nine months of data were available for 1993. The total amount of fish and shellfish shown here represents a pro-rated annual value based on a mean percentage of the total amount of fish and shellfish exported from January to August in 1988 and 1990-1992. Calculated mean percentage of fish and shellfish exports during this period is 75\*. The actual amount of exports recorded in 1993 is 141 mt



**Figure 4. Annual exports of fishery products from the Grenada Grenadines**

The number and size of export shipments of fish from Carriacou and Petit Martinique are given in Table 43. The number of trips per year has risen sharply from 44 in 1988 to 127 in 1993 with a peak of 170 in 1992 (Table 43). The median size of shipments has also increased from around 1000 kg to 1350 kg over the years 1988-1993, with a peak of 1500 kg per shipment in 1991 (Table 43). Shipment data for the Grenada Grenadines are not available separately by species category.

**Table 42: Annual number of shipments, median and (range) in size of individual shipments (kg) by fish category from St. Vincent and the Grenadines (1985-15\*92). Data are from St. Vincent and the Grenadines Government Fisheries Division .**

YEAR	NO. OF SHIPS	REEF/ DEMERSAL	LARGE PELAGIC	SEINE FISH	MIXED FISH	LOBSTER	CONCH	OTHER
1985	64	953 (200-2272)	-	1589 (4545-1000)	1135 (52-2000)	45 (14-391)	52 (36-136)	1135 (1135-1135)
1986	79	1000 (272-2000)	125 (68-182)	2000 (850-2270)	2000 (454-2000)	636 (590-681)	25 (23-63)	-
1917	MS	1000 (91-4000)	-	1362 (900-1816)	999 (91-2000)	122 (91-397)	50 (50-50)	68 (68-68)
1981	163	1000 (90-6000)	-	1362 (350-6000)	1514 (1250-257)	250 (100-600)	150 (40-363)	-
1919	tsi	1000 (300-2270)	1362 (1362-1362)	1453 (454-2724)	854 (150-2270)	182 (10-227)	136 (20-454)	132 (132-132)
1990	131	1000 (300-1500)	567 (68-1589)	1000 (45-2724)	454 (318-454)	182 (130-581)	150 (20-400)	-
1991	93	1100 (36-2400)	954 (32-3332)	3000 (3000-3000)	800 (41-3632)	ISO (23-250)	-	-
1992	111	1100 (300-3500)	600 (193-1329)	1100 (55-2000)	1477 (74-2270)	295 (136-400)	386 (91-681)	-

-- No Shipments recorded

**Table 43: Annual number and median size of individual shipments (kg) of fish from Carriacou and Petit Martinique. Data are from Grenada Fisheries Extension Officer in Carriacou,**

YPAR	NUMBER OF SHIPMENTS	MEDIAN SIZE (kg)
1988	44	1000
1989	74	600
1990	166	1200
1991	166	1500
1992	170	1400
1993	127	1350

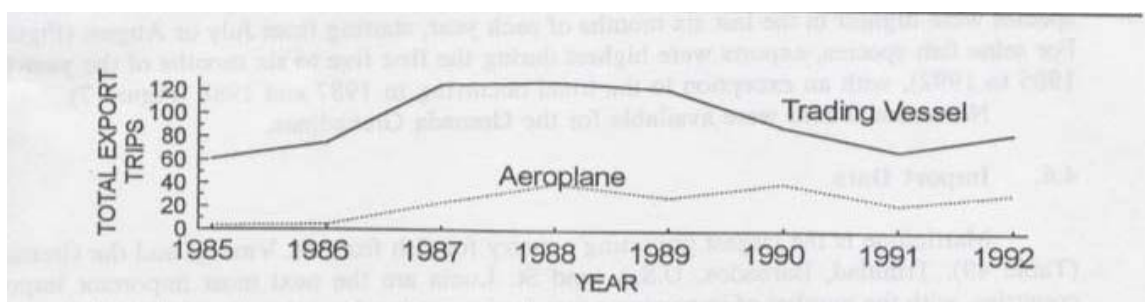
### 4.5.3 Shipment Carriers

The total number of air and sea carriers for fish shipments (exports) from St. Vincent and the Grenadines and their relative importance, is shown in Figure 5 and Table 44.

Trading vessels are the most important carriers taking between 95% and 72% of all fish exports, although their importance appears to be declining steadily from 1985<sub>f</sub> with shipments by aeroplane becoming more frequent (Table 44).

**Table 44: Total number of air and sea trips and carriers for fish shipments from St. Vincent and the Grenadines, and their relative importance from 1985-1992, Data are from St Vincent and the Grenadines Government Fisheries Division.**

YEAR	CARRIER	1985	1986	1987	1988	1989	1990	1991	1992
Total No. of Export Trips	Trading Vessel	61	66	125	128	122	90	70	85
	Aeroplane	3	4	23	40	29	41	23	33
Percent of Export Trips	Trading Vessel	95	95	85	76	81	69	75	72
	Aeroplane	5	5	16	24	19	31	25	28
Total No. of Carriers	Trading Vessel	103	11	12	17	18	12	10	12
	Aeroplane	3	2	3	2	2	4	3	6



**Figure 5. The total number of exports trips per year by trading boat and aeroplane from St. Vincent and the Grenadines**

The number of individual trading vessel carriers has remained around 10-12 for most of 1985-1992, although their numbers did peak around 1988-1989 when 17-18 vessels were recorded (Tables 44 and 45). Puma, Stranger Man and Clariann B. were the most active vessels in the period 1985-1992, with each making trips for five or more years between 1985 to 1992 (Table 45). Only two vessels (Puma and Stranger Man) have remained in operation throughout the period of recording (1985-1992). Many new vessels have entered the trade, whilst older ones have dropped out (Table 45). For example, in each of the years 1987 to 1989, seven new vessels entered the trade, while through each of the years 1990 to 1992 four new vessels entered.

The number of aeroplanes (commercial and charter carriers) differed little for the years 1985-1991, ranging between two to four. The highest number of planes was recorded in 1992 at six.

For Carriacou and Petit Martinique, only records for fish shipments by trading vessel were available (Table 46). The number of operationally active vessels has increased from around 11 in 1988, to 16 in 1993, reaching a maximum of 20 in 1990 (Table 46).

Content H, Let Me Live, Lady Antoinette, Minnerva Pride, Leonora S. and Determination were the only vessels which made trips each year from 1988-1992 (Table 47). The highest number of trips made by any one vessel in any single year was 22, made by the vessel Black Fin in 1990 (Table 47).

#### 4.5.4 Fish Exporters

For St. Vincent and the Grenadines, the total number of fish exporters is given in Table 48, and shows an increase from 13 in 1985 to 23 in 1992. The highest number of fish exporters was recorded in 1987 at 29.

No reliable or complete data on the number of fish exporters were available for the Grenada Grenadines.

#### 4.5.5 Seasonal Variation

With little exception, during the years 1985 to 1992, export shipments of reef/demersal species were highest in the last six months of each year, starting from July or August (Figure 6). For seine fish species, exports were highest during the first five to six months of the year (from 1985 to 1992), with an exception to the trend occurring in 1987 and 1988 (Figure 7).

No seasonal data were available for the Grenada Grenadines.

### **4.6 Import Data**

Martinique is the largest importing country for fish from St. Vincent and the Grenadines (Table 49). Trinidad, Barbados, U.S.A. and St. Lucia are the next most important importing countries, with the number of importing countries increasing from three in 1985 to seven in 1991 and 1992 (Table 49). Shipments to Barbados declined in 1988 and 1989 while those to Trinidad declined from 1990-1992.

Imports of fmfish and shellfish to Martinique from Grenada and St. Vincent and the Grenadines, recorded by the Statistics Bureau of Martinique Customs from 1980-1993, are given in Table 50. Import data for Grenada, is predominantly from the Grenada Grenadines but also includes data from Grenada while import data for St. Vincent and the Grenadines includes imports both from mainland St. Vincent and the St. Vincent Grenadines.

### **4.7 Fish Yield from the Grenadine Bank**

Estimates of fish yield from the Grenadine Bank from the perspectives of supplying fishers, trading vessels, key informants, fish import data for Martinique, and export data from St. Vincent and the Grenadines and the Grenada Grenadines are presented. All estimates are made from data collected

in this study. Where possible, a range of estimates per year or per operational area, such as minimum and maximum values, are provided from each data source. In addition, estimates derived from different methods of computation using data variables from each data source are compared.

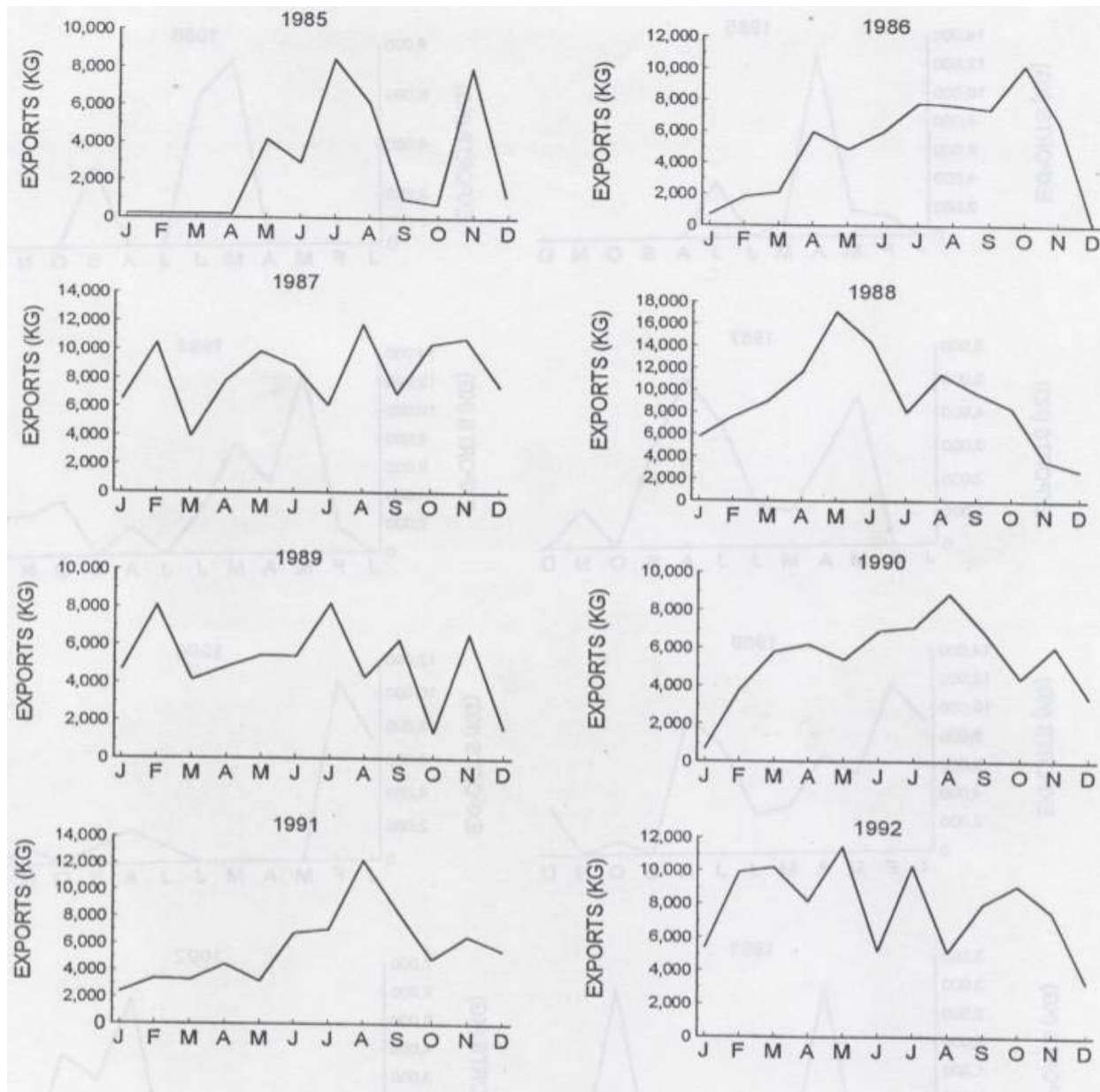


Figure 6. The monthly pattern of exports of reef/demersal species from St. Vincent and the Grenadines from 1985-1992.

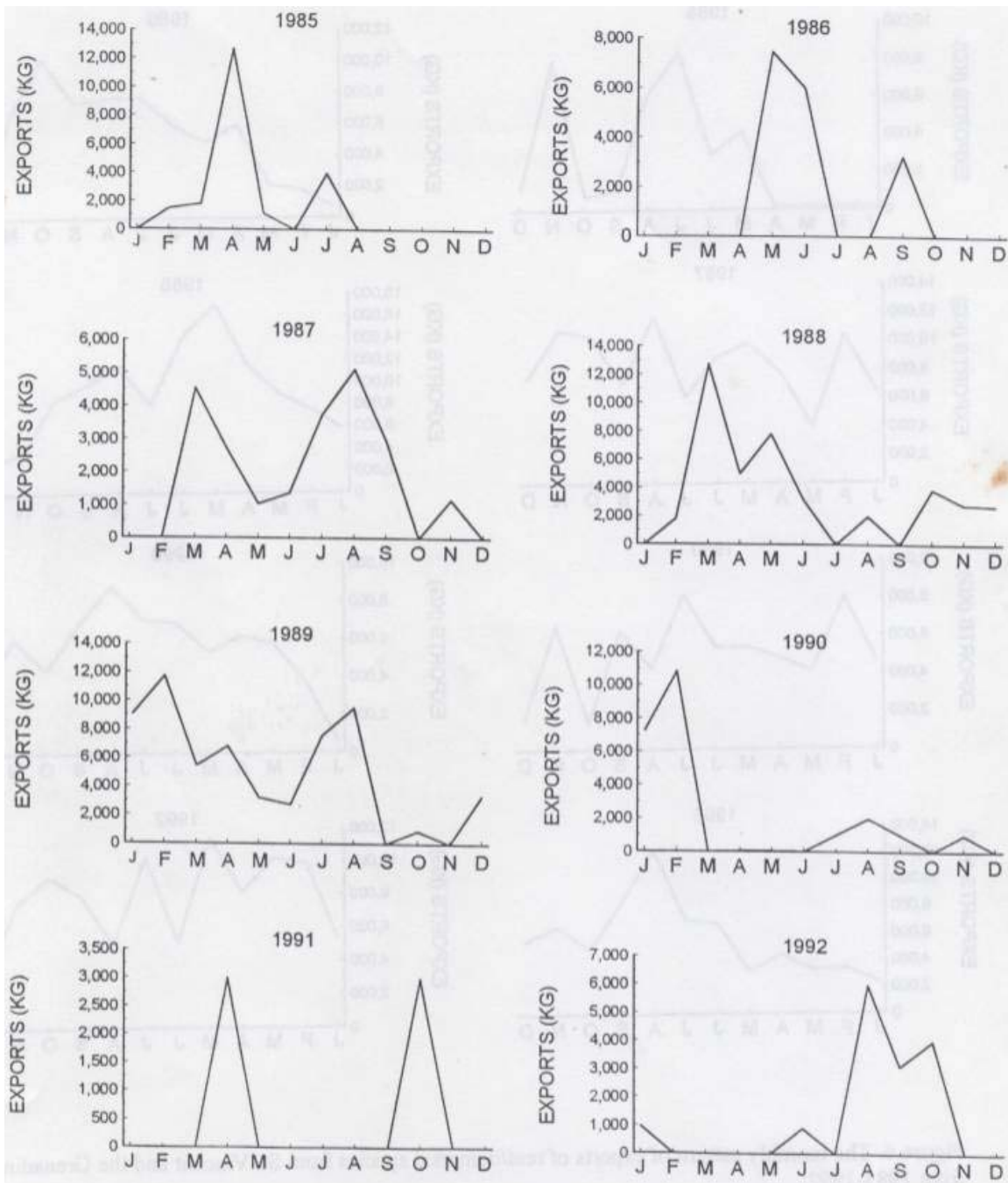


Figure 7. The monthly pattern of exports of seine fish species from St. Vincent and the Grenadines from 1985 - 1992



**Table 45: Number of export trips per year for named trading vessels from St. Vincent and the Grenadines (1985-1992). Data are from St. Vincent and the Grenadines Government Fisheries Division.**

VESSEL NAME	1985	1986	1987	1988	1989	1990	1991	1992
Boreas	2							
Lyra Kri	3							
Trait	1		6					
ZuliaO	2	1	3					
Ground Dove	4	8	12					
One Way	11	9		4				1
Outward Bound	15	8		2				17
Belinda O	12	4	16	5				
Puma	8	4		8	13	4		
Stranger Man	3	18	18	15	15	23		
Undetermined		1						
Let Me Live	1					23		
Good Fortune		8	21	1				
Five Nails		1	4		2			
Three Stars		1	11	6	2			
Lady Jacinta				7	8			
Agatha Keiry				10	9			
Jaiiick				3		8		
Whit				15	2	1		
Sailor				1				
Persia II				8				
Maxann O				14				
St. Martin de Porest				9	9	4		
Good News				9	10	7		
Nehtry				1	17	18	3	
Clariann B				14	9	19	3	5
Baldhead II					1			
Lady Ann					3			
Georgia L.					3			
Perica					3			
Be coy a I					4		1	
Leontine					13	3		
Janet					4	3		
Godspeed						1		
La Gibonne						2		
Agrionderon						1	2	
Content II						2	29	23
United Blossom							1	
Still Trying I							1	
Kale							1	5
Determined							4	1
Redstorm								1
Give Thanks and Praise								1
Still Trying II								7
Racio								10

**Table 46: Total number of trips and carriers for fish shipments from Carriacou and Petit Martinique (1988-1993). Data are from export records collected by Grenada Government Fisheries Division Extension Officer in Carriacou.**

YEAR	CARRIER	1988	1989**	1990	1991	1992	1993**
Total No. of Export Trips	Trading Vessel	44	74	166	166	170	127
Total No. of Vessel Carriers		11	8	20	18	19	16

- Only five months of data (January-May) were available. The number of export trips, and total number of vessel carriers presented for 1989 are pro-rated values based on a mean percentage of total number of export trips and the number of operationally active vessels occurring in the first five months of the years 1988, 1990, 1991, 1992 and 1993. Calculated mean percentage of export trips from January-May is 51% and for the number of vessel carriers operating it is 85%. The actual number of export trips recorded in 1989 was 37 and total number of vessel carriers recorded was 7,

- Only eight months of data (January-August) were available. The number of export trips and total number of vessel earners operating for 1993 are pro-rated values based on a mean percentage of export trips and total number of vessel earners occurring in the (list nine months of the years 1988, 1990, 1991 and 1992. Mean percentage of export trips from January-August of these years is 75% and for the total number of vessel operating it is 100%. The actual number of export trips recorded in 1993 was 95 and the total number of vessel carriers recorded was 16.

**Table 47: Number of export trips per year by named trading vessels from Carriacou and Petit Martinique (1988-1993). Data are from records collected by Grenada Government Fisheries Division Extension Officer in Carriacou.**

**FREQUENCY OF EXPORTING TRIP**

NAME OF VESSEL	YEAR					
	1988	1989*	1990	1991	1992	1993**
Content 11	3	2	9	5	5	7
Georgia L.	1	5	8	4	2	1
Clariann B.	5	2	3	7	5	6
Lei Me Live	5	7	8	7	4	3
Lady Antoinette	7	13	18	5	4	2
Minnerva Pride	3	6	11	19	21	4
Leonora S.	8	3	12	9	4	17
Rose Crest	5		10	12	1	5
Gypsy Moth	3		3	6	18	7
Vacta	2		12	20	3	
Determination	2		7	16	4	6
Black Fin			22	8	17	1
Amanda C.			5	12	5	
Mine Rum			3	2	20	
United Blossom			10	15	20	
Comment			6	7	14	7
Janick			2	8	11	
Deliver Us			5	5	1	6
Minnerva			8	12	8	10
F.H.C.			5			
My Kindness						6
Contempt						
Dignity						

**Data for 1989 and 1993 are incomplete. For 1989 only data from January-May were available and for 1993 only data from January-August were available.**

**Table 48: Number of fish exporters for St. Vincent and the Grenadines from 1985-1992. Data are from St. Vincent and the Grenadines Government Fisheries Division.**

YEAR	1985	1986	1987	1988	1989	1990	1991	1992
NUM OF EXPORTERS	3	6	9	8	2	8	4	3

**Table 49: Distribution of all fish shipments per year from St. Vincent and the Grenadines by importing country (1985-1992). Data are from St. Vincent and the Grenadines Government Fisheries Division.**

COUNTRY	YEAR								Avg.
	1985	1986	1987	1988	1989	1990	1991	1992	
Martinique	48	71	140	160	140	118	77	85	105
Trinidad	13	4	2	5	4	3	1	9	4
Barbados	3	2	6	1	7	1	6	14	3
U.S.A.		2		1		1	1	2	3
St Lucia				1		6	6	6	2
Dominica						2	1	1	2
Tortola							1	1	2
Antigua									1
Curacao									<1
St. Croix									<1
Guadeloupe									<1
Grenada									<1

**Table 50: Total annual finfish and shellfish imports into Martinique from Grenada and St. Vincent and the Grenadines from 1980 to and their values in french Francs. Data are from Statistics Bureau of Martinique Customs.**

YEAR	FROM GRENADA (kg)	VALUE (SIOOOFF) ^5 GRE	X^, RTS FROM ST. ENT AND THE NADDMES (kg)	VALUE (SIOOOFF) (
1980	103,972	1023,5	••	••
1981	96,930	1345.1	486,399	6557.0
1982	96,275	1598,8	270,269	4838.4
1983	214,800	4879.1	332,074	7255.0
1984	221,409	4428.0	168,559	3825.0
1985	204,370	4115.3	208,841	4393.3
1986	331,570	6294.8	274,620	4428.2
1987	243,410	5206.6	212,996	4689.8
1988	261,800	6606.0	191,100	4007.0
1989	216,400	5496.0	151,100	3245.0
1990	230,300	4995,0	119,700	2518.0
1991	260,600	6362.0	139,800	3229.0
1992	216,600	5389.0	226,100	5350.0
1993 <sup>1</sup>	1 10,400	2957.0	89,600	2414.0

Only data from January to July were available.; Data for this year were unavailable.

**The data used in calculating the estimates are given below. Data from key informants are given first, followed by data from supplying fishers and trading vessel operators.**

#### Key Informant Data:

Avg  $VC_{sg} = 2.5$ , Avg  $VC_{ng} = 2.3$ , Min  $TM_{sg} = 2$ , Max  $TM_{sg} = 3$ ,  
 Min  $TM_{ng} = 2$ , Max  $TM_{ng} = 3$ ,  $AV_{sg} = 6$ ,  $AV_{ng} = 5$ ,  $DP_{sg} = 7$ ,  $DP_{ng} = 9$ ,  
 $DT_{sg \text{ and } ng} = 1$ , Min  $DO_{sg \text{ and } ng} = 1$ , Max  $DO_{sg \text{ and } ng} = 3$ .

#### Supplying Fisher Data:

Avg  $VC_{sg} = 2.25$ , Avg  $VC_{ng} = 2.25$ ,  $TM_{sg \text{ and } ng} = 3$ ,  $AV_{sg} = 6$ ,  $AV_{ng} = 4$ ,  
 $DP_{sg} = 5$ ,  $DP_{ng} = 8$ ,  $DT_{sg \text{ and } ng} = 1$ , Min  $DO_{sg \text{ and } ng} = 1$ , Max  $DO_{sg \text{ and } ng} = 3$ .

#### Trading Vessel Data:

Avg  $VC_{sg} = 1.8$ , Avg  $VC_{ng} = 3.6$ , Min  $TM_{sg} = 3$ , Max  $TM_{sg} = 4$ ,  
 Min  $TM_{ng} = 3$ , Max  $TM_{ng} = 4$ ,  $AV_{sg} = 5$ ,  $AV_{ng} = 4$ ,  $DP_{sg} = 3.5$ ,  $DP_{ng} = 7$ ,  
 $DT_{sg \text{ and } ng} = 1$ , Min  $DO_{sg \text{ and } ng} = 1$ , Max  $DO_{sg \text{ and } ng} = 3$ ,  $MA_{sg \text{ and } ng} = 12$ .

Minimum estimates of the total fish yield from the Grenadine Bank using formulas 1 and 2 and based on data from key informants, trading vessel operators and supplying fishers, ranged between 436 to 916 mt, while maximum estimates ranged between 810 to 1182 mt (Table 51).

Minimum and maximum estimates of the total fish yield from the Grenadine Bank (sum of fish taken from the northern and southern Grenadines) from trading vessel operators, key informants and fishers calculated by formula 2 were higher than those calculated using formula 1 (Table 51).

**Table 51: Minimum and maximum estimates of the total annual fish yield (mt) from the Grenadine Bank from key informant, supplying fisher, and trading vessel operator data.**

YIELD ESTIMATES	PERIOD	SOUTHERN ST. VINCENT AND GRENADA GRENADINES		NORTHERN ST. VINCENT GRENADINES	ALL		
		Min	Max	Min	Max	Min	Max
		Y <sub>KI</sub>	1993	360 498	540 608	276 322	414 382
Y <sub>SF</sub>	1993	486 548	486 704	324 274	324 329	810 822	810 1033
Y <sub>VO</sub>	1993	324 438	432 598	518 478	691 584	842 916	1123 1182

The first given values of yield estimate based on fisher, trailing vessel operator and key informant responses are derived from formula 1 and the second values are derived from formula 2.

Y<sub>KI</sub> - Fish yield derived from key informant data; Y<sub>SF</sub> - Fish yield derived from supplying fisher data; Y<sub>VO</sub> - Fish yield derived from trading vessel Heritors

Martinique import data from Grenada and from the Grenada Grenadines are available for 1980-1993. Estimates of yield from these data are provided in Table 52. Minimum estimates from key informant data of the total fish yield from the Grenadine Bank were lower than other minimum estimates made by trading vessel operators and supplying fishers (Table 51). Trading vessel operators, followed by supplying fishers, suggested the highest estimates for the total annual fish yield from the Grenadine Bank.

**Table 52: Estimates of the total annual fish yield (nit) from the Grenadine Bank from export (Y<sub>EXP</sub>) and import (Y<sub>IMP</sub>) data.**

YIELD ESTIMATES	PERIOD	ST. VINCENT AND THE GRENADINES	GRENADA AND GRANADA GRENADINES	TOTAL ANNUAL YIELD FROM THE GRENADINE BANK
Y <sub>EXP</sub>	Avg. for entire period*	118	170	288
	Avg. for last 2 years	118	201	319
Y <sub>IMP</sub>	Avg. for entire period	221	201	422
	Avg. for last 2 years	183	239	422

\* - Period of record for St. Vincent and the Grenadines export data is 1985-1992; Martinique import data from St. Vincent and the Grenadines is 1981-1993; Grenada Grenadine export data is 1988-1993

## 5. DISCUSSION

A discussion of the results of fisher interviews, trading vessel interviews, key informant interviews, export and import data and personal observation are presented in this section. The discussion is presented under specific topic headings related to the: operational difficulties experienced during data collection; evaluation of the data collection process; operational characteristics of supplying fishers and trading vessels; estimates of fish yield from the Grenadine Bank; and overall conclusions and recommendations for future studies.

Wherever possible, the findings of prior studies as they relate to the topic headings presented, are compared. It is important to note however that related information in the existing literature is scant, with much of it not quantitatively derived.

### **5.1 Data Collection Problems**

Gathering information from fishers and trading vessel operators was sometimes difficult. Grenadine fishers in particular tended to exhibit an intrinsic suspicion of strangers. Avoidance of communication with the researcher was common. From personal observation it appeared that many fishers and people of the community initially perceived the researcher's presence as an attempt to "spy" on their lifestyles and commercial business practices. This was probably in part due to the fact that cargoes other than fish, some of which may be illicit or at least undeclared, may also be carried.

Any apparent affiliation or contact of the researcher with local Government officials such as fisheries extension officers also apparently produced the perception that the research was Government back and was for the purpose of some future punitive intervention. When this occurred, information gathering was more difficult. An emphatic declaration of non-affiliation with the local Government by the researcher prior to any attempts at information gathering from fishers, key informants or trading vessel operators usually facilitated the collection of information. The above view is based solely on personal impressions, since no systematic comparisons of situations were made.

Vocal and, on occasion, threatened physical aggression to researcher presence was encountered. Social "testing" of the researcher by fishers was common upon initial contact. Declarations on the reasons why information was being sought did not result in an ease of collection. Much of the information had to be collected subtly and almost covertly.

Information gathering was more difficult when all the information required from an individual could not be collected at the same time, making repetitive visits necessary. Fisher interviews were more difficult to collect in communities with small numbers of fishers. Members of such communities were more reserved in their willingness to respond and comparatively more time had to be invested in winning the confidence and trust of such fishers than those in larger communities.

In order to counteract these difficulties, the researcher had to initiate good personal contact and rapidly familiarize fishers and trading vessel operators with his presence. Rapid familiarization was achieved through consistent social interaction and participation in community events. The researcher had to work actively to win trust, confidence and respect in the community.

### **5.2 Evaluation of the Data Collection**

Interviews of fishers, key informants and trading vessel operators appeared to work well as data

collection tools, in most instances, the results from these different approaches corroborated each other. Data collection was easier when the researcher was prepared to quickly adapt to any social circumstances confronting him during the data collection process. First impressions of personal social attributes (i.e. attitudes and mannerisms) of the researcher appeared to be critical in determining whether interviews would be granted by fishers, trading vessel operators and key informants. If the researcher communicated using a tough tone of voice, and was easily understandable ("down to earth"), and friendly without appearing to be outwardly conceited during first encounters, willingness of fishers to communicate increased.

Data collection also appeared to be easier when communication, in terms of the language used, was kept simple, consistent with the respondents' level of education. Easy collection was also achieved when interviews were conducted informally through casual conversation, without note taking and when the respondent could be isolated from a larger social grouping, i.e. "one on one" situations.

Data collection was easier in communities which had some prior exposure to the presence of outside researchers. Older individuals were most cooperative in communicating with the researcher.

### **5.3 Operational Characteristics of Fishers**

Bequian fishers appear to be the most mobile of all the Grenadine fishers (Table 15). Apart from fishing around Bequia they fish in Mustique in the northern Grenadines area and Petit Tabac (Tobago Cays) in the southern Grenadines. Fishers in the St. Vincent Grenadines are provided with accommodation in Mustique, for which they each pay a minimum utilization fee per year. This allows them to remain in Mustique for extended periods of time. Mobile fishers, especially seine and lobster fishers, typically remain in Mustique for the duration of the fishing season, only returning to their homes at the end of the season ("when fish are not running") or occasionally for weekends, special occasions and family emergencies. Bequian fishers that fish from Petit Tabac in the Tobago Cays do not have permanent accommodation and "camp out" on beaches instead. These fishers fish mostly for reef and demersal species, conch and lobster. Bequian fishers based on Petit Tabac typically travel daily to Petit Martinique to sell their fish to trading vessels and to Union Island to sell lobsters to French buyers, to purchase fuel and to re-fill SCUBA tanks.

Full time employment in fishing is lower for southern St. Vincent and Grenada Grenadine fishers than for northern St. Vincent Grenadine fishers. Employment in tourism is growing in the southern Grenadines, islands primarily in tourist hotels and associated businesses in Union Island and resorts in nearby Petit St. Vincent (PSV), Palm Island and Carriacou. Personal observations suggest that, for the island of Canouan, increased construction activity for tourism and other infrastructure projects has diverted much of the employment of adult males away from fishing.

Spear fishing is more popular as a primary fishing method in the southern St. Vincent Grenadines than in the northern St. Vincent Grenadines (Table 16). This is done predominantly for reef and demersal species. A majority of the northern Grenadine fishers from Bequia fish in Mustique, with fishing being done primarily by seine for coastal pelagic species.

Average quantities of fish caught daily (Table 17) were higher for fishers for the northern and southern St. Vincent Grenadines than for fishers from Carriacou. This is because a large number of fishers in the northern Grenadines and some in the southern Grenadines fish together by seine for coastal pelagic species and average catch quantities per day given by these fishers refer to the entire catch by the same net, rather than their individual share of that catch.

Quantitative information on the operational characteristics of Grenadine fishers is generally lacking with no comprehensive documentation apart from the work of Matthes (1984) for St. Vincent and the Grenadines existing.

#### **5.4 Operational Characteristics of Trading Vessels**

Supplying fishers, key informants and trading vessel operators all reported that Martinique is the main market for Grenadine fish catch (Table 19). This was consistent with Government export records from both St. Vincent and the Grenadines and the Grenada Grenadines (Table 49). This was also consistent with the findings of Vidaeus (1969), Anderson *et al* (1982), Matthes (1984), Finlay (1990), and the CAN/SVG. Fisheries Development Project (1991). The majority of the catch is purchased and transported by trading vessels which represent the main marketing system. Local hotels, restaurants and local consumers are the other purchasing entities in order of importance. The trading vessel marketing system is a principal contributor to the economies of Grenadine islands and large numbers of the population appear to be dependent on it. Although fish is at the centre of this marketing system, additional spin-off commercial gains such as trade • in retail goods have evolved over time in association with the fish trade.

The results of fisher interviews, trading vessel interviews, key informant interviews and personal observation all corroborated each other with respect to the numbers and names of vessels that are currently, i.e, for the duration of this study, operationally active in the northern and southern Grenadines (Table 19). Five to six vessels were reported active for the southern St. Vincent and Grenada Grenadines and four to five vessels for the northern St. Vincent Grenadines. The total number of vessels reported active was equal to or just slightly lower than the number reported in the literature. Scott (1988) reported 11 trading vessels active for St. Vincent and the Grenadines while Matthes (1984) reported 13 traders and Czekaj (1984) reported 12-15.

A discrepancy in the total number of vessels operating per year between officially recorded export data for St. Vincent and the Grenadines (Table 44) and the Grenada Grenadines (Table 46) and the number of vessels recorded from personal observation and key informant accounts was observed. This suggests that, during an entire year, all vessels may not be consistently operational. This could be attributed to the fact that some trading vessel operators only enter into the trade when it is perceived that greatest profits can be made, possibly in the high season. Alternatively, it is possible that some of the vessels recorded in official export data are not "professional" fish traders but participate in fish trading on an incidental basis. Should movement of vessels into and out of the trade occur extensively over past and future time, the importance of over-capitalization in the trade may be diminished.

According to key informant, trading vessel operator and supplying fisher respondents from the northern St. Vincent Grenadines, trading vessels purchase fish from mainland St. Vincent as well as from the Grenadine islands. None of the respondents indicated if trading vessels sold fish to islands other than Martinique. However, one informant from Bequia reported that one of the older trading vessels, does periodically take agricultural produce, rather than fish, from St. Vincent to St. Maarten. This type of flexibility may also affect patterns of operation of vessels in the fish trade.



Similarly, trade in merchandise on the return leg of fish trading trips may well affect patterns of operation, particularly in the "low season" (January-June).

With regard to the pattern of purchasing activity, it is apparent (Tables 21 and 22) that trading vessels largely operate within discrete spatially separated areas, with specific groups of vessels only purchasing fish in specific areas. Only two of some nine to eleven vessels, one from the northern St. Vincent Grenadines and one from the southern Grenadines, overlap in their routes of purchase. Vessels from the northern St. Vincent Grenadines area (based mainly at Bequia) typically make daily, multiple location stops, while those from the southern Grenadines (based at Petit Martinique) typically purchase fish at a single location. This spatially discrete pattern of purchasing activity is perhaps the most optimal for trading vessel operators. Vessel groupings in these areas (Bequia and Petit Martinique) are located close to communities with large populations of fishers, where fish is more easily accessible and the probability of loading turnover is high. Islands such as Canouan and Mayreau, falling between the main operating hubs, have smaller populations of fishers, and the catch from these islands probably does not require more than one or two vessels. It would therefore be less economically efficient for all vessels working the northern Grenadines and the southern Grenadines to purchase fish from Canouan and Mayreau.

Economic factors such as elevated fuel consumption, access to lower catch volumes, and longer loading times are probably the main reasons which prevent trading vessel operators from adopting a more diffuse or "spread out" island-specific approach. Other factors such as lack of physical infrastructure and unavailability of commercial services in many of the islands, notably Canouan, Mayreau and the Tobago Cays, may act as-further disincentives to purchasing fish at these sites. For example, Canouan and Mayreau lack a continuous supply of electricity, an adequate supply of ice and shops for fishing gear and related equipment such as spare engine parts. They also lack bars and rum shops around which much of fisher and trading vessel operator social activity is centered. The Tobago Cays remain undeveloped with no permanent inhabitants or services.

A majority of fishers, trading vessel operators and key informants reported that trading vessels operate on a regular schedule, purchasing fish for a fixed number of times each month without, however, necessarily purchasing fish at exactly the same days each month.

Both key informants and trading vessel operators indicated that vessels purchase fish on a rotational basis, facilitated by a mutual understanding between trading vessel operators. Due to the "regularity" of the trading vessels and the nature of the pattern of vessel scheduling, i.e. that all vessels are never either purchasing fish or absent at the same time, a reliable, or continuously guaranteed market for fish catch from fishers is ensured.

The major factors reported by fishers, key informants and trading vessel operators which affect vessel scheduling are fish availability and market demand. If demand is higher, vessel trip frequency to Martinique increase and vessel loading or turnover will be more rapid as long as the supply of fish can be maintained or increased. If fish availability becomes lower, either due to temporal or spatial variation in local abundance or from a general decline in fishing effort, trading vessel loading will be longer and trip frequency to Martinique will decline.

Overall, the duration of fish purchase by trading vessels reported by key informants, trading vessel operators and supplying fishers ranges from five to nine days. The reported duration of fish purchase by a majority of respondents was longer from the northern St. Vincent Grenadines than for the southern St. Vincent Grenadines and Carriacou by at least two days. This is consistent with the seven-day duration of fish purchase reported by the CAN/SVG Fisheries Development Project

(1991).

The extended duration of fish purchase by trading vessels in the northern St. Vincent Grenadines is probably a function of a range of factors such as: the total population and distribution of active supplying fishers by area of operation, proximity to ice suppliers, demand for selected species groups, fish availability, and competition from other vessels.

Assuming that catch rates per individual are equal between areas, if the actual number of active fishers in the northern St. Vincent Grenadine area of operation is much lower than that in the southern St. Vincent Grenadines and Carriacou, supply of fish to trading vessels would occur at a lower rate, and loading to maximum vessel capacity and hence duration of purchase would be longer.

Alternatively, if the supply of ice is more abundant in the northern St. Vincent Grenadines than in the southern St. Vincent Grenadines, duration of purchase may be lengthened, since the probability of spoilage of fish purchased would be reduced. Personal observation suggests that ice may be more abundant in the required quantities for vessels in the northern St. Vincent Grenadines than in the southern Grenadines.

If the market demand is for select species of which the availability is low (from natural spatial/temporal variation, from over-fishing or lowered fishing effort), then duration of purchase may be longer.

Of all the factors mentioned, availability of fish is apparently the most important factor affecting the duration of fish purchase in the northern St. Vincent Grenadines.

Results from the different information gathering methods corresponded well with regards to the average number of market trips per month. Turnover data for the northern St. Vincent Grenadines and southern Grenadines from the informant system indicated that trading vessels make, on average, from one to three trips to market per month. This is slightly more frequent than the two trips per month assumed by the CAN/SVG Fisheries Development Project (1991<sup>b</sup>), on the basis of a reported trading vessel loading time of 7 days and a market turnaround of 7 days. It is also apparent from the informant system data that some vessels can be more active than others with respect to frequency of trips to market per month.

As with duration of fish purchase, the average number of market trips per month made by trading vessels is dependent on several factors, the most important of which are: environmental (weather) conditions, fish availability and market demand.

Trading vessel purchasing activity varies with the time of the year. The season of low vessel purchasing activity (January to June) corresponds to the period of restriction on importation of pelagic species into Martinique. Importation of pelagic species was restricted to protect Martinique fishers during their peak pelagic fishing season known as the "Miqueloti Season".

Estimates of the average vessel capacity provided by key informants and supplying fishers were close, with key informants suggesting that it ranged from 2 to 2.5 mt and fishers suggesting that it ranged from 2 to 3 mt. These estimates of average vessel capacity corresponded well with estimates of 1.5 to 3 mt reported by Scott (1988), but were much lower than the average capacity of 9.07 mt reported by Matthes (1984).

However, key informants and supplying fishers from the northern St. Vincent Grenadines reported

vessel capacity as slightly lower (median value 2.5 mt) than key informant and fisher respondents from the southern St. Vincent Grenadines (median value 3.0 mt). Reports of vessel capacity by trading vessel operators were more variable (1.8-5.4 mt) and are likely to be more accurate because of their direct involvement with this aspect of the fish trade. It is unlikely that trading vessel operators would overstate the maximal amount of fish they carry per vessel trip since they are legally required to pay export fees per kilogram.

It is likely that, of the vessels interviewed, some have smaller hold sizes than others or that some owners are more restricted in the availability of cash required for fish purchase, and therefore load less than the maximum capacity of the vessel per trip.

The factors which fishers, trading vessel operators and key informants cited as affecting loading cessation and departure of trading vessels were not mutually exclusive. Availability of fish, fullness of hold, condition of cargo, and calls from Martinique fish purchasing agents were all considered important factors by the entire range of respondents. More accurate determinations of which is the most important factor can only be possible if mutually exclusive causal factors are defined and posed.

Results from key informants, the majority of fishers, all trading vessel operators and personal observation across all areas of operation appeared consistent with respect to the composition of species purchased and the hierarchy of purchase preference (Tables 33, 34 and 35). Fisher respondent results from Carriacou were the only exception, probably due to the small sample size. Demersal and reef fish species such as snappers, groupers, hinds, and parrotfish are the species most preferred in Martinique. Small coastal pelagics or whitefish are also purchased but are less important with respect to market preference. The purchase of this type of fish is seasonal, occurring only outside of the periods when importation to Martinique is restricted to quotas.

From fisher reports, it is apparent that lobster is not taken to Martinique by trading vessels. This is probably because lobsters are usually sold live or frozen and are thus exported by air.

Only fishers from the southern St. Vincent Grenadines reported the purchase of sea urchins by trading vessels. This is probably due to the fact that the southern St. Vincent Grenadines area may be the only remaining area yielding sufficient quantities of sea urchins for exports. A larger, less pollutant-stressed, less overfished habitat is probably more available for the sea urchin resource around islands in the southern Grenadines area than for more developed islands in the northern Grenadines area.

Fish quality was considered the most important criterion for trading vessel purchase by key informants, trading vessel operators and fishers. Whether the fish are processed (gutted) was also considered an important criterion of trading vessel fish purchase, by trading vessel operators and supplying fishers from the southern St. Vincent Grenadines and Carriacou, although not by those from the northern St. Vincent Grenadines. This difference may be attributable to a combination of three factors. First, more seine fish are caught and purchased in the northern St. Vincent Grenadines, and seine fish does not usually require processing. Second, ice for fish storage is more readily accessible in adequate quantities at nearby locations in the northern St. Vincent Grenadines, and consequently the possibility of rapid spoilage is less than that for southern St. Vincent Grenadine and Carriacou vessels. Third, travel time to the Martinique market is more rapid for northern St. Vincent Grenadine trading vessels, which means that fish spoilage is a less significant factor.

A minimum average size of fish of 15 to 20 cm was reported by key informants and fishers, which would allow exploitation of juveniles for preferred species such as parrotfish, snappers and hinds. The differential pricing system used by trading vessels was reported by a majority of fishers, trading vessel operators and key informants as being based solely upon species/groups of fish rather than on size. A majority of fishers across all areas of operation, in addition to trading vessel operators from the southern Grenadines, indicated the existence of three major categories of purchase (Table 33). Similar prices per kilogram for each of these categories were given by trading vessel operators, key informants and fishers.

Official export records from the St. Vincent and Grenada Grenadines, and official import data by country from Martinique, indicate that exports from the Grenadines and imports of Grenadine fish into Martinique increased during the early 1980s, reaching peak amounts by the mid 1980s, the same period for which peak trading vessel activity is reported by key informants.

## **5.5 Fish Yield from the Grenadine Bank**

The disparity in fish yield estimates between data from key informants and other data sources is probably attributable to the fact that key informants are the least likely to accurately know the amount of fish taken off the Grenadine Bank, since they are usually not involved in direct daily contact with vessels.

Estimates based on average annual fish exports (St. Vincent and the Grenadines and Grenada Grenadines) and average annual imports (into Martinique) of fish yield from the Grenadine Bank differ, with the former (288 and 344 mt) being lower than the latter (422 mt) (Table 51). This could occur if Grenadine trading vessels understate the amount of fish they export so as to minimize export fees and the possibility of being required to pay income or other Government taxes. However, the fish purchasing agents in Martinique must pay taxes on fish imports and so also have an incentive to under-report the amount of fish imported. Seasonality in annual exports may also influence estimates of yield. As a consequence, the estimates derived from both export and import records may be biased downward. Estimates of Grenadine fish yield based on export and import data corresponded well with estimated Grenadine fish exports presented by other authors (Table 3). Minimum (636-916 mt) and maximum (810-1182 mt) estimates of the total annual amount of fish taken off the Grenadine Bank from key informant, trading vessel operator and supplying fisher perspectives may be realistic as they are well within the ranges of annual fish landing estimates recorded in the literature for both St. Vincent and the Grenadines and Grenada and the Grenada Grenadines (Table 8). The estimates derived in this study are likely, however, to be inflated, because of the non-specific nature of some of the assumptions used in the formulae used in computation. This strengthens the case for future studies against which the initial background data presented in this study can be compared.

It should be noted that formula 2 does not factor in TM, but instead assumes that every opportunity is taken to trade fish during the year and that this activity is continuous all year. Estimates of annual fish yield from the Grenadine Bank based on both formulae may be slightly inflated since average TM and AV varies with time of the year and this was not factored in.

Formula 2 also does not include duration of maintenance and recreational, leisure or holiday time of trading vessel operators, as this information was not collected. An unproved yield estimate would have been obtained if the data could have been included.

An additional formula (given below), using the average quantity of fish caught daily per fisher (FC) can also be used, but it would require a determination of the number of fishers by area of operation involved in specific types of fishery (NF). The formula is:

$$FC \times (365/DP+DT+DO) \times AV \times NF$$

This formula is based on the assumption that supplying fishers only catch fish when trading vessels are purchasing fish, and all of the fish caught daily is supplied to trading vessels. Since no accurate data on the number of fisher by area of operation involved in specific types of fishery (NF) were collected or available from other sources, estimates of the amount of fish taken off the Grenadine Bank using this formula was not possible. More accurate estimates using this formula can be achieved if duration of maintenance, recreation or holiday time of trading vessels is also factored in.

## **5.6 Recommendations for Fisheries Data Collection System**

Historically, the collection of good catch data, i.e. data which includes species composition, quantities landed and size distributions, and effort data in the Grenadines, necessary to effect sustainable fisheries management, has been minimal or negligible. This has been mainly due to the difficulties in accessing landing sites dispersed over several islands, and in accessing trading vessels which serve as mobile marine sites, as well as a lack of manpower to facilitate sampling.

The trading vessel fish purchasing and retailing system is an extremely important, well established, multifaceted commercial system upon which Grenadine populations are highly dependent. A structured sampling program to collect data on this system for fisheries management should take the characteristics of the system into account, so as to minimize perturbation. It should be implemented with components of education, community involvement and public discussion with affected parties. This would help to minimize the perception that the data are being collected for other motives.

The best way to get data is to sample trading vessels directly. This should be done on an opportunistic basis. However, since the basic pattern of purchasing activity (routes of purchase, anchoring/purchasing locations, names of operational vessels) is known, the probability of vessel interception can be increased. It should be noted that the pattern may vary over extended time periods, so that on-going re-assessments of the basic pattern of purchasing activity during sampling will be required to optimize vessel interception rates. It should also be noted that trading vessel operators are likely to alter their pattern of purchasing activity (particularly with respect to arranged purchase locations with supplying fishers) so as to evade any interception for sampling and to maintain secrecy/privacy in their operations. The abundance of anchoring locations and the ability to purchase fish at sea while moving facilitates this.

Data on the amounts and species traded can also be supplemented using the purchase slip, export license, and logbook methods as suggested by Finlay *et al* (1988). A real-time inter-island telephone network of key informants can also be an effective means of assessing the annual variation in trading vessel activity. Such a system could also increase the probability of vessel interception for

sampling.

In the interim, before any intensive sampling program is implemented, estimates of the total fish yield from the Grenadine Bank can be further refined. Future work in this area should attempt to collect more detailed information on the annual variation in the vessel and fisher operational activity. This should include specific quantitative data on the number of operational vessels per month for each year, the average number of trips per month for each year, the average catch rates per fisher for specific fishery types by season, the duration of fish purchase and average vessel capacity per vessel trip per month for each year, and a vessel census with indications of the frequency of fishing use and alternative use such as tourism. Feasibility of these proposed sampling methods should be field tested.

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7. APPENDIX 1: Questionnaires

CFRAMP/MAREMP TRADING VESSEL STUDY 1993  
TRADING VESSELS QUESTIONNAIRE

- 1. Name of interviewer:
2. Location:
3. Date:
4. Name of interviewee:
5. Place of residence:

- 6. Vessel Description:
Name:
Type:
Age:
Horsepower:
Length size:
Hold capacity:
Port of Registry:
Home base/Port of operations:

- 7. Who owns the vessel?
Family:
Individual:
Company (commercial):
Cooperative:
Other:

8. Address/Location of owner:

9. Where do they sell fish? (Location)
Location Always Freq. Occas Seld.

10. To whom do you sell fish at these markets?

- Wholesaler:
Processor:
Exporter:
Vendors:
Restaurant/Hotel:
Charter boats:
Other:

What are your patterns of movement?

11. Do you only buy fish in the Grenadine Islands? Yes No

12. If not where else?

13. Are you on a fixed schedule/route? Yes No

Specify: \_\_\_\_\_

14. How many stops do you make per trip?

---

15. Where do you stop? (Locations)

Island

Bay

15. For how **long do you typically** stop? Days ----- or Hours -----  
(NB: Categorization: multiple stop etc.)

16. How many trips do you make per month? -----

17. Is your schedule affected most by:                    availability of fish                    -----  
   market demand?                    -----  
   other                                        -----

18. Does your activity vary with the time of the year? Yes ----- No -----

19. If so, how, indicate months of:  
highest activity -----  
least activity -----

20. What is the typical/usual loading practice of the vessel:

21. What determines when you stop loading and move out?

Availability of fish -----  
Condition of cargo -----  
Fullness of hold -----  
Other -----

**What are you purchasing?**

22. What is composition of catch purchased from fishermen? Indicate proportions of each present in catch purchased.

% by weight

% by time of year

Conch \_\_\_\_\_  
Lobster \_\_\_\_\_  
Sea eggs \_\_\_\_\_  
Demersal/Reef species \_\_\_\_\_  
Large Pelagics \_\_\_\_\_  
Whitefish \_\_\_\_\_  
Other \_\_\_\_\_

23. What is the composition of the demersal species?

SPP	P	A	SQ	NT	SIZE TAKEN

24. \_ What other criteria determine what fish you buy?

Quality? -----  
 Processing? -----  
 Other? -----

**What are the prices and how are they arrived at?**

25. Are different prices paid for different categories of fish (categories refers to fish groups/individ. spp.)

Yes \_\_\_\_\_ No \_\_\_\_\_

26. Are these prices determined by:

Species -----  
 Size -----  
 Both -----

27. What are the categories?  
Categories

Typical prices

---



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---

28. Do trading vessels do any of their own fishing?

29. How many other trading vessels do you know of, Name them

30. Do they typically work the same route as you? Yes -----  
 No -----

31. Which of them come to this same location:

**CFRAMP/MAREMP TRADING VESSELS STUDY 1993**  
**SUPPLYING FISHERMEN QUESTIONNAIRE**

1. Name of interviewer: \_\_\_\_\_ 2. Location: \_\_\_\_\_  
 3. Date: \_\_\_\_\_ 4. Name of interviewee: \_\_\_\_\_  
 5. Place of residence: \_\_\_\_\_

6. Vessel Description:  
 Name: -----  
 Type: -----  
 Age: -----  
 Horsepower: -----  
 Length size: -----  
 Hold capacity: -----  
 Port of Registry: -----  
 Home base/Port of operations: -----

7. What kind of fisherman are you?    Trap/Reef fish                    -----  
    Coastal Pelagic/Seine fish    -----  
    Offshore pelagic                -----  
    Lobster                            -----  
    Conch                              -----  
    Demersal / Bank fish           -----

8. Where do you fish? (Location): -----

6 To whom do you sell catch? (Tick as appropriate)

<u>Buyer</u>	<u>Location</u>	<u>% to each</u>	<u>Value</u>
Wholesaler	_____	_____	_____
Processor	_____	_____	_____
Exporter	_____	_____	_____
Vendor	_____	_____	_____
Restaurant/Hotel	_____	_____	_____
Charter Boats	_____	_____	_____
Other	_____	_____	_____

7 Which of these buyers give you the best value for your catch?

8 What is the composition of other species sold to trading vessels?

% by weight      % by time of year

Conch -----  
 Lobster -----  
 Sea eggs -----  
 Demersal/Reef species -----  
 Large Pelagics -----  
 Whitefish -----  
 Other -----

23. Where do they stop? (Locations)

Island

Bay

\_\_\_\_\_
\_\_\_\_\_
\_\_\_\_\_

24. For how long do they typically stop? Days \_\_\_\_\_ or Hours \_\_\_\_\_

25. How many trips do they make per month? \_\_\_\_\_

26. Is their schedule affected more by: Availability of fish \_\_\_\_\_
Market demand \_\_\_\_\_
Other \_\_\_\_\_

27. Does their activity vary with the time of the year? Yes -----
No -----

28. If so, how, indicate months of:
highest activity -----
least activity -----

29. What is the typical/usual loading practice of a vessel:
\_\_\_\_\_
-----

30. What determines when they stop loading and move out?
Availability of fish -----
Condition of cargo -----
Fullness of hold -----
Other -----